Oregon Water Data Portal

HB 5006 Funding Final Report and Portal Recommendations

Stage 1

June 30, 2023

Public Agency Partners

Business Oregon

Office of the Governor

Department of Agriculture

Department of Enterprise Information Services

Department of Energy

Department of Fish and Wildlife

Department of Gem and Mineral Industries

Department of Land Conservation and Development

Department of State Lands

Department of Transportation

Oregon Health Authority

Department of Parks and Recreation

Oregon Regional Solutions

State Marine Board

Water Resources Department

Watershed Enhancement Board

Department of Environmental Quality

Contracted Organizations

Internet of Water Coalition

Oregon State University

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SEPTEMBER 21, 1969 – MARCH 28, 2023

Friend and contributor

Contents

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Executive Summary

The 2021 Oregon Legislature directed the Department of Environmental Quality (DEQ) and state water agencies to begin initial scoping and design and develop a funding request for further development of a water database framework. In response, the DEQ, in collaboration with other state water agencies, initiated the Oregon Water Data Portal (OWDP) Project.

The OWDP envisions a modernized, single point of access for public data about water and water infrastructure. This could include data and information relevant to or about water quality and quantity, habitat, and ecosystems, and natural and built infrastructure used to store, deliver, or treat water. The portal will help state and local governments use and share data more effectively, saving state and local resources. State agencies, Tribes, stakeholders, and people living in Oregon will have better and more efficient access to water data. This access will allow decision-makers to better prioritize water investments, help more people understand or identify issues of water availability and quality in communities across the state, and improve access to information needed to make short-and long-term water management decisions. The portal will also include modernized security systems to protect sensitive data when appropriate.

During 2021-2023 (Stage 1), the OWDP development began with scoping and design by engaging 68 participants representing more than 40 state, local, and Tribal agencies, community organizations and other interested groups. The OWDP project team inventoried currently existing water data sets held by the 17 state agencies with water related missions or functions, assessed their readiness for inclusion in the OWDP, and identified additional critical data needs. Based on meetings with representatives from states who have initiated similar water data modernization projects and meetings with private sector representatives, the OWDP project team evaluated the technical aspects of the portal platform that will be needed.

Based on the work completed for Stage 1, the OWDP project team developed a set of recommendations and associated tasks for work to be performed in OWDP Stage 2 (2023-2025):

- **Recommendation 1:** Develop a governance structure for the OWDP.
- **Recommendation 2:** Develop Standard Operating Procedures for submission, curation, and integration of data in the OWDP.
- **Recommendation 3:** Develop a pilot OWDP based on an iterative process.
- **Recommendation 4:** Based on agency and stakeholder identified needs, determine short- and long-term priorities for data readiness and integration.
- **Recommendation 5:** Where appropriate and possible, use existing software systems to build on staff knowledge and expertise.

In February 2023, the OWDP Project Team submitted a report to the Oregon State Legislature detailing project accomplishments to date, and requested funding to meet the recommendations above. The OWDP Project Team estimated necessary resources, including costs to support technical staffing and contract services, for project development and implementation during the 2023-2025 biennium at approximately $2.5M. This request was incorporated into the Bipartisan Drought Relief and Water Security Package (BiDRAWS). As of June 2023, BiDRAWS is awaiting review in the House Rules Committee after passing the House Committee on Agriculture, Land Use, Natural Resources, and Water without recommendation.

Introduction

The state of Oregon is known for its rich water resources: the transboundary Columbia River, Crater Lake, the Pacific Ocean, winter rains, snowy mountain peaks, salmon runs and fly fishing, great beer, wine, and drinking water. However, long-term trends of decreased rainfall and snowpack, as well as population growth, depleted aquifers, harmful algal blooms, other water quality concerns, and aging infrastructure, have led to increasing water stress throughout the region. To effectively manage its water resources, Oregon's public agencies need access to comprehensive, accurate, and up-to-date water data.

Today, Oregon's water data is scattered across seventeen public state agencies, each with its own data management standards and procedures. Water data users, including water resource managers and planners, must navigate a complex web of disparate sources to access the data they need to make informed decisions. We envision a modernized, single point of access for public water and infrastructure data. By centralizing diverse data sources into a unified platform, the OWDP will enable holistic assessments of the state's water resources. With timely access to accurate and relevant data, agencies can proactively mitigate water-related issues before they become crises.

The OWDP will enable agencies to address ongoing water management challenges identified by multiple stakeholders, including, but not limited to:

- Tracking the capacity and condition of dams, canals, and other critical public water infrastructure.
- Developing a standardized portal to support the interoperability and accessibility of reported data between agencies.
- Integrating existing and new groundwater data to characterize aquifers and support aquifer-specific groundwater budgets.
- Forecasting water availability and demand under climate and population change scenarios.
- Developing a statewide assessment of Publicly Owned Treatment Works infrastructure improvement needs to ensure compliance with the Clean Water Act and address future water quality and climate challenges.
- Documenting outcomes of water planning efforts, such as instream flow conservation programs.

Improved coordination of inter-agency data management, sharing, and processing is the foundation of the OWDP and will enable public, private, and non-governmental organizations to make more informed decisions about water management, use, conservation, and investment. Moreover, by leveraging consistent and modern data management practices and technologies, the OWDP will increase the accessibility and utility of required data reported by regulated entities and agencies, and improve the security of public water data managed by state agencies. By investing in this project, Oregon can position itself as a leader in water governance, ensuring the efficient and responsible management of its precious water resources for generations to come.

Background

The state of Oregon has undertaken several efforts focused on improving cross-agency water planning and management. These efforts included initiatives around water planning and collaboration, such as the Oregon Water Core Team (WCT), the 2017 Integrated Water Resources Strategy, and the 2020 100-Year Water Vision, among others. A consistent and growing theme across these initiatives has been the need for improved data access and integration across agencies.

In 2021, the Oregon Legislature directed the Oregon Department of Environmental Quality (DEQ) and the state water agencies to begin initial scoping and design and develop a funding request for further development of a water database framework.[1] This authorized work is also responsive to Recommendations A and B[2] of the 2022 Report of the Work Group on State-Supported Regional Water Planning & Management. In addition, this work aligns with recommendations from the 2017 IWRS, the 2020 100-Year Water Vision, and the Secretary of State's 2023 Water Security Advisory Report by seeking to aggregate data currently fragmented across many different agencies and process those data into answers to key water questions.

To implement this work, the partnering agencies developed a Project Concept Document that introduced the OWDP and outlined three Stages of work: Stage 1 from 2021-2023, Stage 2 from 2023-2025, and Stage 3 beyond 2025 (see Appendix A). Stage 1 focused on planning and scoping the OWDP project, including engagement with stakeholders, assessing current data availability and needs, developing a technical framework for the pilot portal, and pursuing funding from the OR legislature and federal grants.

1 HB 5006 SECTION 112: "In addition to and not in lieu of any other appropriation, there is appropriated to the Department of Environmental Quality, for the biennium beginning July 1, 2021, out of the General Fund, the amount of $350,000, to begin initial scoping and design of a database framework of water and infrastructure data."

2 HB 5006 Report of the Work Group on State-Supported Regional Water Planning & Management, Recommendation A: "The Legislature should allocate increased funding to support state agency capacity and resources for collecting, processing, interpreting, and distributing the water data needed for more effective water planning and management of instream and out-of-stream needs." Recommendation B: "The Legislature should fund, and the Governor should direct, the appropriate level of agency capacity needed for interagency data collection and analysis, technical support, and coordinated work-planning and budgeting to ensure robust engagement by and between agencies in support of water planning in alignment with each agency's mission and authorities."

Purpose of this Report

This report documents the accomplishments and lessons learned from Stage 1 of the OWDP project. In addition, it recommends goals for Stage 2 and lays out the activities, budget, and staffing needed to reach those goals. While this report is focused on the development of the OWDP, it can also inform broader agency initiatives toward data infrastructure modernization and organizational process maturity.

OWDP Stage 1 Accomplishments

Stage 1 of the OWDP project (July 2021 - June 2023) consisted of a massive planning and scoping effort that involved collaboration across the 16 state agencies that collect or manage water data in Oregon and engagement with more than 40 state and local agencies, Tribes, community organizations, industry groups, and non-governmental organizations.

Project Management and Organization

Stage 1 of the OWDP project, led by DEQ, established three interagency working groups, known collectively as the OWDP Project Team.

- **The Administrative Team/Steering Committee** consists of water data agency and IT executives to guide the project and serve as its change control board.
- **The Subject Matter Expert (SME) Team** represents each of the 17 Oregon water agencies with knowledge of each water agency's processes, data, and supporting business systems.
- **The Technical Team** provides expertise for the platform and technologies to be considered for the OWDP. Team members include several water agencies, the Oregon Department of Administrative Services, and three external organizations.[3]

These three teams worked collaboratively to build a cohesive vision for the OWDP that meets the needs and aspirations of Oregon's water agencies and communities. Focusing on their individual strengths, each of the three teams provided unique insights that shaped the planning and scoping efforts detailed below.

3 In addition to these agency-based teams, DEQ commissioned three external organizations to assist with the OWDP Project: Oregon State University's Center for Applied Systems and Software (CASS); Oregon State University's Institute for Natural Resources (INR); Oregon State University Libraries and Press; and the Internet of Water team at Duke University (IoW). CASS has special expertise in planning, managing, and executing data and information technology projects with Oregon state agencies; INR has special expertise in geospatial server applications and great familiarity with a wide variety of public data types in Oregon; and the IoW has assisted several US states in their water data modernization efforts (e.g., NM, TX, CA, NC), and developed a set of standard water data integration templates and best practices suitable for national use.

Accomplishments

During Stage 1, the OWDP project team made rapid progress toward the development of a water database framework for the state of Oregon, accomplishing all the Stage 1 planning and scoping tasks listed below.

Data and Tools Review and Assessment

Data Inventory: The OWDP Project Team compiled an initial inventory of currently existing water data sets held by the 17 state agencies with water-related missions or functions. The inventory includes available information on the managing agency, data type, and current need and condition. The inventory does not include or address federal or local water agency data (unless those data are reported to state agencies). Over 500 distinct data sets were identified and preliminarily assessed for level of readiness, level of need by user groups, and priority for inclusion in the OWDP (See Appendix H). Further development of the content of the data inventory will continue as part of Stage 2 recommended tasks.

Data Needs Assessment: The OWDP Project Team began a Data Needs Assessment to identify data sets that are essential for responding to consistent water data-related questions, but either do not exist or have low readiness e.g., not readily available in digital or interoperable formats, only available across fragmented spreadsheets. The OWDP Project Team identified a baseline of data sets that are needed but not yet collected or available for inclusion in the OWDP; several of these data sets were further identified as a significant need, key data, or both (see Appendix H). Data Needs Assessment work will continue as part of Stage 2 recommended tasks.

Long Term Project Inventory: This Inventory includes proposals from 8 agencies, so far, for projects that would enable them to develop or modernize data sets needed to answer key water management and planning questions identified during the OWDP planning and scoping period (see Appendix I). In addition to supporting the development of a comprehensive single point-of-access for Oregon water data, these long-term projects will advance the modernization of Oregon public agencies' organizational processes, increasing their efficiency and effectiveness in achieving their missions and mandates.

Data Prioritization Framework: The SME Team and Technical Team collaborated with IoW to develop a preliminary framework to prioritize data for incorporation into the OWDP. This framework was informed by stakeholder, user, and Tribal Government engagement (See Appendix C) and as well engagement across the participating agencies (see Appendix E) including a survey to assess what questions agency staff would most like to be able to answer using OWDP data.

Technical Team Engagements and Report: The OWDP Project Team engaged with peers from Texas, New Mexico, and California, who have initiated and managed similar water data modernization projects. Additionally, the Technical Team solicited presentations from data management vendors (e.g., Foundry Spatial, Google, True Elements) to better understand the technical options available, and how those interacted with currently adopted technology and expertise in the various water agencies. The Technical Team produced a report that analyzes the options available to Oregon to establish the OWDP and includes recommendations for technical aspects of the portal platform (described below) to be implemented in 2024 (See Appendix J).

Internal and External Engagement

Engagement and Listening Sessions: Members of the SME Team conducted a series of Tribal Government and stakeholder engagement and listening sessions. The goals of these sessions were to hear from users, Tribes, and stakeholders about water data issues including data needs and gaps; challenges in accessing existing data; concerns about portal development and data management; and prioritization of data use case themes (e.g., plausible data use and decision scenarios) to inform the development of a pilot portal. Following these sessions, the SME team distributed a survey to gather additional information to inform the design and development of the OWDP to best fit data and user needs. These engagements included 68 participants representing more than 40 state and local agencies, Tribes, community organizations, industry groups, and non-governmental organizations (See Appendix C). A follow-up survey emailed to attendees yielded 21 responses from organizations representing conservation, consulting, forestry, local government, utilities or services, and others. Short-term planning questions that could likely be answered by available data sets were prioritized with the most popular being "What do we know about surface water quality, and are there concerns?" followed by "How and where is water being monitored" and "Do stream temperatures support native fish species at all necessary life Stages?" (See Appendix C) for the survey results.

In-person Interagency Engagement: In October 2022, members of the SME and Technical teams participated in a day-long in-person workshop facilitated by the IoW team. This workshop followed the IoW Technology Adoption Program (TAP) principles and methods (see Appendix O). The objectives of the workshop were to promote meaningful dialogue across participating Oregon water agencies related to the Oregon Water Data Portal, establish sequencing strategies for each agency's water data, and discuss lessons from the New Mexico pilot program that can be applied to the OWDP project. After the workshop and subsequent SME team meetings, the IoW team proposed recommendations for prioritizing data to be included in the pilot portal (see Appendix E).

Project Learnings Engagement: In June 2023, members of the SME and Technical teams participated in a virtual workshop to discuss lessons learned from Stage 1 of the OWDP project (see Appendix S).

Informing Use Cases and Personas: The OWDP project team completed preliminary research on use cases for the OWDP and has developed six user personas, thus far (see Appendix M). User personas represent subgroups of the portal's target audience. These profiles depict an individual from each identified subgroup and include details such as their demographic information, background, and goals and imagine the pain points they may experience and how the portal could alleviate them. These user personas will be refined, and additional sub-user groups and personas will be developed in Stage 2 of the OWDP project.

Legislative Coordination and Reporting

Legislative Report: In February 2023, the OWDP project team submitted a report to the Oregon Legislature detailing the work to date and proposing a plan and budget for Stage 2 of the project (see Appendix F). The Stage 2 proposal was incorporated in the Bipartisan Drought Relief and Water Security Package (BiDRAWS), which aims to "produce triple bottom line benefits, charting a sustainable water future for families, farms, and fish." As of June 2023, the bill is awaiting review in the House Rules Committee after passing the House Committee on Agriculture, Land Use, Natural Resources, and Water without recommendation.

Final Report: The final report (this document) details the accomplishments and learnings from Stage 1 of the OWDP project, recommends goals for Stage 2, and lays out the activities, budget, and staffing needed to reach those goals.

Stage 1 Results and Follow-up at a Glance

STAGE 1		STAGE 2
Accomplishment	**Observations**	**Task**
PROJECT MANAGEMENT		
Established 3 interagency working groups to guide and inform the OWDP project: Steering Committee, Subject Matter Expert Team, and Technical Team	Each of the interagency working groups provided unique and valuable insights to the planning and scoping process; however, increasing collaboration could improve understanding and awareness across agencies and groups. The voluntary and informal nature of participation in these interagency working groups may not provide sufficient support for the portal over the long term	Continue to utilize these three interagency working groups to develop the OWDP project in Stage 2. Incorporate targeted cross-group collaboration and/or informative meetings into the project management plan. Evaluate and recommend a preferred formal governance structure for long-term sustainability of portal operation

STAGE 1		STAGE 2
Accomplishment	**Observations**	**Task**
Established contracts with 3 external organizations: Oregon State University's Center for Applied Systems and Software (CASS); Oregon State University's Institute for Natural Resources (INR); and the Internet of Water team at Duke University (IoW).		Continue to utilize these three external organizations to support the development of the OWDP project in Stage 2.
DATA TOOLS REVIEW AND ASSESSMENT		
Developed a draft data inventory with information on over 500 data sets from 15 agencies.	The readiness of datasets varied significantly across agencies. In addition, the level of detail provided about existing datasets varied across agencies as did the interpretation of terms like readiness.	Continue to assess and analyze data sets in the OWDP Draft Data Inventory, and refine the inventory structure as needed. Develop and draft a library of standard operating procedures, data privacy and quality guidelines, and standards for data to be included in the OWDP. Determine, define, and draft criteria for data readiness.
Completed a Data Needs Assessment	Data needs were greater than anticipated.	Continue to assess and analyze data sets in the OWDP Draft Data Needs Assessment and determine level of need and agency capacity to fill data gaps. Meet annually as project teams to address emerging data needs. Update Data Needs Assessment following expansion, prioritization, and refinement of use cases.

STAGE 1		STAGE 2
Accomplishment	**Observations**	**Task**
Developed a Long-Term Project Inventory including projects from 8 agencies	There is more background data organization and modernization work needed to prepare data for inclusion in the OWDP than anticipated	Formally assess necessary long-term projects for both data with high priority and low readiness and data with high readiness. Evaluate and catalog the status of and requirements for data and organizational readiness. Draft project evaluation plans and Policy Option Package suggestions for agencies to address water data and information technology gaps. Work with state water agencies to communicate the implications of projects and resulting data at the regional and state level.
Developed a Preliminary Data Prioritization Framework	For the pilot portal, the OWDP project team should prioritize data that: (1) meet a high-priority use case, (2) are of known quality and well maintained, (3) have a high degree of readiness and/or accessibility, and (4) will contribute to increased agency effectiveness.	Refine the data prioritization recommendations developed in Stage 1 and sequence data sets for inclusion in the pilot OWDP.
Produced a technical report based on engagements with peers from TX, NM, and CA, presentations from data management vendors, and other research.	The technical team report provides critical recommendations for the development of the pilot OWDP.	Determine the appropriate platform(s) for data storage, data reporting, and data analysis based on OWDP Technical Team recommendations. Where appropriate, deploy tools and software products included in existing state software systems to build on staff knowledge and create efficiencies in developing the pilot OWDP infrastructure and interface. Where state-licensed technologies are insufficient, analyze additional software options. Build a pilot OWDP based on guidance and recommendations from the OWDP Technical Team. Engage in an iterative design process that incorporates feedback throughout the development process by testing pilot versions of the interface for usability and functionality with potential user groups.

STAGE 1		STAGE 2
Accomplishment	**Observations**	**Task**
INTERNAL AND EXTERNAL ENGAGEMENT		
Conducted a series of Tribal Government and stakeholder engagement and listening sessions	The Tribal Government and stakeholder engagements and listening sessions were highly informative	Host two Tribal Government and/or stakeholder engagement or listening sessions each year, including an engagement to evaluate the usability of the pilot portal.
Held an in-person interagency engagement focused on data prioritization for the pilot OWDP with representatives from 9 Oregon state agencies.	The engagement enabled open discussion of agencies' data priorities, potential use cases, organizational readiness, and data quality.	Consider holding another in-person interagency engagement if there are complex or potentially continuous questions that need to be resolved collaboratively.
Held a virtual interagency engagement on project learnings	The project team gained valuable insights from participants about [details will be added after the engagement is held on June 21]	Hold another project learnings engagement at the end of Stage 2 to inform the work in Stage 3.
Developed use cases and personas to inform portal development	Serving data of the appropriate type and quality to support use cases will make the OWDP much more useful. Supporting use cases also adds significant complexity to its design.	Add, refine, and prioritize use cases that will be supported by the OWDP, to ensure that critical water management decisions can be made using appropriate data.
LEGISLATIVE COORDINATION AND REPORTING		
Submitted a report to the Oregon Legislature to request funding for Stage 2 of the OWDP project.	DEQ secured a portion of the requested funding for OWDP development.	In partnership with the IoW, secure Federal grant funds, such as Water Smart grants from the Bureau of Reclamation to supplement legislative funding. Draft a legislative request to secure resources for Stage 3 of the OWDP project.
Developed a final report documenting the accomplishments of Stage 1 and detailing plans for Stage 2	The development of the final report has enabled the project team to document, organize, and review the work completed in Stage 1, enabling us to develop an informed strategy for Stage 2.	Develop a final report at the end of Stage 2 to document accomplishments and detail a plan for Stage 3.

OWDP Stage 2 Objectives

In Stage two of the OWDP project (July 2023- June 2025) the Project Team will support participating agencies as they modernize their organizational processes to enable them to contribute to the OWDP, develop the organizational and technical structures and procedures necessary to support and maintain the OWDP, build a pilot version of the portal and evaluate it with stakeholders, and prioritize data for inclusion in the portal in the short and long term. Based on the project learnings from Stage 1, the Project Team has developed high-level recommendations to foster the continued success of the OWDP project in Stage 2, as well as specific tasks to effectively implement those recommendations.

Recommendations

Recommendation 1: Develop a governance structure for the OWDP.

Task 1.1: In collaboration with participating agencies, develop a governance structure and process that includes the designation of a lead agency, articulation of portal-related decision-making processes, procedures for incorporation of feedback, and development of a detailed plan for the ongoing maintenance and governance of the OWDP.

Task 1.2: Develop resources to support the implementation of the OWDP, including, but not limited to, writing position descriptions, identifying recruitment opportunities, creating contract language, identifying and pursuing applicable grant funding, and developing a legislative request for Stage 3 of the project.

Recommendation 2: Develop Standard Operating Procedures for submission, curation, and integration of data in the OWDP.

Task 2.1: In collaboration with participating Oregon state agencies, develop and draft a library of standard operating procedures, data privacy and quality guidelines, and standards for data to be included in the OWDP.

Task 2.2: Determine, define, and draft criteria for data readiness.

Recommendation 3: Develop a pilot[4] OWDP based on an iterative process.

Task 3.1: Build a pilot OWDP based on guidance and recommendations from the OWDP Technical Team. This product will have enough data sets and features to

4 The Pilot OWDP will include a small subset of data sets that the OWDP Project Team identified during the planning and scoping period. Some of these data sets will have statewide coverage while others will initially be limited to specific geographic regions.

attract early users and validate technology assumptions and processes for data integration.

Task 3.2: Engage in an iterative design process that incorporates feedback throughout the development process by testing pilot versions of the interface for usability and functionality with potential user groups.

Task 3.3: Host two Tribal Government and/or stakeholder engagement or listening sessions each year, including an engagement to evaluate the usability of the pilot portal.

Recommendation 4: Based on agency and stakeholder-identified needs, determine short- and long-term priorities for data readiness and integration.

Task 4.1: Add, refine, and prioritize use cases that will be supported by the OWDP, to ensure that critical water management decisions can be made using appropriate data.

Task 4.2: Continue to assess and analyze data sets in the OWDP Draft Data Inventory and Draft Data Needs Assessment, to determine the requirements to meet the standards for inclusion in the OWDP.

Task 4.3 Refine the data prioritization recommendations developed in Stage 1 and sequence data sets for inclusion in the pilot OWDP.

Task 4.4: Employing the standards and guidance developed in Recommendation 2, evaluate, and catalog the status of and requirements for data and organizational readiness.

Task 4.5: Formally assess necessary long-term projects for both data with high priority and low readiness and data with high readiness.

Task 4.6: Collaborate with state water agencies to develop project evaluation plans and Policy Option Packages address water data and information technology gaps.

Task 4.7: Work with state water agencies to communicate the implications of projects and resulting data at the regional and state level.

Recommendation 5: Where appropriate and possible, use existing software systems to build on staff knowledge and expertise.

Task 5.1: Where appropriate, deploy tools and software products included in existing state software systems to build on staff knowledge and create efficiencies in developing the pilot OWDP infrastructure and interface. Where state-licensed technologies are insufficient, analyze additional software options.

Task 5.2: Determine the appropriate platform(s) for data storage, data reporting, and data analysis based on OWDP Technical Team recommendations.

Project Management and Organization

Stage 2 of the OWDP project will be led by DEQ and will include collaboration from the three interagency working groups established in Stage 1: the Administrative Team/Steering Committee, the Subject Matter Expert (SME) Team, and the Technical Team.

Development of a DEI Framework to Guide Portal Development

Diversity, equity, and inclusion (DEI) are critical matters for state agencies in Oregon to address in agency work, from staffing to development, management practices, and implementation of work programs. The next Stage of creating the OWDP presents an opportunity to ensure that the portal is informed by and responsive to DEI principles. For example, identifying opportunities to diversify the development team to make the portal more accessible to a broader population, and expanding the development team with previously underrepresented groups that have experience with Oregon water issues. The following actions are potential ways to bring DEI principles into the OWDP project development.

In Stage 2, the OWDP team would discuss and develop a DEI-specific framework to inform the portal development. This framework would be informed by existing DEI goals and practices of participating agencies and organizations. The framework may include identification of the following:

- Identification of specific DEI principles and metrics for this project;
- Identify DEI principles and metrics that can be used to evaluate the data to be included in the portal and how it will be collected, analyzed, and presented; and
- Develop strategies for ensuring that the portal is inclusive, equitable, and accessible to all users, including those with disabilities and language barriers.

Development of the DEI framework would include input from a diverse group of stakeholders, including representatives from underrepresented communities, to ensure that it reflects the needs and perspectives of the portal's users depending on the ability and availability of representatives from underrepresented communities with water experiences to engage in this project.

Connecting with Environmental Justice Mapping Tool and Environmental Justice Council per HB 4077

The passing of HB4077 by the 2021 Oregon legislature established the state Environmental Justice (EJ) Council and directed[5] DEQ and Oregon Health Authority (OHA) to work with other natural resource agencies as needed to develop an Environmental Justice Mapping tool. Discussions around the development of the EJ mapping tool have been occurring between DEQ and OHA staff in parallel to the development of the work on Stage 1 of the OWDP. The EJ Council held its first meeting in June 2023 and is tasked with overseeing the development of a publicly accessible EJ mapping tool by the legislative deadline of September 15, 2025. As the OWDP Stage 2 proceeds, the project will make opportunities for staff engaged in the two efforts to discuss data, accessibility, and ways in which the OWDP can support the EJ Mapping tool process and vice versa.

Stage 2 Deliverables

The OWDP project will be expected to produce several useful deliverables during the 2023-2025 biennium:

- Project Management Plan
- Monthly Status Reports
- Website Updates
- Various Grant Deliverables
- Procurement Contracts
- Tribal & Stakeholder Engagement Meetings
- Standard Operating Procedures
- Data Uploads
- Live Pilot Portal
- Governance Structure
- Legislative Updates
- Stage 2 Final Report

5 HB4007 Section 2: "Natural resource agencies and other state agencies as requested by the council are directed to assist the [task force] council in the performance of its duties and, to the extent permitted by laws relating to confidentiality, to furnish such information and advice as the members of the [task force] council consider necessary to perform their duties."

Estimated Resource Needs for Stage 2

The estimated OWDP Stage 2 resource need detailed in this section were submitted to the Oregon state legislature in February 2023 as part of the *Oregon Water Data Portal Project Legislative Report* and later incorporated into the Bipartisan Drought Relief and Water Security Package (BiDRAWS). As of early June 2023, BiDRAWS is awaiting review in the House Rules Committee after passing the House Committee on Agriculture, Land Use, Natural Resources, and Water without recommendation. As such, funding for Stage 2 of the OWDP project has not been approved and the budget and staffing recommendations below may be adjusted and/or supplemented by additional grant funds.

	CATEGORY	DESCRIPTION	AMOUNT
1	**Limitation**	"Limitation" is permission from the Oregon Legislature to spend funds acquired via Federal grants, including the Bureau of Reclamation Water Smart grant.	$250,000
2	**Contractors Services**	IoW, CASS, INR, DAS rotation project Quality Assurance contractor, additional contracting TBD	$1,000,000
3	**Software Systems and Hosting**	ESRI, FME software licenses, other software licensing fees TBD, hosting, and central data storage	$125,000
4	**Staffing**	3.56 FTE Two half-time Data Specialists (ISS-4) One Geographical Information Specialist (ISS-5) One Business Analyst/Developer (ISS-6) One System Architect/Lead Developer (ISS-7)	$1,136,846
	Total		$2,511,846

Limitation

$250,000 of limitation for an anticipated Federal Bureau of Reclamation Water Smart data grant, expected to begin in September of 2023.

Contractor Services

Contractor cost estimates are based on 2021-2023 project contractor spending. OWDP used contractors for approximately 12 months of the 2021-2023 biennium and spent approximately $300,000 of the allocated project money on the three main project contractors. Those three contractors, doing similar work for 24 months should be approximately $600,000. An additional contractor is added to perform an ongoing project

Quality Analysis, per the state Chief Information Officer's recommendations, for an additional $200,000.

The project team anticipates several substantive but currently unassigned contractor tasks to be necessary during the development of the pilot portal. These are likely to be for software system setup, data transformation, and setup of data flows, especially for data toolset providers. These tasks will be assigned to the $200,000 allocation titled "Additional Contracting."

CONTRACTOR	DESCRIPTION	AMOUNT
IoW	IoW will format water data families, engage local governments, draft plans for missing-but-needed data, analyze water data sets, move water data sets to the prototype portal via standard data communication protocols, consult on national water policy and its applicability to the OWDP	$250,000
CASS	CASS will be responsible for Project Management assistance, administrative work, assistance with project planning paperwork and project reporting, meeting facilitation, and other miscellaneous duties. CASS is an experiential learning program and will include internships.	$250,000
INR	INR will supply technical leadership, project component execution, perform INR stakeholder engagement, and other miscellaneous duties.	$100,000
QA Contractor	DAS rotational project QA contractor	$200,000
Total		$1,000,000

Software Systems and Hosting

DESCRIPTION	DURATION	AMOUNT
ESRI access licenses	1 year	$15,000
Data integration tool licenses	1 year	$15,000
Other software licensing fees	1 year	$20,000
Hosting and central data storage	2 years	$75,000
Total		$125,000

Staffing

This staffing request is largely based on the OWDP Technical Team's recommendation. (The Technical Team report is included in Appendix J) The staffing outlined below assumes that the project lead and some ancillary project management roles will be performed by existing agency staff.

POSITION	PT/ FT	START DATE	COMMENT	AMOUNT
ISS-4	PT (.5)	9/1/23	Data Analyst	$149,185
ISS-4	PT (.5)	1/1/24	Data Analyst	$117,018
ISS-5	FT	9/1/23	GIS Specialist to participate in data analysis and portal development	$278,005
ISS-6	FT	10/1/23	Business Analyst/Developer for agency backlogs and long-term projects, general Portal developer for Portal Tech Stack	$277,507
ISS-7	FT	9/1/23	Architect, lead developer and data analyst, data communication standards	$315,131
Total				$1,136,846

ISS-7: This position is the operational technical lead and will serve as the SME team technical advisor. They will be primarily responsible for the success of the project's overall technology setup and secondarily responsible for the data acquisition, analysis, and transformation portions of the project. This position could eventually develop into the OWDP system operator.

ISS-6: This position is the application lead and will actively participate the project's Technical Team. They will be primarily responsible for leading and executing the building of the pilot portal and secondarily responsible for developing OWDP Standard Operating Procedures (SOP).

ISS-5: This position will be primarily responsible for developing the OWDP's mapping display and managing geospatial components of the data sets and secondarily responsible for defining and maintaining geospatial data standards. They will participate in the development of SOP and provide subject matter expertise on geospatial topics. They will be a member of the Technical Team, responsible for acquiring and setting up various geospatial contract data sets.

ISS-4: These two positions will be graduate-level student data analysts. They will be primarily responsible for analyzing available data sets to determine transformations needed for integration with similar data sets from other agencies intended to be offered on the OWDP and secondarily responsible for assisting in technical tasks as necessary and requested by the project management and senior technical staff.

These two ISS-4 positions will be half-time. They will be expected to accomplish data analysis work for the OWDP project while gaining valuable experiential learning. This will include occasional state agency field work with the intention of conceptually connecting the data they are working on to real-world operations Oregon agencies perform.

In all cases, during the project Stages, technical staff will work with the contracting organizations to produce project outputs as planned and be responsible for meeting the stated goals and expectations of project governance bodies.

Funds allocated to project staffing will be used to meet the fund-matching requirements of Federal grants, including the 2023 Bureau of Reclamation grant which is a 1-1 matching grant.

Appendices

The following appendices are taken from sources that approved the use of these documents in whole or part, or are taken from documents that are posted online for public consumption. Please contact the project team with any questions or concerns.

Oregon Water Data Portal
Project Concept

January 2023

Project team contacts

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Overview

Problem Statement

Decision-makers, communities, and regular users of water-related data do not have easy access to the necessary data and information upon which to base long-term strategic water and water infrastructure-related decisions, including planning and investment.

Drivers

The primary driver of this project is the production of a single point of access to current, high quality, integrated water data from numerous sources that would support important decisions about management, planning and investing in water resources including natural and human-made water infrastructure throughout the state. The secondary driver is the state's commitment to make Oregon water data easier for the public to access.

Background

In 2017, state water managers revised the *Statewide Integrated Water Resources Strategy*[1], highlighting the need for billions of dollars of water and water infrastructure investment in Oregon. Subsequently, the *100-Year Water Vision*[2] called out the need for an Oregon Water Data Portal that not only offers Oregon water data but also processes those data into serviceable answers to key water questions. While the *100-Year Water Vision* was not explicitly funded in 2021, many of the priorities identified in the Vision were carried forward by various water agencies. DEQ was allocated $350,000 in the 2021

[1] 2017 *Oregon Statewide Integrated Water Resource Strategy*: https://www.oregon.gov/owrd/programs/planning/iwrs/pages/default.aspx

[2] *Oregon's 100-Year Water Vision*. This project was suggested in the Technical Workgroup stakeholder engagement meeting. A summary of this meeting is recorded on pages 171-209 in the following report: https://www.oregon.gov/oweb/Documents/OWV-Full-Report.pdf

legislative session[3] to conduct initial scoping and planning for a water data platform that will meet current and future needs.

Project

The Oregon Water Data Portal (OWDP) will be an internet accessible, single point of access for all of Oregon's water decision-making data and information. Geospatial data, tabular data, documents and reports, and data parcels such as FLIR or satellite data will be available to water decision makers. Data and information will come from and be accessible to federal agencies, tribes, state agencies, special service districts, local governments, the regulated community, nonprofits, and the public.
This is a complicated vision that will involve a series of tasks completed in several stages:

Stage	Timeframe	Tasks
1	Jan. 2022 – Jun. 2023	• Plan project • Plan a single point of access OWDP • Set up a framework of state standards and standard operating procedures • Inventory water data and information needs • Evaluate state agencies' existing data sets and information technology infrastructure • Draft a report and resource request to the Oregon Legislature
2	Jul. 2023 – Jun. 2025	• Implement initial single point of access OWDP • Draft standard operating procedures and quality standards for portal • Draft plans and Policy Option Packages to address state agency data and information technology infrastructure gaps • Begin engaging special service districts and local governments • Conduct pilot OWDP project using state agency data
3	Jul. 2025 and beyond	• Fully implement single point of access OWDP • Begin executing agency projects and Policy Option Packages to address identified state agency data and information technology infrastructure gaps • Enable regular maintenance and operations • Empower continuous improvement processes

Efforts to produce platforms like the OWDP in Texas, New Mexico, North Carolina, and California have been assisted by Duke University's Internet of Water (IoW). Other projects have been developed for British Columbia and Alberta, Canada. These projects generally differ from the Oregon Water Data Platform project only in that Oregon has more entities that produce or maintain water data involved (17 state agencies and hundreds of other organizations, including local governments) and emphasizes water decision-makers as its principal audience.

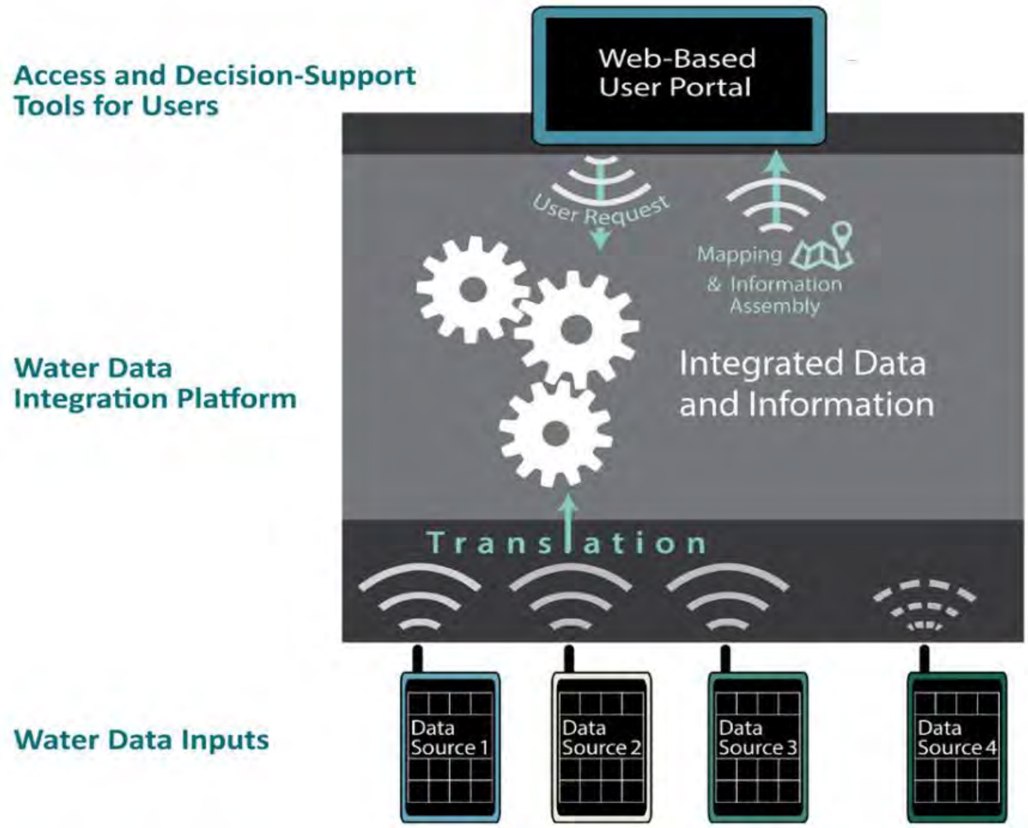
[3] The authorizing language from HB 5006 (2021) is as follows: "SECTION 112. In addition to and not in lieu of any other appropriation, there is appropriated to the Department of Environmental Quality, for the biennium beginning July 1, 2021, out of the General Fund, the amount of $350,000, to begin initial scoping and design of a database framework of water and infrastructure data."

Project Approach

The legislature requires the project to "begin initial scoping and design" of the OWDP (e.g., Stage 1). According to the Legislative Fiscal Office (LFO), *"*DEQ will need to develop a funding request for further development of this database framework" [4] (e.g., Stage 2 and beyond). LFO mentions that significant information technology projects will result from this effort, such that Oregon Enterprise Information Systems (EIS) and LFO should be stakeholders. Other stakeholders not mentioned in the legislation include Enterprise Data Coordination at Department of Administrative Services Chief Information Officer, which operates Oregon's *Socrata* installation and the Oregon Open Data Standards project, and the Institute for Natural Resources (INR) at Oregon State University, which operates the existing Oregon Spatial Data Library and the Oregon Water Explorer using ESRI, Geocortex and Geoportal Server technology. These two organizations are also principal subject matter experts and will be essential to engage at the more detailed level at which the project teams must operate.

Preliminary discussions and documentation associated with water-related data undertaken as part of *Oregon's 100-Year Water Vision* will help guide development of this project. For planning purposes, the State's existing ESRI and Socrata licenses will be assumed – but not yet validated or selected – to provide the tools necessary to create and host the central water data access point. The Water Data Portal will serve data and information, including Geospatial data, tabular data, documents, and data parcels such as FLIR data and satellite imagery, to water and water infrastructure decision makers and planners. The image below is a draft visual description of how a water data portal could work.

[4] The Legislative Fiscal Office budget report contains the following additional verbiage that provides some indication of legislative intent: "…. as part of an overall statewide investment in water-related priorities, $350,000 General Fund was provided to begin initial scoping and design of a database framework of water and infrastructure data. While this is provided as a one-time appropriation, this is likely to become a significant information technology project, which will need to be reviewed by the Legislative Fiscal Office and the State Chief Information Office as part of the Stage Gate process. DEQ will need to develop a funding request for further development of this database framework."



Stage 1 Project Tasks

There are several bodies of work associated with Stage 1 of this project:

1. Conduct administrative work
    a. Contracting
    b. Project management
    c. Work coordination and assembly
    d. Meeting facilitation
    e. Document drafting

2. Design the OWDP platform (single point of access for water data with various data and information intake mechanisms) and framework (agreements and standards on the data and information procedures and associated processes)
    a. Platform
        i. Determine User Interface(s) that are desirable for the single point of access OWDP
        ii. Determine the base technological functionality necessary for the OWDP to accomplish its mission
        iii. Perform an analysis of the toolsets available to support the OWDP. Determine if Oregon's current Socrata (data portal software) and ESRI/Geocortex (GIS server software) toolset licenses are acceptable. Identify other toolsets required to meet the needs of OWDP.

        iv. Determine acceptable intake methods for the OWDP and the capabilities and minimum information technology infrastructure agencies must have to use them.
    b. Framework
        i. Establish an inventory of data sets necessary for the platform to perform its basic functions (the "use cases")
        ii. Establish standards for quality, completeness, etc. of submitted data
        iii. Establish minimum agency infrastructure requirements
        iv. Establish Standard Operating Procedures

3. Evaluate state agency data and infrastructure
    a. What are the key agency data sets that need to be supplied?
    b. What is the current state of each of the key data sets and supporting infrastructure relative to the standards established in the framework?
    c. What are the gaps between the current state and the standards established in the framework, for each data set, and what should be done to close them?

4. Engage interested parties
    a. This project originates from a strategic water implementation effort rich in public involvement. Stage 1 of this project begins with the 2018 and 2019 public input received during drafting of *Oregon's 100-year Water Vision*. The project teams will concentrate effort on understanding and implementing the public input that was received.
    b. There will be additional specific outreach and public input sought by interviewing the originating former state executives, Oregon tribes, representative local governments, key state legislators and other identified key groups.
    c. Several formal interested party engagement sessions are planned for the first project stage. Each session will host representative interested parties. The project teams will briefly present the effort's approach and goals, an update and current project status, and offer an opportunity for input and feedback to the stage 1 project teams.

5. Provide input on general questions
    a. What data should be available to whom? (e.g., Are some data available only to agency-level partners? On what criteria do we base such determinations?)
    b. What tribal, special service district, county and municipal, etc. data should be available on the platform, and what is the best way for us to engage potential data-providing entities?
    c. Are there other water data organizations we should potentially engage?
    d. What federal agency data are key to this project, and are they available to us?
    e. How shall we handle potentially duplicative data sets from different agencies?
    f. What are the rough setup and maintenance costs for each of the features?
    g. How shall the OWDP be maintained and staffed, and how shall it be governed?
    h. What level of data processing and integrating should the platform be capable of doing at various stages, and what level of investment is justified to produce each? What data analysis and processing tools are necessary to make the data most useful to water decision makers?
    i. How do we manage expectations of agencies' data which may take large amounts of resources and many years to develop? Are there needs for which Oregon state agencies do not have the data or possibly even the authority to answer?

j. Based on this information, which data should be prioritized to initially populate the platform during the pilot project?
k. What resources are necessary to continue this project, and what would this project produce over the next biennium?

Resourcing and Budgeting

The legislature's authorizing language from HB 5006 (2021) commits $350,000 for DEQ contracting expenses to "begin initial scoping and design." [3] The Legislative Fiscal Office report on the bill clarifies that "DEQ will need to develop a funding request for further development of this database framework." [4] For Stage 1, provided funds are for project contracting; participating agencies are generally responsible for their own staff time.

Project Contractors

DEQ has retained Oregon State University's Center for Applied Systems and Software to manage, organize, facilitate, and draft documents for the project. DEQ has also retained the Internet of Water team from Duke University to assist in planning the central data structure, help plan change methodology for adoption of new business processes and data standard operating procedures at state agencies, evaluate existing data sets, and draft project documents. The Institute for Natural Resources, also hosted by Oregon State University, is the creator and maintainer of the Oregon Water Explorer a geospatial website making substantive data and data processes available to water decision makers, online. DEQ has contracted with INR for substantive OWDP project technical consulting.

The final portion of the project allocation will be reserved for additional potential contracting expenses. These could include one or more information technology research and advisory contractors from Covendis or the state's other price agreements or a water decision-making data consultant to review the recommendation and resources request resulting from the 2021-2023 biennium project work.

Oregon State University's Center for Applied Systems and Software (CASS) – DEQ and CASS maintain an Intergovernmental Agreement under which Work Order Agreements for individual DEQ projects can be drafted. CASS has a particular expertise in organizing and managing information technology projects. While this project is not an information technology project as defined by the state, it clearly will lead to several substantive information technology projects. CASS is DEQ's default source for auxiliary information technology project expertise, and their familiarity with DEQ and other state agency methodology and staff will be an advantage in this situation.

Internet of Water (IoW) – Duke University's Internet of Water program has assisted New Mexico, Texas, California, and North Carolina in producing projects like the OWDP. They have crafted a road map for states to do many of the necessary functions and are prepared to walk Oregon through our process.

Institute for Natural Resources (INR) – Oregon's INR at Oregon State University has, in partnership with Oregon State University Libraries and Press, and in association with state agencies, created the Oregon Water Explorer, a geospatial access point to portions of the state's water data. INR and Oregon State University Libraries and Press have also created and maintain the Oregon Spatial Data Library, a joint effort with the Department of Administrative Services Geospatial Enterprise Office that provides access to hundreds of spatial datasets, including datasets which are designated elements of Oregon's GIS framework.

INR is a self-funded entity within Oregon State University and generally requires an external sponsor. The implication of this structure on the Oregon Water Data Portal are two-fold. First, given its stated mission, Oregon Water Explorer's mission is certainly within scope of the project's legislative commission, and the application's subject matter experts should be in the project conversation. Second, a geospatial interface similar to the Oregon Water Explorer will be essential to the planning and outcome of this project. The current hosting and funding situation of the INR application may be insufficient to meet the Department of Administrative Services' Information Technology standards and therefore probably cannot be used as a core executive agency application. To justify the time and priority treatment of this project, INR's staff time must be taken into account and funded.

Project Teams

Steering Committee – The Steering Committee will supervise and guide the project, decide, or approve major project decisions and serve as the project change control board. The Steering Committee will be composed of executive level managers from state agencies and the State Chief Information Officer's Office.

Agency Subject Matter Expert Team – The subject matter expertise of staff from the participating state agencies will be necessary for IoW to perform its tasks for this project. State agency subject matter experts can assist in evaluating State agency data sets, business processes and information technology infrastructure for suitability to serve data to the central access point. Necessary data sets are not defined in this project by selecting from existing, curated datasets, but by asking which potential data sets are necessary to get the job done. This means that some necessary data sets may not currently be collected; may be collected on paper, in spreadsheets or Microsoft Access databases; may be in a core data system but of very poor completeness or quality, etc. Filling these data gaps may require changes in the way an agency does business or new information technology infrastructure, and those changes may be expensive.

Each participating agency's subject matter experts know the current state of the data, its importance, and data infrastructure. They will need to generate a substantive portion of the project output. The subject matter expert team will determine necessary data sets, characterize the state of the data and information technology infrastructure, and identify actions to close the gap between what the agency has and what it needs to fulfill requirements of this project. This portion of the project deliverables will include expenses incurred by various state agencies and Policy Option Packages to be submitted by these agencies to build additional infrastructure. Agency subject matter experts, project staff and any additional executive agency resources required will be paid for by the respective agencies participating in project Stage 1.

Technical Team – State and Contractor staff will serve together on the project Technical Team. The team will provide recommendations for the platform and major applications constituting the single point of access data portal, describe how data will be communicated to the portal and contribute data standards and operating procedures.

Other State Participants

Department of Administrative Services, Enterprise Information Systems (EIS)
The Oregon Chief Information Officer at DAS EIS has an interest in any process which will generate oversite-level information technology projects. This project is essentially the planning of one or several such projects.

The Data Coordination Section at EIS oversees data coordination across the state and is the "owner" of the Socrata system and several state efforts overlapping the outcomes of this project. The maintenance of any multi-agency Water Data Platform will be at least partially under the section's purview. Based on similar previous projects, section leadership can also contribute subject matter expert insight into how we can best engage with local Oregon governments and special service districts.

Legislative Fiscal Office – LFO is an interested party, and project personnel will keep LFO informed and answer questions as necessary.

Deliverables

Two main packages of deliverables are planned for Stage 1. The first will be delivered to the legislature in early February of 2023, and will contain a project update, preliminary recommendations for project development, and a funding request for further planning and development of the database framework. The second deliverable will be a final report completed by June 2023, which will contain additional planning, agency needs and project tasks for the next stage of the project.

Glossary of terms

The terms and definitions below reflect their use within the Oregon Water Data Portal project concept. Terms are defined relative to Oregon-specific regulations or guidance where available and based on reference to water data and information about water. Sources used to inform definitions are provided as footnotes. These Oregon Water Datal Portal definitions are intended as a guide for interested parties and may be revised over time as the project concept evolves or to further clarify specific terms.

Data: Characteristics of water (e.g., water quality, quantity, stream location, groundwater basin boundaries, or water use) that are collected, stored, and made available. Alone, data may have little meaning until they are organized into information. Data includes, but is not limited to, geospatial data, tabular data, data parcels such as Forward-Looking Infrared data (FLIR) or satellite data.

Decision makers: Elected or appointed officials of local, state, federal and tribal governments or special use districts, or individuals within a private company who set priorities based on input from constituents and interested parties, and considering several variables, including time constraints, resources available, and the amount and type of information available.

Framework: The agreements among data providers (agencies and others) on digital availability, data quality, format, and privacy protections that make it possible to have integrated access to the data and information water managers may require.

Groundwater: Water resources held below ground in soils or spaces between rocks and sediments; specifically, any water beneath the land surface or beneath the bed of any stream, lake, reservoir, or other body of surface water, whatever may be the geological formation or structure in which such water stands, flows, percolates or otherwise moves.[5]

Information: Data that have been organized, synthesized, presented, or analyzed in some way that begins to attach meaning to the individual bits of data. Information is often what is needed to support decisions, but you cannot have information without data. Data and information will come from and be accessible to federal agencies, tribes, state agencies, special service districts, local governments, the regulated community, nonprofits, and the public.

Infrastructure - Built: systems built to store, transport, treat, or manage water, usually in the form of dams, pipes, sewer systems, wastewater treatment plants, dikes, levees, or storm water drainage.[6, 7]

Infrastructure - Green: A subset of natural infrastructure. It mimics natural systems at the neighborhood, or site scale, and can be part of an integrated approach to addressing water management challenges in residential, municipal, and industrial developments. Examples of green infrastructure include eco-roofs, green street swales, and neighborhood natural areas that filter sediment and other pollutants carried by stormwater runoff.[8]

Infrastructure - Natural: A strategically planned network of natural and working lands, such as forests, rivers, wetlands, and waterways that conserve and enhance ecosystem values and functions and provide associated benefits for safe and healthy communities and vibrant local economies.[9, 10, 11, 12]

Internet accessible: Data and information that is made available online and may have varying levels of accessibility. Publicly accessible data, sometimes called "open data" is data that is made available to all interested parties without restriction. Some internet accessible data and information may have limitations on availability due to privacy or security concerns.

Platform (data and information): The data standards, technological connections, software systems, user interfaces, and other aspects of data and information systems that allow water data to be accessed, organized into information, and used to support decision-making.

Project scoping and design: The first phase of a collaborative project. Key tasks are to identify and agree upon project elements and a phased approach to planning and completing deliverables.

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[5] ORS 537.515

[6] US EPA: https://www.epa.gov/sustainable-water-infrastructure/building-sustainable-water-infrastructure

[7] The Environmental Literacy Council: https://enviroliteracy.org/water/water-infrastructure/

[8] https://www.midcoastwaterpartners.com/definitions

[9] US EPA: https://archive.epa.gov/region03/green/web/html/infrastructure.html

[10] The International Union for Conservation of Nature: http://www.iwa-network.org/wp-content/uploads/2016/06/Natural-Infrastructure-in-the-Nexus_Final-Dialogue-Synthesis-Paper-2015.pdf

[11] World Resources Institute: https://www.wri.org/publication/natural-infrastructure

[12] European Environment Agency (Green Infrastructure): https://www.eea.europa.eu/themes/sustainability-transitions/urban-environment/urban-green-infrastructure/what-is-green-infrastructure

Portal: internet accessible, single point of access for water data supported by the *platform,* typically a website. The portal is a tool that provides users with access to water data and information that does not directly host or store the data and information.

Resources – Capacity (capacity, capacity resources): The people and money resources needed to accomplish project objectives.

Resources – Natural (natural resources): General term used to encompass surface or groundwater resources, including water providing fish and wildlife habitat.

Water Budget: A hydrological tool used to quantify the flow of water into and out of a system. If the system of interest is the surface water system, then the budget typically balances precipitation and inflows against evapotranspiration, flow out of the basin, and changes in storage. If the system of interest is the groundwater system, then the budget typically balances groundwater recharge and inflows against groundwater discharge, outflows, and changes in storage. Many water budgets assume that the system is at steady state, such that changes in storage can be neglected, but a water budget most refer to a period of time. Some components of the water budget can be refined into sub-components like runoff and snowmelt. See U.S. Geological Survey Circular 1308 for more detail.

Water Quality: Evaluation or measurement of the chemical, physical and biological attributes of water to determine suitability for beneficial uses such as drinking, agriculture, recreation, industry, and habitat for aquatic organisms and other wildlife.[13]

Water Quantity: Amounts of water are generally described using rate and volume. When discussing water quantity to be diverted, term commonly used is cubic feet per second, or gallons per minute. When discussing volumes of water applied to land or stored in a reservoir, the term used is acre-feet.[14]

Water Users (aka Water Managers): people who manage, plan, and maintain water systems, both built and natural, in communities across the state.

[13] DEQ WQS - https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=1458 , USGS Water science school - https://www.usgs.gov/special-topics/water-science-school

[14] WRD AquaBook - https://www.oregon.gov/owrd/WRDPublications1/aquabook.pdf

Appendix B: Oregon Water Data Portal Project Background and Summary Information

This appendix provides additional information regarding the authorizing environment and key work undertaken by state agencies in the last 10 years that provided direction or recommendation in support of developing a modernized, centralized approach to sharing and improving access to state water data. It also provides information about the participation and preliminary organizational structures of agencies and staff brought together to support the development of the OWDP project.

Background

In the 2021 legislative session, DEQ was allocated $350,000 to conduct initial scoping and planning during the 2021-2023 biennium for a water data platform. According to the Legislative Fiscal Office (LFO), *"*DEQ will need to develop a funding request for further development of this database framework"[1]. This report provides an overview of the initial scoping effort undertaken by DEQ, which represents Stage 1 of a multi-stage effort to identify requirements, options, challenges, opportunities and resources required for development of a water data platform or portal.

While the 2021 legislative allocation referred to planning for a "water data platform", the Stage 1 report identified an approach to develop a "water data portal". It is important to note that a water data portal is distinct from a data platform. A **data platform** is a broader term that refers to the infrastructure, tools, and services for collecting, storing, processing, and analyzing data. A **data portal** is focused more specifically on providing access to a particular type of data rather than supporting a wide range of data-related activities. A data portal may be part of a larger or broader data platform. Specific definitions of other terms used in this report are provided in the **project glossary** (located in Appendix A: Project Concept).

Two significant water-oriented planning efforts undertaken over the last 10 years identified water data access and availability as significant challenges for managing water resources to maintain safe and healthy waterways for Oregonians, protect fish and wildlife, and support healthy economies. Oregon's 2017 revised ***Statewide Integrated Water Resources Strategy (IWRS)*** highlighted the need for billions of dollars of water and water infrastructure investment in Oregon, and the challenges facing decision-makers in identifying the best data and information available to prioritize water investments. In early 2018, state agencies began working together more formally to better coordinate investments in built and natural water infrastructure, and noted that data needed to identify and prioritize infrastructure investments was difficult to locate or did not exist.

Subsequently, the ***100-Year Water Vision*** called out the need for a single-point of entry to find water data. This water portal or water platform would not only provide access to Oregon water data but also assist in processing those data into serviceable answers to key water questions. The Water Vision

[1] The Legislative Fiscal Office budget report contains the following additional verbiage that provides some indication of legislative intent: "…. as part of an overall statewide investment in water-related priorities, $350,000 General Fund was provided to begin initial scoping and design of a database framework of water and infrastructure data. While this is provided as a one-time appropriation, this is likely to become a significant information technology project, which will need to be reviewed by the Legislative Fiscal Office and the State Chief Information Office as part of the Stage Gate process. DEQ will need to develop a funding request for further development of this database framework."

documented water data needs and initiated development of a water data inventory. The Water Vision information was provided by agency staff representatives of the Water Core Team. The Water Core Team data inventory spreadsheet, IWRS, and Water Vision data needs and data inventory efforts provide the initial baseline for data inventory work initiated by the OWDP team. The OWDP draft data inventory is provided as Appendix H to the Legislative Report.

Links to IWRS, the 100-year Water Vision and other documents related to Oregon's water data are provided below.

- Oregon's 2017 Integrated Water Resources Strategy
- Oregon's 100-year Water Vision
- Oregon Secretary of State Advisory Report
- Oregon State-Supported Regional Water Planning and Management Workgroup
- Oregon Water Futures Project Report 2020-21 Community Engagement

Agency and State Actions Supporting Water Data

Development of a water data portal requires cooperation among many state agencies responsible for managing water and water infrastructure, as well as agencies responsible for managing information technology and data infrastructure. The legislative directive to DEQ mentions that significant information technology projects will result from this effort, such that Oregon Enterprise Information Systems (EIS) and LFO should be stakeholders. Other state government stakeholders not mentioned in the legislation, but expected to have significant involvement include:

- Enterprise Data Coordination at Department of Administrative Services and the Chief Information Officer, which operates Oregon's *Socrata* installation and the **Oregon Open Data Standards project**;
- Institute for Natural Resources (INR) at Oregon State University, which operates the existing Oregon Spatial Data Library and the **Oregon Water Explorer** using ESRI, Geocortex and Geoportal Server technology.

Significant agency-directed planning efforts undertaken over the last 10 years identified data access and availability as significant challenges for managing natural resources to maintain safe and healthy environments for Oregonians, protect fish and wildlife, and support healthy, equitable economies. The OWDP project draws upon data and information gathered from previous planning efforts and data management strategies, most notably including the Oregon Integrated Water Resources Strategy (2017); Oregon 100-year Water Vision (completed in 2019); and Oregon's Open Data Standards (codified in ORS 276A.350-374). Additionally, the data compilation and water data mapping work by the OSU-INR via the Oregon Water Explorer provides insight and opportunity to examine potential efficiencies and challenges that may arise from using existing platforms and data analysis tools.

As previously noted, Oregon's 2017 Statewide IWRS highlighted the need for billions of dollars of water and water infrastructure investment in Oregon, and the challenges facing decision-makers in identifying the best data and information available to prioritize water investments. In addition, *100-Year Water Vision* called out the need for an Oregon Water Data Portal that not only offers Oregon water data but also processes those data into serviceable answers to key water questions. While the IWRS is the state's foundational blueprint for water management, the Vision proposed strategic investments in Oregon's water future, using the IWRS as the foundation, and carrying forward many of its recommended actions. While implementation of the *100-Year Water Vision* was not explicitly funded, many of the priorities identified in the Vision were carried forward by various water agencies in support of IWRS actions.

In 2021, Oregon developed and published guidance for state agencies to implement Oregon's Open Data Standards. The guidance outlined steps and timelines for state agencies to inventory agency data and identify data that could be made publicly available through the state's Open Data Portal. The initial agency data inventories were used to assist in identifying the water-related datasets that could be included in a water data portal. The inventories were also used to identify data gaps and provide input on developing OWDP timelines and resources needed to make data available to a portal. Further, the OWDP Stage 1 project considered the extent to which the Socrata software platform supporting the Oregon Open Data Portal can be used or adapted in service of a water data portal, and recommends moving ahead with evaluating the performance of this platform in support of the pilot portal envisioned to be developed in Stage 2.

Participating Agencies and OWDP Team Organization

The following graphic identifies the different teams involved in the initiation of data coordination discussions and development of the OWDP. The box for each team identifies its focus or title; team membership; and a brief description of the role of the team within the project. The table identifies individual staff participants by agency leading up to and during the 2021-2023 biennium, along with various individual's OWDP team roles.

Water Core Team
Executive Agency Leadership
Agency coordination, data insights, staffing information and project input

Steering Committee
Executive Agency Leadership; Administrative Team
Project oversight and decision making

Subject Matter Expert Team
Water Agency Staff and Consultants
Data insights and recommendations

Technical Expert Team
Executive Agency, State Staff and Consultants
Technology insights and recommendations

Administrative Team
DEQ Staff and Consultants
Project Management
Deliverables

Engagement Team
Water Agency Staff and Consultants
Stakeholder and tribes engagement

State agencies and organizations participating in the OWDP include:

- Oregon Department of Administrative Services (DAS)
- Oregon Department of Agriculture (ODA)
- Oregon Department of Energy (ODOE)
- Oregon Department of Environmental Quality (DEQ)

- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of Forestry (ODF)
- Oregon Department of Geology and Mineral Industries (DOGAMI)
- Oregon Department of State Lands (DSL)
- Oregon Department of Land Conservation and Development (DLCD)
- Oregon Department of Transportation (ODOT)
- Business Development Department (BizOR)
- Oregon Health Authority (OHA)
- Oregon Emergency Management Agency (OEM)
- Oregon Parks and Recreation Department (OPRD)
- Oregon Water Resources Department (WRD)
- Oregon Watershed Enhancement Board (OWEB)
- Oregon State Marine Board (OSMB)
- Oregon State University Institute for Natural Resources (OSU-INR)
- Oregon State University Computer and Software Services (OSU-CASS)
- Governor's Office of natural Resources - under both Gov. Brown and Gov Kotek administrations

Other organizations include the Internet of Water, which has participated as a technology and policy guide with national-level insights. Within Oregon agencies, many water-related agencies participate in the Water Core Team, where discussions occur around opportunities to secure funding and provide governance for the OWDP. Oregon DAS and OEM are not represented on WCT but have been engaged in various discussions about the OWDP project. OPRD and DOGAMI are invited to attend WCT, but currently lack sufficient staff resources to participate and have not had staff actively engaged in the OWDP project to date.

Table B-1. OWDP Contributing Agency Staff

		OWDP Project Staff Roles					
Agency and Staff Names	**Organization/ Title**	**WCT**	**SC**	**SME**	**TT**	**ET**	**AT**
Oregon Department of Environmental Quality							
Justin Green[2]	*Water Quality Division Administrator*	*^					
Jennifer Wigal	WQ Division Administrator	*	*				*
Josh Weber	OWDP Project Manager			*	*	*	*
Rian Hooff	Senior Policy & Legislative Analyst	*					*
Valerie Thompson	Water Quality Program Analyst	*		*		*	*

[2] Through approximately November 2021

		OWDP Project Staff Roles					
Agency and Staff Names	**Organization/ Title**	**WCT**	**SC**	**SME**	**TT**	**ET**	**AT**
Sarah Rockwell	Lab Data Coordinator			*			
Michele Martin	Project Manager					*	
Cesar Villaca	Software Development and Integration Manager				*		
Oregon Water Resources Department							
Tom Byler[3]	*Director*	*+					
Doug Woodcock	Acting Director/Deputy Director	*+^	*				
Ben Scandella	Hydrogeologist			*		*	
Raquel Rancier	Deputy Director, Strategy and Administration	*				*	
Crystal Grinnell	IWRS Strategist	*					
Oregon Watershed Enhancement Board							
Meta Loftsgaarden[2]	*Director*	*+^					
Renee Davis[2]	*Deputy Director*	*^					
Stephanie Page[4]	Deputy Director	*^	*				
Jessi Kershner	Water and Climate Programs Coordinator	*					
Audrey Hatch	Conservation Outcomes Coordinator			*		*	
Ken Fetcho	Effectiveness Monitoring Coordinator			*			
Oregon Department of Fish and Wildlife							
Shaun Clements	Assistant Administrator for Inland Fish	*	*				
Chandra Ferrari	Deputy Habitat Administrator	*	*				
Jamie Anthony	Oregon Plan Monitoring Coordinator			*			
Spencer Sawaske	In-stream Flow Specialist			*			

[3] Through approximately September 2021
[4] Also participated in WCT in previous position as Water Program Manager at ODA through December 2021
* Team Membership
^ WCT Co-chair
+WCT Executive Sponsor

Oregon Department of Land Conservation and Development							
Amanda Punton	Natural Resource Specialist	*	*				
Kristin Greene	Deputy Director	*					
Tanya Haddad	Coastal Atlas Coordinator			*			
Oregon Department of State Lands							
Bill Ryan	Deputy Director of Operations; Aquatic Resource Management	*					
Peter Ryan	Planning & Policy Operations Specialist			*			
Oregon Department of Agriculture							
Isaak Stapleton	Natural Resources Program Area Director	*	*				
Marganne Allen	Ag water Quality Program Manager			*			
Rob Hibbs	Ag Water Quality Monitoring Specialist			*			
Oregon Department of Forestry							
Kyle Abraham	Chief of Private Forests Division	*	*				
Rebecca McCoun	Riparian and Aquatic Specialist			*			
Mellony Hoskinson	Forest Resources GIS Specialist			*	*		
Oregon Health Authority							
Andre Ourso	Administrator for the Center for Health Protection	*					
Samina Panwhar	Compliance and Regulatory Manager			*			
Curtis Cude	Healthy Waters Program Coordinator			*			
Oregon Department of Energy							
Tom Elliott	Energy Analyst, Rural and Agricultural Energy Audits	*					
Business Oregon							
Ed Tabor	Economic Development Program and Inventive Manager	*					
Chris Cummings	Assistant Director for Economic Development	*					
Jon Unger	Water Program & Policy Coordinator	*		*			
Oregon State Marine Board							
Janine Belleque	Boating Facilities Manager	*					

Oregon Department of Transportation							
Susan Haupt[5]	*State Environmental Manager/Environmental and Hydraulic Engineering Section Manager*	*					
Paul Wirfs	State Hydraulic Engineer	*					
Governor’s Office							
Courtney Crowell[6]	Water Policy Coordinator	*					
Morgan Gratz-Weiser[5]	Natural Resources Policy Coordinator	*					
Oregon Department of Administrative Services							
Kathryn Helms	Oregon’s Chief Data Officer		*		*		
Ryan Parent	Senior Information Technology Portfolio Manager			*	*		
Rachel Smith	GIS Officer; Deputy Chief Data Officer			*	*		
Erik Brewster	Data and Operations Coordinator				*		
OSU – Center for Applied Systems and Software							
Carrie Hertel	CASS Software Development Group Director; OWDP Project Manager			*	*	*	*
Alex Merino	OWDP Project Intern			*	*		*
OSU – Institute for Natural Resources							
Marc Rempel	Oregon Explorer Lead Developer			*	*		
Myrica McCune	Oregon Explorer GIS Analyst and Program Manager			*	*		
Duke University - Internet of Water							
Ashley Ward	Senior Policy Associate for Engagement and Outreach			*			
David Bjorkback	Project Coordinator			*			
Lucas Stephens[7]	*Policy Associate*			*			
Kyle Onda	Associate Director, Center for Geospatial Solutions			*	*		
Lilian Watson	Science Communications Associate			*			
Benjamin Webb	Software Developer, Center for Geospatial Solutions			*	*		

[5] Through August 2021

[6] Under Governors Brown and Kotek

[7] Through October 2022

Note about Agency participation: Efforts have been made, and will continue, to engage other state agencies, including OEM, DOGAMI, and OPRD. To date, these agencies have been provided information about the OWDP, but have not been able to provide staff resources nor have they been active participants in activities or briefings associated with the OWDP project.

WCT = Water Core Team
SC = Steering Committee
SME = Subject Matter Expert Team
TT = Technical Team
ET = Engagement Team
AT = Administrative Team

Identifying Portal Examples and Data Tools: Presentations to OWDP Teams

The initial staff assembled as the Subject Matter Expert Team looked outside of Oregon to identify examples of other data portals and types of data tools that might be available to support the preliminary concept of the OWDP. Project team members have invited a number of presenters to share information with Oregon agency staff to assist in the development of the recommendations of Stage 1. The table below lists the various presentations or demonstrations made to the various OWDP teams as part of our information gathering.

Table B-2 Presentations to OWDP Teams

Presenter	Date	Topic
Internet of Water (IoW)	March 28, 2022	Overview of Internet of Water
Texas Water Development Board	May 20, 2022	Texas' Water Data Portal Journey
New Mexico Bureau of Geology & Mineral Resources	May 23, 2022	New Mexico's Water Data Portal Journey
California State Water Resources Control Board	May 25, 2022	California's Water Data Portal Journey
Foundry Spatial	June 6, 2022	High level tour of offerings
Foundry Spatial	October 17, 2022	Deeper technical dive and offerings to consider
Kyle Onda (IoW)	October 21, 2022	Water Data Portal Tour
Google/True Elements	January 17, 2023 January 24, 2023	Google's tool offerings to consider and follow-up
Andrew Felton (Tualatin SWCD)	April 24, 2023	Tualatin Watershed Navigator

Presenter	Date	Topic
Tyler Technologies	May 3, 2023	Discussion about Data & Insights (aka Socrata) and licensing options
Internet of Water (IoW)	May 22, 2023	California Freshwater Harmful Algal Bloom Monitoring & Notification System North Carolina Water Supply Dashboard Boundary Sync
Kathryn Helms and team (Oregon EIS, Data Governance and Transparency)	June 14, 2023	Walk through of State of Oregon tech tools that may be useful to the project

Identifying Non-State Agency Data Partners

The OWDP will initially focus on development of a portal that provides access to water data from Oregon state agencies and state universities. Pending available funding, the OWDP would also eventually include access to or incorporate unique and informative water data from non-state agency partners. Some data held by non-state agency partners may be duplicative of data held by other agencies or partners (e.g., data collected by the state that is submitted to a Federal agency; data collected by a special service district which is submitted to a state agency; citizen-collected data submitted to a watershed council).

The eventual incorporation of non-state agency data may require work in subsequent stages to address priority data needs and understand potential constraints that may include data format, consistency, accessibility, or quality. The incorporation of data from other partners may have limitations that the OWDP project team has little ability to influence or modify. Sources of non-state agency data from smaller organizations or communities may require different approaches for inclusion, such as incorporation into a centralized data warehouse due to lack of organizational capacity or infrastructure to host or connect to a portal.

Non-state agency data partners may include the following types of entities:

- Federal agencies:
    - Oregon water data held by various Federal agencies; data concerning federal lands in Oregon
- Oregon Municipalities
    - Cities, towns, or districts providing municipal services
- Oregon Counties
- Tribes: individual Tribes or Tribal organizations may choose to provide access to data or knowledge
- Oregon Special districts or quasi-governmental organizations, which may include:
    - Regional Government organizations
    - Utility or wastewater districts
    - Port districts
    - Watershed Councils

    - Estuary Partnerships
    - Irrigation Districts
    - Soil & Water Conservation Districts
    - Drainage Districts
    - Drinking Water service providers
    - Forest Collaboratives
    - Placed Based Water Planning groups
    - Other Special Districts
- Other State governments or other state entities
    - States adjacent to Oregon (i.e., Washington, Idaho, California) may hold and choose to share relevant upstream or downstream water data or information
- State, regional or national non-governmental organizations
- State, regional or national non-profit organizations
- Oregon public- or volunteer-collected data consistent with citizen-science guidelines
- Private entities
- Other partners to be identified

Appendix C: Tribal and Stakeholder Engagement Sessions

Compiled by Carrie Hertel, January 2023

Work Summary

In late May 2022, the Subject Matter Experts (SME) Team recommended putting together tribal and stakeholder input sessions to assist with information gathering and set expectations with potential OWDP users. An Ad Hoc committee was formed including Josh Weber, DEQ; Ben Scandella, WRD; Audrey Hatch, OWEB; and Carrie Hertel, OSU. In June 2022, Michele Martin of DEQ joined the team to assist with planning and shaping the listening sessions with her experience in these types of activities. In August 2022, Valerie Thompson of DEQ joined the team.

Through input from the OWDP Steering Committee, a list of users and associations was developed including a plan to reach out to Tribes. The following dates were set and invitations submitted:

- October 5, 2022 – Tribal Briefing as part of the Natural Resources Work Group (NRWG) meeting
- October 6, 2022 – Associations Listening Session
- October 12, 2022 – Users Listening Session

The OWDP engagement team spent many hours honing the message, materials and slides. Outcomes provided in-depth feedback on the value of the portal; potential use cases; and portal functionality. A post-session survey was developed and sent out to the attendees of the various sessions for feedback on their prioritized questions for both the pilot/short term project and the long term project.

Tribal Engagement

In addition to the October 5, 2022 Tribal Briefing, a Letter of Consultation was issued by DEQ to the nine Federally-recognized Tribes in Oregon. The Cow Creek Band of Umpqua Tribe of Indians responded and DEQ, OWEB, WRD, and CASS participated in a session with Cow Creek representatives to discuss the Oregon Water Data Portal.

Documents included:

- OWDP Tribal Briefing Notes (Oct 5, 2022)
- Tribal Consultation Letters
- Cow Creek Band of Umpqua Tribe of Indians Meeting Notes (Nov 17, 2022)
- List of agencies invited to an Associations or User Listening session
- OWDP Users Listening Session Agenda (Oct 12, 2022)
- OWDP Listening Session Questions to Consider
- OWDP Associations Listening Session Notes (Oct 6, 2022)
- OWDP Users Listening Session Notes (Oct 12, 2022)
- OWDP Survey Results Summary
- OWDP Users Listening Session Slides

OWDP Tribal Briefing Notes

10/5/2022
Complied by Carrie Hertel

Team:
- Rian Hooff, DEQ (Facilitator/Presenter)
- Josh Weber, DEQ (Presenter)
- Ben Scandella, WRD (Presenter)
- Audrey Hatch, OWEB (Presenter)
- Carrie Hertel, OSU (Notes/Logistics)
- Michele Martin, DEQ (Notes/Logistics)

Presented the first part of the OWDP Listening Session slide deck as an informational session. Thirty minutes were given on the agenda.

Key takeaways:

- **Tribal consultation letters are needed, as soon as possible**. The sooner the better to have tribes involved more formally/officially.
- Water was a major theme in the summit the day before. There was a panel on water, fire, drought, etc. and there were questions about water data and data gaps.
- There was a question about the relationship with the Regional Water Planning team. Rian responded that the groups are aware of each other. How that relationship will develop is TBD.
- There was a suggestion to bring up the OWDP in the next Tribal Water Taskforce meeting to assist with coordination so both groups are aware of what is going on.
- Brief discussion on tribal data. The tribes will determine what and how much data they will share. Josh brought up that we will have some follow up with them on the data sovereignty and how they would like to work with the OWDP.

Tribal Consultation Letters

Tribal consultation letters were developed and sent to the below tribes individually. Included below is a copy of the letter sent to the Cow Creek Band of Umpqua Tribe of Indians.
- Burns Paiute Tribe
- Confederated Tribes of Coos, Lower Umpqua & Siuslaw
- Coquille Indian Tribe
- Cow Creek Band of Umpqua Tribe of Indians
- Confederated Tribes of Grand Ronde
- Klamath Tribes
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of Warm Springs Reservation

Oregon
Kate Brown, Governor

Department of Environmental Quality
Agency Headquarters
700 NE Multnomah Street, Suite 600
Portland, OR 97232
(503) 229-5696
FAX (503) 229-6124
TTY 711

October 14, 2022

Transmitted via electronic mail to: vpence@cowcreek-nsn.gov and kcoates@cowcreek-nsn.gov

Carla Keene, Chairman
Cow Creek Band of Umpqua Tribe of Indians
2371 N.E. Stephens Street, #100
Roseburg, OR 97470

Dear Chair Keene:

Thank you for your continued partnership with the Oregon Department of Environmental Quality (DEQ) to restore and enhance the quality of Oregon's air, land, and water. At this time, DEQ's Water Quality Division, in collaboration with Oregon Watershed Enhancement Board, Oregon Water Resources Department, and other state natural resource agencies, is working to evaluate and propose design options for an information technology project that would provide a web-based single point of access for water related data that could support planning and decision making around the state. Due to our shared interests in water management issues, I want to ensure your awareness of the project and provide opportunities for early and meaningful tribal engagement.

The Legislature appropriated $350,000 General Fund to the Department of Environmental Quality for the 2021-23 biennia to begin initial scoping and design of a database framework we are calling the Oregon Water Data Portal (OWDP) project. A primary objective of the OWDP will be to improve decision-making, community and public access to the necessary data and information upon which long-term strategic water and water infrastructure-related decisions can be made, including planning and investment. DEQ gave a presentation at the Natural Resource Cluster meeting on October 5th, 2022 to share some initial information with your staff members. We anticipate that Tribal Governments will be important partners in this endeavor, and therefore consider your input critical to early development and implementation stages of this project.

We are writing now to inquire about interest from the Cow Creek Band of Umpqua Tribe of Indians and staff to discuss this project and to consult with you on the initial development of this project. We anticipate providing an initial report to the Legislature in January 2023 involving an analysis of the project scope and potential and would welcome your input and questions prior to developing that report and next steps recommendations.

Please let us know if you are interested in meeting with us regarding this work, or if you support ongoing staff-to-staff engagement opportunities. DEQ's tribal liaison, Annalisa Bhatia at 503.734.4080 or Annalisa.bhatia@deq.oregon.gov can assist with scheduling this conversation at a time and place convenient for you. Whether through this project and or others, DEQ looks forward to our continued partnership in protecting Oregon's water.

Sincerely,

Leah K. Feldon

Leah Feldon

Interim Director

OWDP Cow Creek Band of Umpqua Tribe of Indians Meeting

11/17/2022
Complied by Carrie Hertel

A meeting was requested by the Cow Creek Band of Umpqua Tribe of Indians to discuss the Oregon Water Data Portal Plans. The notes below are from that meeting.

Attendees:
Kelly Coates, Cow Creek Band of Umpqua Tribe of Indians
Karen Kennedy, Cow Creek Band of Umpqua Tribe of Indians
Rian Hoof, DEQ
Josh Weber, DEQ
Audrey Hatch, OWEB
Ben Scandella, WRD
Alex Merino, OSU/CASS
Carrie Hertel, OSU/CASS

Kelly wanted to make sure she understood the scope of the project

- How tribes engaged
- Who gets to use the data
- Concerned about the data being available and what people can run with it and use it inappropriately

Rian

- We do not have a plan for how to reach out to tribes, but we are engaging and asking the tribes how they would like to connect. Getting feedback, nothing in stone.

Josh

- Still learning about working with the tribes
- Correct, nothing is set in stone
- This stage is scoping and planning
    - Coming out of this stage is a pretty good idea of where we are going
    - There is still a lot of flexibility we will need to incorporate
    - Very open for input from the Tribes
- Talked a little bit about different access (public vs. agency) to the data
- Assumes there is a negotiation with tribes and get some input on how they would like their data to be available

Audrey

- This will pull information and data together in new ways.
- Disclaimers are expected to be in place
- A process to include non-state data is being discussed

Ben

- Disclaimers and appropriate indications of quality with whatever data is brought into this portal.
- Attempting to not only find data available, but identify particular use cases (decision a group or type of user wants to make) and prioritize publication of data sets to support those use cases.
- Decisions on a specific topic may only need to show some portions of data sets.
- Key is the ability to support that refinement.

Josh

- How the data are used.   The people who want to use the data are not limited to highly educated people in water, the project's commission includes data and information. The tools that turn data into information and combine various data sets from various agencies is part of the mission of this project. This includes the 9th grader that wants to do a report for his class. It should not require a PhD to get this information.
- Examples of tools - mapping tools. Has there been any monitoring done on the stream in my park? Are the bugs in the bottom of the stream in good health?
- Generally, the highly educated people will be able to review the data and make decisions on quality and what questions they are answering.

Kelly

- Will we be reaching out to federal partners?

Audrey

- Yes, and it would be phased. May not be initial priority because it is already so available.
- It makes sense to include fed data, example on temperature data.
- Not a big emphasis on fed outreach yet

Josh

- We had to simplify this a bit
- July 2024 is when we likely will stand this up it, although the first pilot may be small
- A guess, we will have federal data early on (via API's etc.) as an easy access, but not a lot to begin with.

Kelly

- She was mostly thinking stream temperature as she knows Fed data that is available

Ben

- One piece that works in our advantage here, fed data is available.
- Discussing data standards and likely will be shared with federal agencies (like USGS standards)
    - This makes it easy to add in federal data

Kelly

- For the tribal engagement piece, some tribes may choose to submit their data for the portal some tribes may choose not to submit their data.

Rian

- Yes, this is an invitation not a built in assumption.

Kelly

- Example of the spill by water intake is something that actually happened to them
- The data sharing piece is interesting. There are places where it makes sense and where it doesn’t.
- Asked what agencies are involved in this.

Josh

- Talked about the 3 teams and who are involved. (Steering, SME, Tech)
    - Talked about the data included (when talking about tech team)
    - In some cases the data is not ready and have to go back to the agencies to have data examined for quality, maybe have to digitize paper etc.
- Same data at the agency and the portal level. Keeps the data transparent.
- Talked about contractors
- IoW has helped with similar work like New Mexico and IoW are our hand-holders who have done this before.

Ben

- We are using use cases vs. just putting data out there because we have it (data we have vs. data we need)
- Flag we may want to keep in mind the question of how to connect the portal with tribal data to whatever extent they would like to enable that connection.
    - That may not be feasible for all of the data they want to share.

Josh

- Any additional controls the tribes will want
- Extended an invite to Cow Creek Band to join SME or Tech teams or let us know how they would like to engage.

Kelly

- Asked about where we were with legislature

Rian

- Gave update on current status and preliminary recommendations

Kelly

- Appreciated the time and thinks she got all of her questions answered.

List of Organizations Invited to an Associations or Users Listening Session

American Council of Engineering Companies of Oregon
Amp Insights
Asian Pacific American Network of Oregon APANO
Association Clean Water Agencies
Association of Oregon Counties
Association of Oregon Counties & Upper Grand Ronde River Partnership & Anderson Perry & Associates, Inc
City of Lincoln City
City of Portland
Climate Equity Network
Deschutes River Conservancy
Deschutes Watershed Council
Ecotrust
Environmental Defense Fund
Farmers Conservation Alliance
Friends of Family Farmers
GSI - Groundwater Solutions Inc.
Harney Basin Community-Based Water Planning Collaborative
Harney SWCD
IRZ Consulting, LLC
Jacobs Engineering
League of Oregon Cities
League of Women Voters
Lower John Day Place Based Water Planning
Lower Nehalem WC
Mid Coast Water Planning Partnership

Nestica Willamoot - Willamette River Meyer Memorial Trust
Network of Oregon Watershed Councils
North Fork John Day WC
Notheast Oregon Water Association
Office of Representative Ken Helm (Oregon State Legislature)
Office of Representative Mark Owens (Oregon State Legislature)
Oregon Association of Nurseries
Oregon Association of Realtors
Oregon Association of Water Utilities
Oregon Business & Industry
Oregon Cattlemen's Association
Oregon Climate and Agricultural Network
Oregon Environmental Council
Oregon Environmental Justice Task Force - Council
Oregon Farm Bureau
Oregon Forest Industries Council
Oregon Groundwater Association
Oregon State University (Chair of LUBGWMA - Lower Umatilla Basin Groundwater Management Area)
Oregon Water Futures project, Verde
Oregon Water Futures project, Willamette Partnership
Oregon Water Resources Congress
Oregon Water Utilities Council
Oregonians for Food and Shelter
OSU Extension
OSU Institute for Natural Resources
Pacific NW Aquatic Monitoring Partnership (PNAMP)
Pineros y Campesinos Unidos del Noroeste, Oregon Farmworkers PCUN
Rogue Riverkeeper
Soil and Water Conservation District (Oregon Association of Conservation Districts)
Special Districts Association of Oregon
Surfrider Foundation, Newport Chapter
Sustainable Northwest & Lower John Day Place Based Water Planning
The Freshwater Trust
The Nature Conservancy
Trout Unlimited
Upper Grand Ronde River Partnership
Water Watch
Wild Salmon Center
Willamette Partnership

Oregon Water Data Portal
Listening Session Agenda

October 12, 2022

Project team contacts

Audrey Hatch, Oregon Watershed Enhancement Board Audrey.HATCH@oweb.oregon.gov
Ben Scandella, Water Resources Department Benjamin.P.SCANDELLA@water.oregon.gov
Josh Weber, Oregon Department of Environmental Quality Joshua.WEBER@deq.oregon.gov
Valerie Thompson, Oregon Department of Environmental Quality Valerie.THOMPSON@deq.oregon.gov

Agenda

Time	Topic
1:00 p.m.	Welcome
1:05 p.m.	Agenda review
1:10 p.m.	Zoom logistics and ground rules
1:15 p.m.	Project information and background
1:50 p.m.	Break – 10 min. back at 2:00 p.m.
2:00 p.m.	Group discussion (breakout groups, polls, chat responses) We will discuss concerns, challenges, priorities
2:50 p.m.	Break – 10 min. back at 3:00 p.m.
3:00 p.m.	Continue group discussion (breakout groups, polls, chat responses)
3:40 p.m.	Next steps
4:00 p.m.	Adjourn

Zoom

https://us02web.zoom.us/meeting/register/tZAtcOmvpz4rH9w6SvzCs2G46xrCBCoLoBWg

To participate by phone, please click on the link to register. You will have access to a meeting phone number.

Oregon Water Data Portal
Listing Session
Questions to Consider

October 2022

Project team contacts

Audrey Hatch, Oregon Watershed Enhancement Board Audrey.HATCH@oweb.oregon.gov
Ben Scandella, Water Resources Department Benjamin.P.SCANDELLA@water.oregon.gov
Josh Weber, Oregon Department of Environmental Quality Joshua.WEBER@deq.oregon.gov
Valerie Thompson, Oregon Department of Environmental Quality Valerie.THOMPSON@deq.oregon.gov

Listening session

The Oregon Water Data Portal project is about improving access to statewide data and information to make water and water infrastructure decisions. The concept of a water data portal was described in the implementation portion of Oregon's 2017 Integrated Water Resources Strategy and Oregon's 100-year Water Vision. At this listening session, we will ask for input on the different water-related questions the portal could be used to answer, and for input to further prioritize data relevant to the development of an initial water data portal.

We anticipate many of the desired capabilities are going to take a long time to implement. This listening session is an opportunity to have conversations with tribes and stakeholders about prioritizing data and information for the data portal. Members of the project team from Oregon Watershed Enhancement Board, Water Resources Department, and Oregon Department of Environmental Quality will be leading and supporting this listening session.

This interactive listening session will use meeting polls, breakout sessions, chat responses, as well as conversation, to gain feedback from attendees during the meeting. Some of the questions we will talk about are below. We will also provide an additional opportunity for feedback after the listening session.
1. Poll: How easily can you find the Oregon water data you use to make decisions?

2. Questions to consider:

- What data and information do we need?
- What data and information do we have?
- How do we get what we need but don't yet have?
- What is most important and most obtainable?

3. What are the challenges or concerns about a statewide Oregon water data portal? What are your solutions?

4. What could this portal do for your group that you cannot efficiently accomplish with currently available data?

5. Breakout session 1: Prioritization of the following *sample* questions that Oregon state subject matter experts consider possible to be answered with currently available data. You may identify questions about water decision making that are not shown below. Please bring them to the meeting to share with the group.

a. What are the major sources of water for human use (which streams, lakes, springs, etc.)?
b. What are historic flow rates on measured streams?
c. Where and when is surface water available for further allocation?
d. What natural hazards could affect water supplies?
e. Where are there dams and reservoirs, and how much water do they store?
f. How and where is water being monitored?
g. What do we know about surface water quality, and are there concerns?
h. Where are groundwater levels declining?
i. Where are there concerns about groundwater supply and future development?
j. Where have watershed restoration projects occurred?
k. Where are floodplains (habitat distribution), and where have floodplain restoration projects happened?
l. Where are the riparian areas in the planning unit?
m. Where does infrastructure restrict the flow of water in a river or the movement of fish?
n. What is the land ownership and use in this area?
o. What are the watershed and administrative boundaries?
p. Other:____________________

5. Breakout session 2: Prioritization of *sample* questions that could be answered with additional data collection or management. You may identify questions about water decision making that are not shown below. Please bring them to the meeting to share with the group.

a. What are the likely impacts of climate change on water quantity?

a. What are the annual budgets for surface water and groundwater?
b. How much water is used in a watershed?
c. Can we show improvements in floodplain habitat and riparian vegetation restoration over time? Where is restoration most needed?
d. What infrastructure is there to direct and convey water?
e. What is the current condition of key water infrastructure?
f. What invasive species are there and where are they located?
g. Where and how can we design a system to allow for groundwater recharge?
h. Where are the priorities for restoring streamflows?
i. Where and when are instream flows being met, and where and when are they not?
j. What do we know about groundwater quality, and are there concerns?
k. What is the status of snow this year, and how will that affect water supplies?
l. What are forecasted water demands from different sectors and regions?
m. What are current climate conditions in each sub-basin? [Federal data, USBOR]

OWDP Associations Listening Session Notes

10/6/2022; 1pm – 4pm Pacific
Complied by Carrie Hertel

Team:

- Valerie Thompson, DEQ (Presenter/Facilitator; Breakout Facilitator)
- Josh Weber, DEQ (Presenter; Breakout Facilitator)
- Ben Scandella, WRD (Presenter; Breakout Facilitator)
- Audrey Hatch, OWEB (Presenter; Breakout Facilitator)
- Carrie Hertel, OSU (Notes/Logistics; Breakout Facilitator)
- Michele Martin, DEQ (Notes/Logistics)
- Tina Brown, DEQ (Zoom Admin)

Attendees maxed at 44 briefly. 40-42 were typical until after the first breakout when some had to drop.

These notes are intended to capture notes from various team members in the general session. Formatted as follows:

- General Session Notes
- Breakout Session 1
- Breakout Session 2
- Registered Participants

Chat will be interspersed to allow context and in *italics.*

General Session Notes

<u>1:08 pm – Session Started</u>

Poll 20 responses; 50% moderately; 50% can't find. 1 said can't find, the rest said can't find efficiently.

It appears sharing the results stopped the poll from continuing to allow input.

> *From Jocelyn Tutak to Everyone 01:09 PM*
> *Apologies if I missed it -- the meeting materials should be PDFs of the agenda, the Project Concept, and the Listening Session meeting questions?*
>
> *From Josh Weber to Everyone 01:10 PM*
> *Yes*
>
> *From Audrey Hatch to Everyone 01:10 PM*
> *correct, Jocelyn!*
>
> *From Jocelyn Tutak to Everyone 01:10 PM*
> *Thanks Audrey!*
> *and Josh!*

<u>1:18 pm – Started Slide 8</u> (Switched Josh -> Audrey to talk about IWRS and OWV)

1:23 pm – Started Slide 10 (Switched Audrey -> Josh to talk about project appropriation)

> *From Vanessa Green to Everyone 01:26 PM*
> *Hi, had some tech difficulties, just joined now ~Vanessa Green*
>
> *From Michele Martin, Oregon DEQ to Everyone 01:26 PM*
> *Welcome!*

1:33 pm – This was when we had planned a break. We decided to skip the break.

1:33 pm **Started** **Concerns**

Salini Sasidharan (OSU, LUBGWMA) - quality and quantity LUGWMA; ground water management area; very high nitrate in groundwater, limits the ground water. Subcommittee to address. Significant research, Challenge: lack of data. Re-inventing the wheel. Question: Data collection – source data; **How do we foresee that data collection from individual farmers with privacy?** That data is critical for this group. **How do we ensure the quality of that type of data especially when trust between interested parties is a challenge?**

- Josh mentioned these questions are on our project list. We understand how we will maintain quality is an open question.

From Audrey Hatch ~ OWEB to Everyone 01:41 PM
folks can also share concerns here in the Chat! And you can indicate if you agree with comments made by others, as we go along

From Megan Miller, FCA to Everyone 01:43 PM
I can also see this as a potential issue

Tim Wigington (The Freshwater Trust) - Housing of the portal within DEQ as a regulatory agency. Whether that placement may have impacts to trust and centralized data that could be used for regulation. Asked if it would be hosted by something like IoW instead of a state agency. Heard from agriculture that this is an issue.

Megan Miller agreed.

From Peggy Lynch (she/her) LWVOR to Everyone 01:43 PM
So I heard you are NOT housing at DEQ. Will Oregon Explorer work?

- Ben mentioned the Oregon Explorer mapping tool. It does allow a number of capabilities the portal is intended to offer. It's working now across the state. The intention of the Portal is to go beyond the Oregon Explorer – Portal needs to outlast the Oregon Explorer.

From susie smith-ACWA to Everyone 01:44 PM
The data needs to be current and accurate, because posting inaccurate out-of-date data can be worse than not having the data at all. Data is used for planning purposes and for ensuring regulatory compliance and assessing regulatory vulnerability. Agencies spend millions of dollars on these processes and they need to get it right. The solution would involve making sure the project is

adequately resourced, and that all agencies that post data have an obligation to post updated information within x amount of time.

From Salini Sasidharan|OSU to Everyone 01:49 PM
Data should be in a format that can be exported to other platform for additional research. For example, some data is provided as scanned PDF files with hand written document which require additional post-processing for further use. This will minimize the usability of the data.

From Ben Scandella (OWRD, he/him) to Everyone 01:49 PM
https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=water

From susie smith-ACWA to Everyone 01:49 PM
Also concerned about how this will be funded. It will be expensive--up front and ongoing. Should be a general fund investment and should not be added to fees and charges for permitting and other services because affordability of water infrastructure services is becoming a critical challenge for local utilities and ratepayers

- Josh mentioned proposal to the legislature and has not heard anything about fees in discussions

From Megan Miller, FCA to Everyone 01:52 PM
To clarify, will the portal have an interactive map and spatial query function? Or primarily tabular data? I just want to confirm that I heard Josh correctly.

- Team replied that OWDP will include both.

From Sharla Moffett to Everyone 01:53 PM
I appreciate and agree with Susie's comment regarding fees.

Peggy Lynch (League of Women Voters) – Asked about since there are other states with a portal, is there a software package we can use?

- Ben – mentioned IoW and we are contracting with them (they helped other states). Agree, that would be good not to reinvent the wheel. The thing that distinguishes this project is that we are trying to take a step beyond offering existing data to instead think from a user perspective – how current, how finely resolved, over what time period. Previous efforts have not been focused, to my understanding, on the user perspective. Makes this less of a cookie cutter option. That's why you are all here today to help Oregon know priorities and what decisions are you trying to make.

Peggy Lynch (League of Women Voters) – Great answer. Very helpful.

From Salini Sasidharan|OSU to Everyone 01:58 PM
Also data should be categorized as it is the primary raw data or estimated/projected data or cumulative (spatial and/or temporal) data or simulated etc.. If so add the logic behind it.

From Nick Osman (The Freshwater Trust) to Everyone 01:58 PM
How is "water data" defined? We use varied data for water resources decision-making that are not directly associated with water resources themselves (e.g., LiDAR, land use). Are there criteria for what constitutes "water data". Apologies if this is in the resources you've provided.

- Audrey – water data and information that could include imagery, doesn't have to be geospatial. A host of things meant when we use data. Need for nonprofit orgs to find information in one location, OWEB climate resolution. Acknowledge that.

<u>1:58 pm – **Started Benefits**</u>

Audrey emphasized how we have IoW and INR included to avoid reinventing the wheel.

Megan Miller (FCA) – work a lot with water rights and water use at a granular level. What water rights are associated with land, tributaries, etc. It would be amazing to be able to click on a water body and get a map of all of the lands that are irrigated by that water body. Sums of water allocated per acres, number of acres, diversions, etc. (Ben said he may reach out to them when we get further, Megan said OK)

> *From Emma Martin (City of Hillsboro/JWC) to Everyone 02:00 PM*
> *Would be convenient simply to have everything in one place*
>
> *From Zachary Mallon, Lower Nehalem Watershed Council (he/him) to Everyone 02:02 PM*
> *I agree with Emma. I often find myself going to 4 or more different water data map tools preparing grants.*

Lisa Brown (Water Watch) – efficiently access existing information on streamflows and water quality in those streams. We do need more stream gauges, but it would be nice to click on a stream and find out data available for streamflows, water quantity, instream demands, established biological flows. What do we know about stream ecosystem needs. Helps to determine what the data gaps are.

> *From Vanessa Green to Everyone 02:04 PM*
> *Speaking on behalf of watershed councils. Staff have said that they struggle to gather or access landscape-scale data that is current and comprehensive so that they can contextualize the projects they propose. Searching it out can be very time consuming. They are especially concerned about needing this data in order to comply with new proposal and reporting guidelines pertaining to the OWEB Climate Resolution. I thought the proposed project sounds great and hope there is a good plan in place for formative assessment along the way. Thankyou for organizing this :)*
>
> *From Harmony Burright (Rep Owens - HD 60) to Everyone 02:04 PM*
> *Basin water planning - status of water conditions (water supply, quality, other indicators) - water supply and demand (instream and out-of-stream) - water use/needs associated with different uses/users (instream and out-of-stream) on a shared system - water distribution/movement - water "opportunities" (conservation, storage, etc) - status of key water infrastructure - tracking climate change impacts - forecasting*
>
> *From susie smith-ACWA to Everyone 02:07 PM*
> *Local Wastewater and Stormwater managers need to be able to identify reaches of streams and waterbodies and overlay water quality, flow, TMDL, WQ standards/criteria on those reaches to understand the wq pressures they need to address in current programs and can anticipate for planning in future permitting cycles. They also need overlaid on the reaches the information available on opportunities and needs for things like cold water refugia for fish, restoration of riparian habitats, flood plain restoration opportunities, etc. Going forward, local utilities will be*

increasingly looking to enhancement/restoration of natural infrastructure and developing credits as means to meet WQ challenges.

Tim Wiginton (The Freshwater Trust) – aspiration to anticipate uses and needs is great, but first things first, get all of the data aggregated and up-to-date, easy to find so that we can overcome access and quality barrier. Then, over time, formalize into more data use tools. They spend most of the time trying to find the data and QC'ing it.

From susie smith-ACWA to Everyone 02:07 PM
Need to be able to use data to understand where irrigation and other consumptive use needs overlap with opportunities for recycled water development as source water to alleviate pressures on surface water and ground water levels

From Salini Sasidharan|OSU to Everyone 02:08 PM
I would like to use the data on groundwater quantity, quality, water usage, and available water from a specific groundwater basin to estimate the projected decline if there are no natural or artificial recharge efforts implemented. Also tie this back to financial database, for example, a decline in water table and its impact in deep well drilling, pumping, or new well etc., and financial loss for user. Just one example of the use and I can think of many more.

Susie Smith (ACWA) – Plan at the beginning for what you think this project to be, then it's a real problem with IT systems.

From Lisa Brown - WaterWatch of Oregon to Everyone 2:10 PM
It would also be great to compile existing data on aquatic species distribution and have it spatially available with access to the supporting data sets. This could be data from multiple sources.

From Jocelyn Tutak to Everyone 02:10 PM
Tim is saying what I've been thinking!

Peggy Lynch (League of Women Voters) – Agrees with Tim, but wants us to plan beyond getting the data out there from the beginning.

From susie smith-ACWA to Everyone 02:12 PM
Agree with Lisa's comment on species........add updated fish use maps and keep current real time

<u>2:12 pm – Finished Benefits discussion</u>

<u>2:18 pm – Harmony asked Ben to restate his concept of readiness (time to help align with chat)</u>

From Harmony Burright (Rep Owens - HD 60) to Everyone 02:19 PM
I like what you said there, Ben regarding "readiness" - could you say that again or type it out...? It was a helpful lens...

- Ben – if it's data in a core data system if it's ready in a system that can be ready. The data may be useful from that core data system, we can infer where water would be available for further allocation under WRDs rules subject to the second set of data like basin data sets, could be sufficient for example where and when data is available.

Thank you! Are those core data systems with sufficient "quality control" inventoried already - or will that be made available in the report you're developing? Will the inventory also include the questions that the data systems were originally designed to help answer?

From Audrey Hatch ~ OWEB to Everyone 02:19 PM
the inventory is currently in progress through the Subject Matter Expert Team

From Josh Weber to Everyone 02:19 PM
Inventorying the various data sets and their quality are within the work of the project.

- Ben – Get data that you have – state agencies have done a first round of seeing data issues and analysis of the data – it's not for sure if that data is ready for a pilot project. We did a very cursory review of those data sets – which is why the list today is incomplete. You may have other priority questions that we want to hear today. These are the questions today that we used that may be passable in time for this listening session. We can't guarantee the data sets we talk about today will be part of the pilot.

  From Harmony Burright (Rep Owens - HD 60) to Everyone 02:21 PM
  That will be incredibly valuable - thank you. It would be great to also include what questions those data systems were originally designed to answer - what use cases were envisioned when they were developed.

<u>2:24 – 2:30 pm – Break</u>

From Zachary Mallon, Lower Nehalem Watershed Council (he/him) to Everyone 02:25 PM
I'm not going to be able to stick around for the breakout sessions. Thank you for this. I'm looking forward to the follow up survey so i can share some perspective from a small watershed council. Thanks and I'll see you for your session next week as well.

From Tim Wigington (The Freshwater Trust) to Everyone 02:27 PM
thanks for putting this together, i also have to jump off. looking forward to seeing how this progresses

Audrey – IoW, in parallel with that inventory effort we wanted to have a chat with you today. Questions come from interested parties and these are the types of questions we heard previously, are these the right questions and would we still prioritize them that way.

<u>2:30 pm – Started Breakout 1</u>

<u>2:50 pm – Ended Breakout 1</u>

Breakout 1 review with full group (see section below for individual breakout session notes)

Salini Sasidharan (OSU, LUBGWMA) – the group was all focused on the groundwater issues; we had that in common. Recommend the portal offer a broader perspective than folks might know to look for, for alternative sources of water, not just the typical ones, but others.

Susie Smith – Need to understand where supply needs are. Talked about recycled water use but need information on the supply first.

Audrey reported from group: The work around the inventory is super important.

Carrie reported from group: Being able to see data over time (historical) is important to show results of projects.

From Carrie Hertel, OSU to Everyone 02:51 PM
Change over time is important. That came up a few times.

From Lisa Brown - WaterWatch of Oregon to Everyone 02:54 PM
An overarching observation is that the list of questions didn't reflect instream related questions, e.g. what is existing data on instream flow needs, fish distribution and status, distribution and status of other aquatic species.

- Mellony Hoskinson – ODFW may have input on the issues

From Jacob Kimiecik, DRC to Everyone 02:55 PM
Agreed, Lisa!

From Harmony Burright (Rep Owens - HD 60) to Everyone 02:57 PM
Want to share with you an example of how we used available data/information spanning water quantity, quality, infrastructure, ecology, etc - https://storymap.midcoastwaterpartners.com/. We tried to pull in many sources of available information from multiple agencies to answer questions that we gathered through a public survey, tell a story about water, and make information more interactive/user friendly. Some of this was easy to do, some of it required significant analysis.

From Alice Morrison - Friends of Family Farmers to Everyone 02:59 PM
Thank you all for this conversation and including me, I have a schedule conflict at 3 and have to go but I look forward to continuing these discussions. Thanks for building this tool!

<u>3:01 pm – Started Breakout 2</u>

<u>~ 3:10 pm – Ended Breakout 2</u>

Breakout 2 review with full group (see section below for individual breakout session notes)

From Michele Martin, Oregon DEQ to Everyone 03:13 PM
Thank you, Alice!

From Peggy Lynch (she/her) LWVOR to Everyone 03:13 PM
Was DOGAMI listed in one of the technical groups...as data to be linked?

From Carrie Hertel, OSU to Everyone 03:14 PM
DOGAMI is included in the agencies we are connecting with for this project.

Audrey – heard forecast given climate is important in her breakout group – how to respond more quickly to help forecast snow packs

Carrie – infrastructure, who owns it? Where is it? How they find that information now? – Calling people and historical maps – it's a lot of work.

From Peggy Lynch (she/her) LWVOR to Everyone 03:14 PM
Thank you

From Carrie Hertel, OSU to Everyone 03:17 PM
What are the infrastructure and water quality impacts of wildfires?

From Kristen Walz, North Fork John Day Watershed Council to Everyone 03:17 PM
We have had fantastic luck working with DOGAMI. They are always looking for state and private dollars to match their efforts:)

From Adam Denlinger, SRWD, SDAO, and OWUC to Everyone 03:18 PM
This has been fantastic; however I need to drop off for another meeting. thanks everyone

From Michele Martin, Oregon DEQ to Everyone 03:18 PM
Thank you Adam and Peggy.

General Notes Captured:

- Some questions need refinement, multiple questions. What do we really mean?
- Lots of desires for forecasts
- Infrastructure. Who owns it?
- Annual budgets for SW and GW, for drinking and irrigation?

<u>3:18 pm – Next Steps Slide</u>

<u>3:21 pm – Ended</u>

Breakout Session 1

Group 1: Facilitated by Ben Scandella

- Vanessa Green, network of Oregon Watershed Councils. Not end user for the data. Rep watershed councils statewide. Watershed directors in others. Tend to need:
    - Varies depending on needs
    - Mostly nonprofits, small staff, stretched thin
    - Little time considered unrestricted, which is what supports office time not on direct restoration. Use that time to clean toilets, do HR, maintain vehicle.
    - Lots of requirements, but questions answered in different ways. Most valuable thing is their time. Agencies don't do a good job working with one another to benchmark questions so that they're answered in a similar way. Not hard to synchronize that. Would be good to coordinate. Example OWEB Climate Resolution. Didn't realize that this is already in motion. Any comment filtered through that lens, that any way that thing can be made accessible would be great.
    - Ability to contribute data learned through projects?
    - Plan for formative assessment: plan to take temperature as you go, how it's working.
- Ryan Hodges, Ecotrust (he/him)
    - Developer on portals similar to the one being described here. Trying to learn how
    - Mid-Atlantic Ocean?? Similar to story maps. Couple storytelling with a portal underneath. Enable visualization. Make a catalog
    - Oregon Conservation Strategy.org. 300-400 page PDF booklet, content-oriented. Interactive, wrapped around a mapping tool called compass. Map can point users to raw data, either direct download, links to
- Marshall Coba, Lobbyist with ACOC (American council of 110 firms) and Google Cloud
    - Also here trying to listen instead of say stuff. Others will enter into conversation
    - Google: tech capabilities fascinating, can't say much
- Marc Rempel, also on tech team and from Oregon Explorer

Feedback from 1st breakout group:

- Alternate water sources
- Understand where supply needs are. Folks who manage wastewater supply need to know that there's a likely end-use match for it, chicken and egg thing going on. Can't tell where supply is available.
    - I didn't say yet that this likely doesn't exist yet. We should check
- Work around inventory is super important. Hard to say readiness when the inventory isn't quite done.
- ISWR:
    - Instream flow needs, not what's on a certificate

Group 2: Facilitated by Valerie Thompson

Participants: Susie Smith, ACWA; Harmony Burright, Owens; James, TU; Lisa, Water Watch; Alice, Friends of Family Farmers

FFF = top 3 priorities are c, h, g

- Information needed by farmers

TU = top 3 priorities are also c,h,g.

- Information needed for restoration
- e, and i as well, but less so.
- g, DEQ's status and trends does not include enough data to be useful, lots of areas/issues with no data available
- Mapping of state and federal designations for waterways – e.g., wild and scenic, wilderness, etc.

ACWA = no priorities among this list

- g is too general compared to others
- would like to know where are water quality impaired streams, where are TMDLs, and what are those for – this is a high priority for water quality managers.
- List is missing information about species presence or uses

WaterWatch = b, but more broadly than historic rates, also need to include current rates

- Would like to see data on species status, where are the fish, and are they state or federally listed
- What data do we have on instream flow demands or requirements for all users/uses?
- Where are groundwater dependent ecosystems?
- Instream flows, should be able to show where needs are not being met to help with place-based planning

Harmony

- Streamflow – min, max and average
- Locations of droughts and floods of record
- Visualize guage data over time to show variability
- Data about status of allocation, where are we over or under allocated?
- Where is monitoring occurring, and what type? Use to identify priority areas for additional monitoring needs
- Instream flow status and priority rights dates
- Species presence and springs?
- Many questions show bias for human use, need to also include data about ecosystem/species needs

Chat Input

14:41:21 From Harmony Burright (Rep Owens - HD 60) To Everyone:
b - include min/max, average (over a period of record), flood of record, and drought of record; c - broaden this to status of allocation versus available for allocation; f - priority for siting future monitoring stations and increasing investments; h - where are groundwater level trends and/or where are there concerns; other - where are there instream water rights and what are the priority dates, presence and distribution of species/status, presence and distribution of springs - for a) don't bias it towards "human use"

14:42:05 From susie smith-ACWA To Everyone:
agree with importance of the instream flow information

14:42:46 From Harmony Burright (Rep Owens - HD 60) To Everyone:
https://flo.uri.sh/visualisation/5115953/embed

14:45:17 From Lisa Brown - WaterWatch of Oregon To Everyone:
Another source of instream flow requirements important to capture is Scenic Waterway Flows.

14:46:50 From Harmony Burright (Rep Owens - HD 60) To Everyone:
e) what is the hazard rating and status of dams (dam safety)

14:46:53 From susie smith-ACWA To Everyone:
Our priorities: 1) water quality information (including temp) for surface and ground; 2) flow information and availability for surface and ground (including instream needs); 3) beneficial use/species impairments

14:47:45 From Harmony Burright (Rep Owens - HD 60) To Everyone:
other - for land use planners, they are oftentimes interested in well density and well yield

14:48:50 From Harmony Burright (Rep Owens - HD 60) To Everyone:
also throw in there "dry well complaints" - summing up well information

Group 3: Facilitated by Josh Weber

14:36:11 From Breanne Howard (Google) To Everyone:
H
14:36:34 From Breanne Howard (Google) To Everyone:
i
14:37:21 From Breanne Howard (Google) To Everyone:
C
14:37:43 From Salini Sasidharan|OSU To Everyone:
H, But rewrite as below, Where are groundwater levels, declining, the GW quality, and what would be the recharge opportunity? I -Where are there concerns about groundwater supply and future development? C. Where and when is surface water available for further allocation?

Salini - use of water for industry purposes, watershed for ecosystems, and LUGWMA Chair, groundwater: quality, scattered to broadly. Having recycled water data available.

14:37:58 From Salini Sasidharan|OSU To Everyone:
H,I,C
14:38:36 From James O'Brien - Deschutes River Conservancy To Everyone:
C,H,I

James O'Brien (Deschutes River Conservancy) - **C,H,I** Interesting that all priorities were similar, the application of the data might be different among the different stakeholders, the data itself if the overlap. Not on the list. Similar to Megan – the data some of the questions about water right allocations and if you could click on a body of water and who it's going to and the uses (name them) and know that. Agree with Megan's metrics previously said, applications on the ground.

Breanne Howard (Google) – **H, I, C** (H,I together and then C) Relationships with IoW, looking at historical data and predicting floods, drought, where do we see water levels declining. Forward looking vision.

Group 4: Facilitated by Audrey Hatch

- Highlighted = Priority questions for at least 1 person in the group
- Additional notes (highlighted) = clarifications the group wanted to see in the questions and/or felt were important in being able to determine whether they can be addressed

Questions called out as important are in bold below.

a. **What are the major sources of water for human use (which streams, lakes, springs, etc.)?**
b. What are historic flow rates on measured streams?
c. Where and when is surface water available for further allocation?
d. What natural hazards could affect water supplies?
e. Where are there dams and reservoirs, and how much water do they store?
f. **How and where is water being monitored?**
    - **Water quality, quantity**
g. What do we know about surface water quality, and are there concerns?
    - **Data Gap**
h. Where are groundwater levels declining?
i. Where are there concerns about groundwater supply and future development?
j. **Where have watershed restoration projects occurred?**
k. Where are floodplains (habitat distribution), and where have floodplain restoration projects happened?
l. Where are the riparian areas in the planning unit?
m. **Where does infrastructure restrict the flow of water in a river or the movement of fish?**
n. What is the land ownership and use in this area?
    - **Land ownership is more readily available**
    - **Need to link to water right**
o. **What are the watershed and administrative boundaries?**
p. Other questions:
    - **Is water allocated, to whom?**
    - **Wetlands: As natural infrastructure; important to track under changing climate**

- A new question "How to track wetland condition under climate change" recognizing wetlands serve as natural infrastructure. The group was uncertain about the available data on this. I think we should follow up with a SME and then determine which category to add it to (I'm thinking "question that could be answered with more data collection/data management" but a lot of the wetland distribution data is already available so it could be a “ready” question). A SME at INR/DLCD could help. Do we plan to have SMEs review the full list of questions before the survey is sent?

Major points discussed in sessions: (note this includes session 2)

- Recognize that for some, it was difficult to determine whether a question can be “addressed with readily available data” or “addressed, after further data collection/data management or organization) without seeing the full Data Inventory. We discussed how the prioritization task is happening alongside the inventory work, and we wanted to hear from interested parties
- Continued conversation about the importance of data standards
- Several in group expressed interest in using the portal to help inform climate planning. This is a priority for OWEB grantees as the agency recently adopted a Climate Resolution and we are initiating rule-making on climate criteria for our grant programs; this might be good to discuss more as the portal project proceeds

<u>Group 5: Facilitated by Carrie Hertel</u>

Listed the groups under the questions they deemed important.

a. What are the major sources of water for human use (which streams, lakes, springs, etc.)?
    - OGWA
    - Ecotrust – help visualize spatial data
b. What are historic flow rates on measured streams?
c. Where and when is surface water available for further allocation?
d. What natural hazards could affect water supplies?
    - Ecotrust
e. Where are there dams and reservoirs, and how much water do they store?
f. How and where is water being monitored?
g. What do we know about surface water quality, and are there concerns?
    - Ecotrust
    - Oregonians for food and shelter
h. Where are groundwater levels declining?
    - OGWA
i. Where are the concerns about groundwater supply and future development?
j. Where have watershed restoration projects occurred?
k. Where are floodplains (habitat distribution), and where have floodplain restoration projects happened?
l. Where are the riparian areas in the planning unit?
m. Where does infrastructure restrict the flow of water in a river or the movement of fish?
    - Ecotrust
n. What is the land ownership and use in this area?
    - Ecotrust (has lots of options on this data)

- OGWA

o. What are the watershed and administrative boundaries?
   - Ecotrust (lots of options on this data)

p. What change in the water data over time?
   - Can contribute to climate data and use over time

q. Project water saved, projected water improvements. How do we confirm that? Compare historical both flow and water quality data and be able to compare with post-project over years. What projects are most effective.
   - Surface Flows in streams
   - Water Quality, nitrates and phosphates
   - Modernization of irrigation systems. Want to be able to report on the reduction.

Jocelyn EcoTrust – Surface drinking water, salmon fish water quality work.
Struggled to get water quality data, points of pollution, etc. Anything that would help a community to understand what is affecting their drinking water and where.

DRC – very detailed map data conveyance systems, can get it from irrigation systems, but it would be good to have this more readily available and viewable. Water rights – very cumbersome. Be easy to search for the lay person.

Breakout Group 2

Group 1: Facilitated by Ben Scandella

- Mid-Atlantic Ocean?? Similar to storymaps. Couple storytelling with a portal underneath. Enable visualization. Make a catalog
- Oregon Conservation Strategy.org. 300-400 page PDF booklet, content-oriented. Interactive, wrapped around a mapping tool called compass. Map can point users to raw data, either direct download, links to source websites, or service.
- Oregon Explorer has links to where data downloadable where possible
- People don't want data, they want answers. Until they get an answer they don't like. Then they want the data.

Group 2: Facilitated by Valerie Thompson

Participants: Lisa, WaterWatch; Harmony, Owens; Susie Smith, ACWA; Tiffany Moore

Lisa = how much water is in out streams and rivers?

- Current lack of gauges
- Lack of data on water use
- Want to migrate existing data but also ensure we continue to improve ability to monitor and collect data moving forward

Harmony = Temporal and Spatial scale of USGS data is too large, need to find ways to visualize or view data at other scales

Susie = most questions are too general or include different issues in each question

- D and K should be split into multiple questions

- Where is restoration most needed is too vague to be useful. What kind of restoration and for what purpose? Get more specific, like where are cold water refugia needed for salmon in different basins?
- Forecasting
- Ownership of data and improvement over time

Chat Input

15:06:48 From Harmony Burright (Rep Owens - HD 60) To Everyone:
c - How much water is used by various sectors - need to include temporal aspect of water use since it varies...could be nice to look at various scales in addition to watershed

15:07:06 From susie smith-ACWA To Everyone:
d. and g. should be split into two questions. G should be what is the GW WQ data? and then, where are WQ impaired aquifers and for what?

15:07:54 From susie smith-ACWA To Everyone:
D. Needed restoration is separate from showing improvements--split

15:09:11 From Harmony Burright (Rep Owens - HD 60) To Everyone:
other - "opportunity areas" - e.g., known water conservation opportunities, above and below-ground storage

15:09:24 From susie smith-ACWA To Everyone:
Sorry, I met k not g

15:09:44 From Harmony Burright (Rep Owens - HD 60) To Everyone:
re: opportunity areas, the OWSCI project had interactive databases/maps, but those were taken offline and not maintained - it could be nice to get those back up online

15:12:21 From Harmony Burright (Rep Owens - HD 60) To Everyone:
other - flood maps/flood impacts (the City of Vernonia is working on a cool project to improve flood maps/mapping flood impacts) - this was the natural hazards question from above...but you might need to be specific about hazards...drought impacts could also be helpful

Group 3: Facilitated by Josh Weber

Salini – Groundwater issues – interests H, K both have to be available together

James – Groundwater – moving into the future it's going to be relevant to have solid data to have. Because of his role with the Deschutes – A is important, how is climate change going to impact quantity (drought), E and B because that is directly relevant to Deschutes (piping project and on-farm irrigation), annual budgets broad level if it can be more specific in the larger data set. He seconds anything about groundwater. It's a great list!

Group 4: Facilitated by Audrey Hatch

See Breakout session 1 above for some general notes.

Important questions called out in this session are in bold below.

a. What are the likely impacts of climate change on water quantity?

What areas of the state are most likely to be impacted by climate

What types of landscapes/habitats will be most affected

Impact of sea level rise

b. What are the annual budgets for surface water and groundwater?
    a. **Clarify: Forecasting flow; also consider Treatment; costs**

c. How much water is used in a watershed?

d. Can we show improvements in floodplain habitat and riparian vegetation restoration over time? Where is restoration most needed?

e. What infrastructure is there to direct and convey water?

f. What is the current condition of key water infrastructure?

g. What invasive species are there and where are they located?

h. Where and how can we design a system to allow for groundwater recharge?

i. Where are the priorities for restoring streamflows?

j. Where and when are instream flows being met, and where and when are they not?

k. What do we know about groundwater quality, and are there concerns?

l. What is the status of snow this year, and how will that affect water supplies?
    - **Forecasting; demands from different sectors;**
    - **Forecasting snow levels**

m. What are forecasted water demands from different sectors and regions?

n. What are current climate conditions in each sub-basin? [Federal data, USBOR]

<u>Group 5: Facilitated by Carrie Hertel</u>

Listed the groups under the questions they deemed important.

a. What are the likely impacts of climate change on water quantity?
    a. Ecotrust

b. What are the annual budgets for surface water and groundwater?

c. How much water is used in a watershed?
    a. Ecotrust

d. Can we show improvements in floodplain habitat and riparian vegetation restoration over time? Where is restoration most needed?

e. What infrastructure is there to direct and convey water?
    a. FCA
    b. DRC
f. What is the current condition of key water infrastructure?
    a. FCA
    b. Ecotrust
g. What invasive species are there and where are they located?
h. Where and how can we design a system to allow for groundwater recharge?
    a. Ecotrust
i. Where are the priorities for restoring streamflows?
    a. DRC
j. Where and when are instream flows being met, and where and when are they not?
    a. DRC
k. What do we know about groundwater quality, and are there concerns?
    a. Ecotrust
l. What is the status of snow this year, and how will that affect water supplies?
    a. FCA
    b. DRC
m. What are forecasted water demands from different sectors and regions?
    a. FCA
    b. DRC
n. What are current climate conditions in each sub-basin? [Federal data, USBOR]
o. What infrastructure is owned by and by who? (FCA) (DRC)
    a. What canals or head gates are owned by agencies or groups.
    b. Sometimes from the district, sometimes reclamation agency, historic maps, system plans
p. Where are harmful algae blooms occurring and why? (City of Hillsboro JWC)
q. What are the infrastructure and water quality impacts of wildfires? (City of Hillsboro JWC)
r. What is affecting drinking water quality?
s. Who owns a watershed and what is it used for?
t. Habitat quality
u. What communities (who, economic background) are being impacted, related drinking watershed?

FCA – it would help with broad basin projects and linking projects together

Session Participants

The below individuals registered with Zoom to join the listening session but may or may not have attended all parts.

First Name	Last Name	Email	Organization
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OWDP Users Listening Session Notes

10/12/2022; 1pm – 4pm Pacific
Complied by Carrie Hertel

Team:

- Valerie Thompson, DEQ (Presenter/Facilitator; Breakout Facilitator)
- Josh Weber, DEQ (Presenter; Breakout Facilitator)
- Ben Scandella, WRD (Presenter; Breakout Facilitator)
- Audrey Hatch, OWEB (Presenter; Breakout Facilitator)
- Carrie Hertel, OSU (Notes/Logistics; Breakout Facilitator)
- Michele Martin, DEQ (Notes/Logistics)
- Tina Brown, DEQ (Zoom Admin)

Attendees maxed at 24 briefly. 18-20 were typical.

These notes are intended to capture notes from various team members in the general session. Formatted as follows:

- General Session Notes
- Breakout Session 1
- Breakout Session 2
- Registered Participants

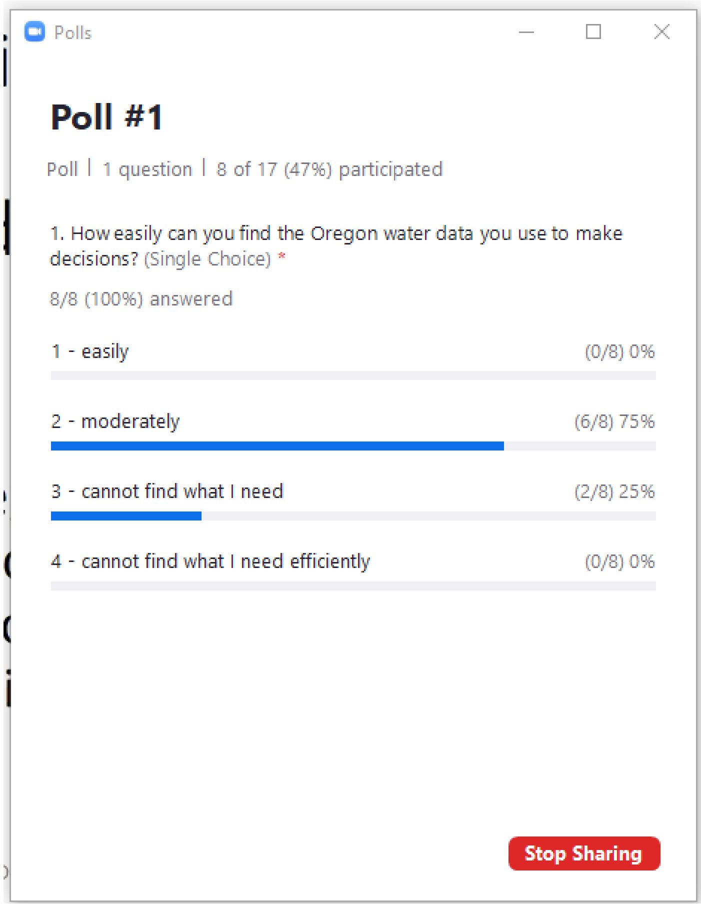
Chat will be interspersed to allow context and in *italics.*

Pre-Session Note:
From Jennifer Bayer, PNAMP Coordinator, via email: I am looking forward to your meeting next week. I took a quick look at the sample questions you offer in the prep materials...looks pretty thorough! just FYI, here are the questions we landed on in a PNAMP project a few years back link here as part of the Regional Habitat Indicators Project. We stalled out when we got to the implementation part ☺ I am glad to see you are making great progress!

General Session Notes

1:05 pm – Session Started

Poll question and responses below:



12:59:07 From Trina Brown, DEQ To Everyone(in Waiting Room):
Good Afternoon, we will be starting the meeting soon.

13:03:08 From Michele Martin, DEQ To Everyone:
Still waiting for others to join.

1:14 pm – Started Slide 6

1:17 pm – Started Slide 8

Caylin Barter (Wild Salmon Center) - Wondered why ODFW is not in this core team.

- Josh talked about the SME team. There are more agencies involved than who is managing this listening session

  13:25:52 From April Snell, OWRC To Everyone:
  While I agree with Caylin's observation about ODFW, is it not correct that info about instream water rights, etc is provided through OWRD?

  13:28:34 From Valerie Thompson To Everyone:
  Hi April - We will get to your question in a few moments - thank you!

- Ben – some nuance to evaluate in-steam water rights – may not have everything available for OWRD, but yes, it's OWRD that does in-steam water rights

1:27 pm – Started Slide 10

13:30:38 From Rebecca McCoun - ODF To Everyone:
ODF is also on SME

1:32 pm – Started Slide 12

13:35:22 From Ken Bierly (retired) To Everyone:
Is the inventory available anywhere?

- Josh - Inventory is in draft but doesn't see a reason we can't share it when completed. Talked about the sources for this inventory.
- Audrey said it seems reasonable to make it available but view it as a work in progress. The work is happening in parallel with this planning work. Also, for prioritization and use of the inventory, the SME team is working on making it useful and relevant.
- Ben, while we are refining the inventory of data sets and evaluating it for its readiness and value for the OWDP. Ben mentioned Open Data Standards and shared a link. Talked about readiness means something different in the context of an Open Data Portal vs. Water Data Portal.

13:39:30 From Ben Scandella, OWRD (he/him) To Everyone:
The Oregon Open Data Portal has posted an initial inventory
https://data.oregon.gov/Administrative/State-of-Oregon-Agency-Data-Inventory/yp9j-pm7w

1:43 pm – Started Slide 16

Owen McMurtey (GSI Water Solutions) – primary works with water rights data with WRD. Will that be contained separately using the WRD or replacing the WRD tools.

- Ben - this will be in addition. All existing WRD tools will remain available.

1:47 pm – **Started Concerns**

Owen McMurtey (GSI Water Solutions) – asked about maintaining portals from different agencies and concerned about losing those resources because they are easy to use. If the data has already been generated – is there an additional administration burden to modify the data for the portal, then maybe the data maintenance falls onto the agency already managing the agency portal? Some of the data currently is low quality – and if going into one portal, using a geospatial tool, there could be an overwhelming amount of data that could not be useful and low quality. You could have people getting different answers using different data sets from a single portal, vs. lower quality from getting data from another portal. You want to end up with the same quality no matter where you go to get the data. Offering quantity vs. quality of data is an issue. Concern about additional administrative burden about doing additional quality control.

- Ben - Owen touched on the core challenges to this portal.
- Josh - this is a complex project and Owen hit on one of the complexities. Its likely to get different answers from different data. Can you identify they are the same data sets when you get them from different.
- Josh - the state has to be responsible with its data.
- Ben - sensitive that the quality control is limited and could see the point about resources. First, the data portal will use the pilot and that data is ready to go. After that, there will be more work to answer questions. We want to know those questions now to start conversations with agencies to talk about resources and anticipates that additional resources will need to be added rather than taking away from current projects.

Caylin Barter (Wild Salmon Center) - WRD has a data set for water makers (whiskey?), is that planned to be in the pilot? Can't remember the name of the DB

- Ben - a few databases are out there. The ones he can think of would not be ready for the data portal. There is some sensitive data in those datasets and will take further conversation. What questions you have can help us identify.
- Caylin – use case example, when a water right holder – trying to assess the usability of the water right – the way that a water right for or against in reality – you can't discern that risk from the information we have now. Being able to see regulation and distribution – where those water rights belong – if there is a way to dedicate a portion of those flows to fish? That is the type of information that would be helpful. How does water actually flow through the landscape?
- Ben wants to follow up on this use case.

13:59:58 From April Snell, OWRC To Everyone:
WRIS, I think, but I like whiskey better ;)
14:08:40 From Caylin Barter, WSC To Everyone:
Ben -- isn't it called WISKI or WISCI or something like that?

14:10:39 From Mellony Hoskinson (OWRD) To Everyone:
Caylin - we do have a WISKI database that is used by our hydrographics group to develop rating curves for gages

14:11:06 From Caylin Barter, WSC To Everyone:
THAT is the one! Thanks Mellony!

14:11:20 From Mellony Hoskinson (OWRD) To Everyone:
I know there is types of data in there, but I am not an expert in that specific area.

14:11:32 From Mellony Hoskinson (OWRD) To Everyone:
other types of data

Caylin Barter – she is super excited about this opportunity and the vision. Goes to many different sources of truth in her work. Questioned whether there needs to be legislation to implement this project or policy changes or proposals to go with this project? Wants to make sure this important work will continue.

- Josh – directed to prepare a package for the next legislative session. Stages 1-3 are as far as we can see given the speed of technology changes, but there is more work out there. Legislature has asked us what we need specifically. Four pieces of package: why we need it and what we expect it to do, plan for how we go about doing that, request for funds and permission to spend. IoW is working on these nationally and we partnered with them. As we examine the situations and get into the weeds there is a possibility we need more legislative assistance that may not be funding. Right now, we feel we just need the funds and permission to do it.

2:09 pm – **Started Benefits**

Owen McMurtrey – If I want to find information on a particular water well, construction information I can link the well ID to a site ID in the groundwater information database and quality OHA database maybe based on their unique identify and if water streams, then to DEQ using a bunch of different databases; to use one unique ID would be extremely useful – maps with unique IDs that would show us all of that information using one ID.

- Audrey - agreed people maybe looking for data in many places today.

Zachary Mallon – I use a lot of water data to write grants – interested in fish distribution and water quality data and recorded in previous activities that took place on the landscape and climate change current and past and a lot of reasoning for our project designs etc. not having to go to the online maps and then going to the wrong one is very challenging. I've been doing this for a long time, but if I didn't have to have that time to learn where to look it would be easier in the future.

Caylin Barter – struck by the folks that are weighing in on the call spending time in the trenches to navigate different interfaces; I'm looking to make our water more transparent, accessible, and useful and if this can account for the different use cases and expertise of people who have water experience across Oregon – 99% of the people you talk with don't have any information about water and with more extreme events it's incumbent on the state to know more about water in the state. Bring more people into the conversation and grow the set of users who can access this data.

- Ben - can you share this with the legislature in January? 😊 Caylin – yes!

Audrey – from the other listening session – others said that climate change conversation across the state would be useful to have the portal.

Valerie asked for infrastructure folks if there are any. Brought up how the portal is also charged to provide data.

Ben asked about what people consider water infrastructure.

> *14:18:46 From Caylin Barter, WSC To Everyone:*
> *natural and built infrastructure, right?*

- Valerie – yes, both natural and built are in scope

14:19:15 From Zachary Mallon (He/Him) Lower Nehalem Watershed Council To Everyone:
Tide gates

14:19:38 From Louis Sweeny (Indp Consult) To Everyone:
Would drinking water infrastructure be in scope?

- Valerie – yes, OHA is a partner.

14:20:08 From Caylin Barter, WSC To Everyone:
floodplains, wetlands, source water areas?

14:20:11 From Janine Salwasser, INR To Everyone:
The water action plans developed by each of the place-based planning group should have prioritized data needs identified to address their action plans, condition of infrastructure was one highlighted in the Mid-Coast Water Action Plan.

14:21:25 From Janine Salwasser, INR To Everyone:
Unfortunately it's a big data gap, and will likely not be addressed in stage 1

- Ben and Valerie responded to Janine's comment – A Mid Coast representative was in the previous session on 10/6.

14:21:52 From Rachel O'Connor, EDF To Everyone:
In addition to NHD, are you considering bringing in data from federal agencies (geospatial or otherwise)?

- Ben – answer Rachel's question. A number of federal agencies will be critical to answering some of the questions. Our charge was to focus first on state databases, but it would help us to know now, if there are critical federal data sets or questions that rely on data sets if you would prioritize that data especially for the pilot. I can't promise that now, but we are open to feedback.
- Josh Weber – not an expert of every data set, but its pretty clear to him that the interaction between the state and federal data can't be ignored. Federal data often paints a background onto which we paint the state data to know what is going on.

14:24:42 From Rachel O'Connor, EDF To Everyone:
Thanks!

14:24:48 From Caylin Barter, WSC To Everyone:
CA included in phase 2 of its platform water-related data from USBR, USFWS, NOAA, USGS, and USFS

<u>2:25 - 2:35 pm – Break</u>

<u>2:42 pm - Started Breakout 1</u>

3:03 pm - Ended Breakout 1

Breakout 1 review with full group (see section below for individual breakout session notes)

Ben – his breakout group connected data with projects that are working and data doesn't remain the obstacle.

3:07 pm - Ended Breakout 1 Group Discussion

Skipped 5 min break

3:09 pm – Started Breakout 2

Kimberly Nelson (True Elements) – this is a natural evolution to taking data and turning it into useful information from the effort for open government 20 years ago. Also, models may be useful, but be careful because the models could be biased or more conservative or less conservative and those models would make sense to allow the user to control the parameters so they can create more or less conservative models vs. one model.

- Audrey Hatch – e.g., creating climate models; context around the use case "all models are wrong, but some are useful"

- Ben Scandella – Kimberly, ties to a model about how we deal with uncertainty. Some may be bias, or unbiased. There is a trade off on complexity e.g., what can a high schooler get vs. a different level of detail that we offer to a consultant who is visiting the website for the 100th time and has more education about uncertainty. No answers yet.

- Dana Kurtz – appreciate about what to include and what not to include. I think about the ones that do a good job, but the ones that give you the highest level of data – but you have to grab around a lot to find quality data and some are voluntary vs. NOAA – so being able to filter out the levels: State sponsored data sets – that are run by the department, but here is the data that the agency may not be responsible for. Filters: States, Sponsored (gauges run by department), data from others (maybe a disclaimer). If you don't have a lot of data you are going to dig for that lower quality data to get more anyways.

Jen Bayer – meta data – about representing different quality of data and some are going to be better than others and being able to describe how data were collected. Thorough methods and also physical design of the water collection data and if the methods change over time, the portal should reflect that. But if you grab the data sets without knowing the method, then it becomes a problem.

- Louis Sweeny – derived from the meta data conversation. People hunting for data as people begin to cite the data they are using and it would give a lot of information about where to close to the loop for funding preproposals, a use case may be where the data is coming from.

  15:29:39 From Caylin Barter, WSC To Everyone:
  Thanks Team Water Data Portal! I have to head to my next meeting -- looking forward to staying in touch about next steps.

  15:39:16 From Dana Kurtz To Everyone:

could also provide a link to other people's meta data describing how they collected it

Josh Weber (DEQ) – impressed with those who decided to have 2 different sessions and forecast the type of feedback we would get from each of them. This feedback was more user feedback and detailed (not political), talked about meta data here. This is a very broad and very complex project. We aren't going to be able to just turn it on and have all the data. It's going to take 10 years. Thank you very much for your feedback.

15:46:06 From Kimberly Nelson To Everyone:
Thank you. Well done!

15:46:18 From Dana Kurtz To Everyone:
Thanks - I am excited about this!

<u>3:46 pm - Ended</u>

Breakout Session 1

<u>Group 1: Facilitated by Ben Scandella</u>

Rachel O'Connor, EDF – C, H, I, and B

Owen McMurtrey – maybe not the most valuable use case, which is more about linking data with water quantity with quality and where there are two different agencies where they would interact. Offering it together on a single map with one identifier would be helpful What are the major sources of water for human use?

Janine Salwasser, INR – a simple way to visualize the water budget. What water is going in and out, evaporation, different resources. Most people don't even understand water that is available in the state at that point in time and where it's not going to be available. (F) having a system to bring that in on a map and monitoring and what is that need.

Dana Kurtz (Upper Grand Ronde River Watershed) – I wish this was available when we started. Having it all in one place. Struggle with water gauges – some of them are maintained by several agencies and some are not and they are not quality gauges. Our group would prioritize the combination of B and ? And I agree with most of the other ones that others said, plus D. Grand Ronde has experienced a lot of flooding and it brought a whole bunch of people into the group, flood monitoring strategies, because the FEMA information is hard to match it all up. F – monitoring. Who is collecting data, how it's being collected. Continuous or grab data. How reliable are these data sets bring used to make decisions. Hard to conceptualize a lot of different data and pull it together. With the project prioritization – where restoration has occurred. Several orgs have monitored that in their databases.

14:56:30 From Owen McMurtrey To Everyone:

I agree with Dana that d. and f. are good examples of something that can be answered with existing datasets but would be made much easier by having them together in a single spatial portal.

Zachary Mallon – who, what, how, and where to get those questions consolidated into one location. Try to show where we are replicating efforts e.g., monitoring sites. Glaring omission from the priorities – first question for me is water resource and management questions. Fish distribution maps. ODFW and ODA maps are not the same. Cross comparing and QA/QC to align the sets of maps would be good to have one dataset for these agencies. How is water quality in terms of what species that are using it. Which aquatic species are using what water and where – is an important question to address.

14:58:29 From Dana Kurtz To Everyone:
maybe not for the pilot project, but it would be nice if people who wanted to deploy a new monitoring device (logger etc) would need to register it on this data portal (and provide their contact info) to reduce redundant measurements (could be a requirement of OWEB funding or DSL permits etc)

15:03:12 From Zachary Mallon (He/Him) Lower Nehalem Watershed Council To Everyone:
being able to just put loggers in for project specific things is helpful too

Dana Kurtz - Natural reservoir consider levy set backs and dredging and areas of state ditches, natural restoration projects, flood protection, habitat restoration and protection of people. NRCS soil map – incorporate that information.

<u>Group 2: Facilitated by Audrey Hatch</u>

Breakout Session 1: Among the example questions that could be answered using available data sets, which ones are most important?

Participants: Jen Bayer, USGS; Mellony, WRD; April Snell, OWRC

Jen, USGS – PNAMP identified more narrowly focused set of questions; questions presented here are very broad (note*, there was a similar issue raised in breakout from October 6th by a couple of participants). Also notes:

- Question d – natural hazards should include predicted future hazards but also known current hazards, like active landslides
- Need to include information/mapping that will result from private forest accords
- Fish distribution mapping
- H, c, and i are priorities
- Where are surface/groundwater interactions known to occur

Mellony, WRD – OpenET framework is still in development, but should be included; how to incorporate tools like this that also use data, housed/created by outside entity

April, OWRC – irrigation district data is important to include but is not included in state systems; annual use data is reported, but not always specific to locations; data presentation needs to be user friendly. Also notes:

- Bureau of Rec Hydromet system should be included and expanded beyond Bureau of Rec operated systems to indicate availability of water in more reservoirs
- Focus on natural and built infrastructure

Important questions called out are in **bold**.

a. What are the major sources of water for human use (which streams, lakes, springs, etc.)?
b. What are historic flow rates on measured streams?
c. Where and when is surface water available for further allocation?
d. What natural hazards could affect water supplies?
    - **Additional information: Landslide data; location information**
e. **Where** are there dams and reservoirs, and how much water do they store?
f. How and where is water being monitored?
g. What do we know about surface water quality, and are there concerns?
h. Where are groundwater levels declining?
i. Where are there concerns about groundwater supply and future development?
j. Where have watershed restoration projects occurred?
k. Where are floodplains (habitat distribution), and where have floodplain restoration projects happened?
l. Where are the riparian areas in the planning unit?
m. Where does infrastructure restrict the flow of water in a river or the movement of fish?
n. What is the land ownership and use in this area?
o. What are the watershed and administrative boundaries?
p. Other:____________________
    - **To help determine amount of water in reservoir: BOR Hydromet Teacup diagrams of current levels of reservoirs: Available now, would help integrate into state hub; could expand**
    - **See also CA: Cal Fish and Game; many Fed Datasets included**
    - **PFA Implementation will result in some newly available data: steep slopes;**
    - **See list of PNAMP Management questions: are flows adequate for native species? Appropriate for "normal" hydrological regime? Do stream temps support native fish; how are macroinvertebrates indicating**

- **How are current flows supporting/not supporting fish at their different stages of life cycles? What areas indicate consistent failure of flows to meet instream water rights? Where are established records of native fish; compare with overlay of water rights**

Data/information not quite ready for pilot but should be considered in future:

- Surface water/groundwater interactions
- Open ET/Satellie information: dataset still in development; WRD discussing the potential to include this type of information; next phase?
- Irrigation district data, not readily available statewide through any portal/repository; must be user friendly; invest in data collection and management as well

Breakout Group 2

Group 1: Facilitated by Ben Scandella

Caylin – A, B, I, J, M

Question: Tack onto B a basin level rather than state level.

15:12:53 From April Snell to Everyone:
a, f, m, n

April Snell - A, F, M, N

• Many of these things are important. What is realistic that the state agencies can build upon instead of things where we don't have anything.

• Impacts climate change and water quantity and how do we collaborate projects to help stretch the water. Gap between the data and activities on the ground. More information on infrastructure is communities, drinking water, waste water, streams and rivers themselves. Know a lot about municipal water demand but less about other areas.

15:13:32 From Owen McMurtrey to Everyone:
b and l

Owen McMurtrey - B , I

He has been trying to figure out the correlation between Snow pack and different streams. Even lower quality snow pack data could be helpful in missing locations. Or gathering from private actors (like ski resorts which is not in the federal system now). New groundwater allocation rules; water budgets.

Ben mentioned an academic project collecting snow depth with citizen science, with significant quality control.

Janine Salwasser – A, B (make sure it is easy to understand, over time and visualizations; water year and growing season), F (to inform future investments into the highest priority infrastructure improvements) Digitize water districts.

15:17:12 From Zachary Mallon (He/Him) Lower Nehalem Watershed Council to Everyone:
A (also water quality), D, F (and it should include green infrastructure), Bonus - Sea level rise for coastal communities.

Zach Mallon - Any of that all needs to be brought in with a chance of a subduction earthquake and how far it will fall.

Ben acknowledged Sea water IS water and that is a great point.

Ben asked if there more questions we should add.

Caylin – Regional Water Planning and Management workgroup; getting to a point where we can provide regions; current and future water supplies and current and future water demand and the delta between is critical. Surface and Groundwater

Janine – Linkage to the plans and implementation actions that these groups are doing on the ground. Being intentional. Prioritize at the local level, priorities of the state level. Linking it to the intentions.

Ben wants to read a bit more about the Mid Coast and maybe follow up with them (Jannie and Caylin)

15:12:53 From April Snell to Everyone:
a, f, m, n

15:13:32 From Owen McMurtrey to Everyone:
b and l

15:17:12 From Zachary Mallon (He/Him) Lower Nehalem Watershed Council to Everyone:
A (also water quality), D, F (and it should include green infrastructure), Bonus - Sea level rise for coastal communities.

Group 2: Facilitated by Audrey Hatch

Breakout session 2: Among the questions that require additional data collection and/or management to answer, which ones are most important? In your breakout group, identify and discuss priority questions.

Participants: USGS, ODF, WRD, Dana Kurtz

Dana – priorities are a, b, j. Also notes:

- How to account for climate, would be interested in having information to support grant applications that ask these types of questions

- Being able to compare water availability information across measurements and flow rates (e.g., acre feet, GPM, etc.)
- Include information tax lots, land use codes, zoning
- Mapping invasive species presence
- Include DEQ's facility profiler information as overlay
- Natural vs built storage options
- Snowpack forecasts, actual and historic data
- Inventory of currently available datasets would be useful to see

Jen, USGS – c is a priority, measuring improvements from restoration. Also notes:

- need to know where restoration is most needed and where there are priority locations to restore instream flows.
- Data gets broader as questions get broader
- Identifying priority data tools as well as data sets
- Accounting for data quality levels
- Using metadata to help with QA/QC, description of original research design and approach/goals, collection methods; need to know how/why data was collected in order to understand whether it is applicable to other uses

a. **What are the likely impacts of climate change on water quantity?**
    - **Climate:**
        i. **to help answer questions about project planning such as How are you taking climate impacts into consideration?**
    - **"Planning a floodplain reconnection project…"**
        i. **Compare natural/built storage; how much water is stored in a system, looking at both types of infrastructure**

b. **What are the annual budgets for surface water and groundwater?**

c. **How much water is used in a watershed?**

d. Can we show improvements in floodplain habitat and riparian vegetation restoration over time? Where is restoration most needed?

e. What infrastructure is there to direct and convey water?

f. What is the current condition of key water infrastructure?

g. **What invasive species are there and where are they located?**

h. Where and how can we design a system to allow for groundwater recharge?

i. Where are the priorities for restoring streamflows?

j. **Where and when are instream flows being met, and where and when are they not?**

k. What do we know about groundwater quality, and are there concerns?

l. **What is the status of snow this year, and how will that affect water supplies?**

m. What are forecasted water demands from different sectors and regions?

n. What are current climate conditions in each sub-basin? [Federal data, USBOR]

How to help the Water data portal be more useful:

- Guidance around water quantity units conversion so that all are using the same units; Tool where information can be
- Include tax lots, land use codes; help interpret codes (i.e. to determine if an activity or project is allowed, in a given area)
- Help find consistent ways to measure improvements resulting from restoration projects

Observation:
As questions increase in complexity, the need for QA/QC and data integration will also increase in complexity. Some data resources will be different (new), i.e. documents/imagery; climate models; standards may not yet be in place
Climate lens:
Will be useful in future
Challenges finding standardized information; challenges especially with use of models
Clarification: What level of prepared reports will be provided?

Session Participants

The below individuals registered with Zoom to join the listening session by may or may not have attended all parts.

First Name	Last Name	Email	Organization
Ken	Bierly	bierlykenneth@gmail.com	Bierly & Associates LLC
Josh	Weber	joshua.weber@deq.state.or.us	DEQ
Trina	Brown	trina.brown@deq.oregon.gov	DEQ
Rachel	O'Connor	roconnor@edf.org	Environmental Defense Fund
Breanne	Howard	breannehoward@google.com	Google
Marshall	Coba	marshall@cobacompany.com	Google Cloud
Ronan	Igloria	rigloria@gsiws.com	GSI Water Solutions, Inc.
Owen	McMurtrey	omcmurtrey@gsiws.com	GSI Water Solutions, Inc.
Janine	Salwasser	janine.salwasser@oregonstate.edu	INR
Zachary	Mallon	zac@nehalemwatershed.org	Lower Nehalem Watershed Council
Louis	Sweeny	louis.sweeny@gmail.com	LSC
Christina	Higby	christina.higby@oda.oregon.gov	ODA
Rebecca	McCoun	rebecca.l.mccoun@odf.oregon.gov	Oregon Department of Forestry
Valerie	Thompson	valerie.thompson@deq.oregon.gov	Oregon DEQ
Lauren	Poor	lauren@oregonfb.org	Oregon Farm Bureau
Carrie	Hertel	Carrie.Hertel@oregonstate.edu	Oregon State University
Myrica	McCune	myrica.mccune@oregonstate.edu	Oregon State University
April	Snell	aprils@owrc.org	Oregon Water Resources Congress
Ben	Scandella	Benjamin.P.Scandella@water.oregon.gov	Oregon Water Resources Department
Mellony	Hoskinson	mellony.d.hoskinson@water.oregon.gov	Oregon Water Resources Department
Ken	Fetcho	ken.fetcho@oweb.oregon.gov	OWEB
Audrey	Hatch	audrey.hatch@oweb.oregon.gov	OWEB
Brent	Stevenson	brents@santiamwater.com	Santiam Water Control District
Kimberly	Nelson	kimnels@hotmail.com	True Elements
Dana	Kurtz	dkurtz@andersonperry.com	Upper Grande Ronde River Watershed Partnership
Jen	Bayer	jbayer@usgs.gov	USGS/PNAMP
Caylin	Barter	cbarter@wildsalmoncenter.org	Wild Salmon Center

Oregon Water Data Portal Listening Sessions, October 6 & 12, 2022

Emailed survey to participants on October 21, 2022. Surveys were due November 4, 2022

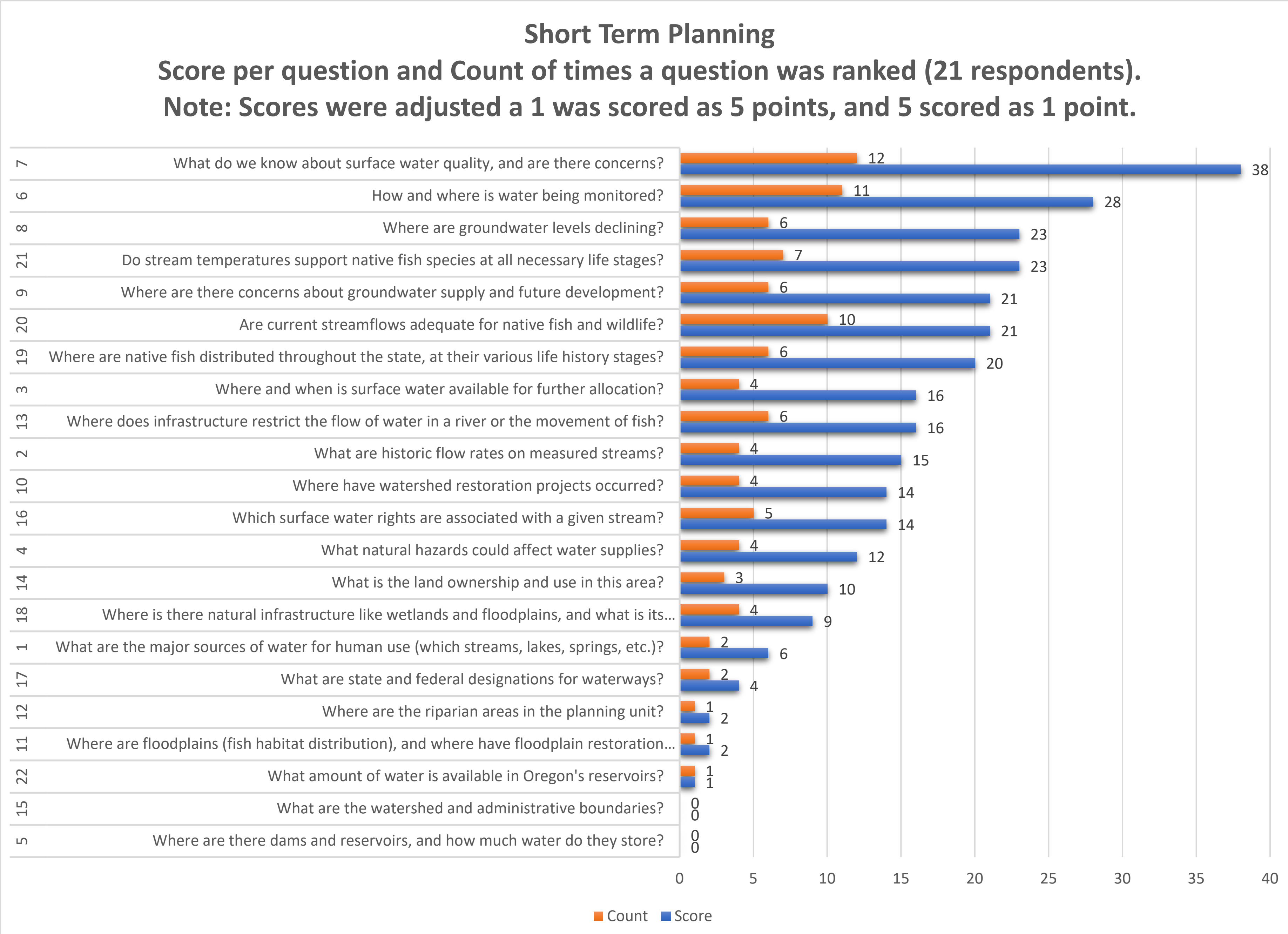
Survey Respondents

Name	Organization	Email	Category	Other Category	Session Attended
Claire Ruffing	The Nature Conservancy in Oregon	claire.ruffing@tnc.org	Conservation		Assoc.
Anita Panko	City of Salem	ampanko@cityofsalem.net	Local Government		
Noah Dolinajec	Necanicum Watershed Council	executivedirector@necanicumwatershed.org	Conservation		
Tim Wigington	The Freshwater Trust	tim@thefreshwatertrust.org	Conservation		Assoc.
Ally Steinmetz	Middle Deschutes Watershed Council	coordinator@middledeschuteswc.org	Conservation		
Rosemary Pazdral	Siuslaw Watershed Council	coordinator@siuslaw.org	Conservation		
Miranda Gray	South Coast Watershed Council	miranda.gray@currywatersheds.org	Other	Watershed Restoration and Education	
Kelly Timchak	Curry Watersheds Partnership	kelly@currywatersheds.org	Conservation		
Jocelyn Tutak	Ecotrust	jtutak@ecotrust.org	Other	We are a non-profit involved in ag, conservation, env. justice, and forestry. We also do consulting work.	Assoc.
Jen Bayer	Pacific Northwest Aquatic Monitoring Partnership	jbayer@usgs.gov	Other	Regional Partnership	User
Peggy Lynch (she/her)	League of Women Voters of Oregon	peggylynchor@gmail.com	Other	Multiple areas/Public Process	Assoc.
Johnny Leavy	City of Medford	johnny.leavy@cityofmedford.org	Utilities/Services		
Susie Smith	Oregon Association of Clean Water Agencies (ACWA)	smith@oracwa.org	Utilities/Services		Assoc.
Owen McMurtrey	GSI Water Solutions - Water Rights Practice	omcmurtrey@gsiws.com	Consulting		User
Zachary Mallon	Lower Nehalem Watershed Council	zac@nehalemwatershed.org	Conservation		Assoc.
Margaret Magruder	Columbia County	margaret.magruder@columbiacountyor.gov	Local Government		Assoc.

Shannon Richardson	South Santiam Watershed Council	s.richardson.sswc@gmail.com	Conservation		
Bill Lehman	Klamath Watershed Partnership	Blehman@klamathpartnership.org	Conservation		
Ken Bierly	Harney Basin Community-Based Water Planning Collaborative	bierlykenneth@gmail.com	Consulting		User
James Fraser	Trout Unlimited	james.fraser@tu.org	Conservation		Association
Rebecca McCoun	Oregon Department of Forestry	rebecca.l.mccoun@odf.oregon.gov	Forestry		User

Ranking 1:

Below is a list of questions that could likely be answered using available data sets. Please select the top five questions that you think are most important from the list and rank those five questions from one to five, with one being the most important and five being the least important. If there are questions that are not listed here that you would include in your top five, please write your question/s in the space provided at the bottom of the list and rank them 1-5. - What are the major sources of water for human use (which streams, lakes, springs, etc.)?


Short Term Planning
Score per question and Count of times a question was ranked (21 respondents).
Note: Scores were adjusted a 1 was scored as 5 points, and 5 scored as 1 point.
7 What do we know about surface water quality, and are there concerns?
12
38
6 How and where is water being monitored?
11
28
8 Where are groundwater levels declining?
6
23
21 Do stream temperatures support native fish species at all necessary life stages?
7
23
9 Where are there concerns about groundwater supply and future development?
6
21
20 Are current streamflows adequate for native fish and wildlife?
10
21
19 Where are native fish distributed throughout the state, at their various life history stages?
6
20
3 Where and when is surface water available for further allocation?
4
16
13 Where does infrastructure restrict the flow of water in a river or the movement of fish?
6
16
2 What are historic flow rates on measured streams?
4
15
10 Where have watershed restoration projects occurred?
4
14
16 Which surface water rights are associated with a given stream?
5
14
4 What natural hazards could affect water supplies?
4
12
14 What is the land ownership and use in this area?
3
10
18 Where is there natural infrastructure like wetlands and floodplains, and what is its...
4
9
1 What are the major sources of water for human use (which streams, lakes, springs, etc.)?
2
6
17 What are state and federal designations for waterways?
2
4
12 Where are the riparian areas in the planning unit?
1
2
11 Where are floodplains (fish habitat distribution), and where have floodplain restoration...
1
2
22 What amount of water is available in Oregon's reservoirs?
1
1
15 What are the watershed and administrative boundaries?
0
0
5 Where are there dams and reservoirs, and how much water do they store?
0
0
0
5
10
15
20
25
30
35
40
Count
Score

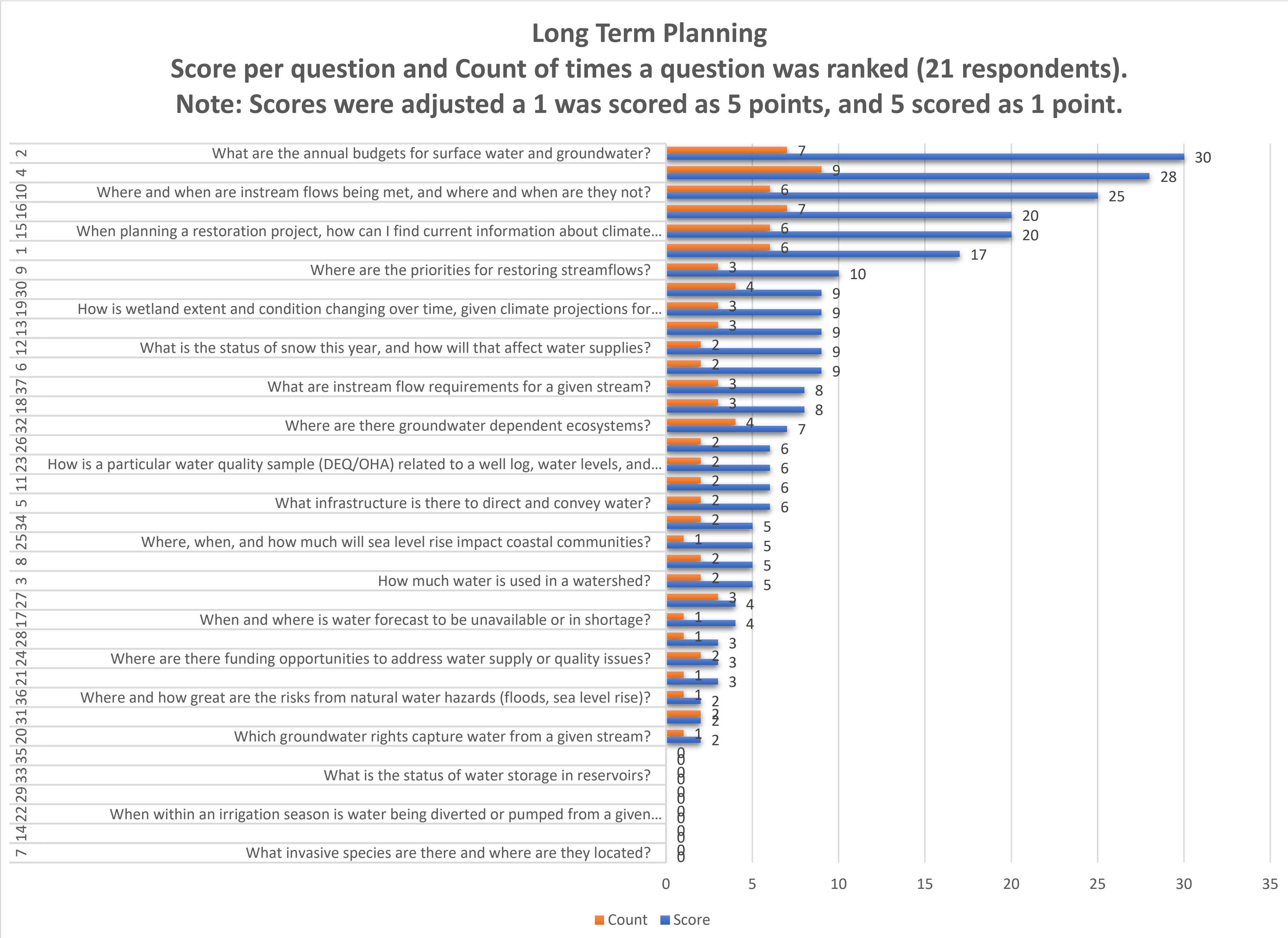
Scores per Question by Self Identified Category - Short Term Planning
What do we know about surface water quality, and are there concerns?
How and where is water being monitored?
Do stream temperatures support native fish species at all necessary life stages?
Where are groundwater levels declining?
Are current streamflows adequate for native fish and wildlife?
Where are there concerns about groundwater supply and future development?
Where are native fish distributed throughout the state, at their various life history...
Where does infrastructure restrict the flow of water in a river or the movement of...
Where and when is surface water available for further allocation?
What are historic flow rates on measured streams?
Which surface water rights are associated with a given stream?
Where have watershed restoration projects occurred?
What natural hazards could affect water supplies?
What is the land ownership and use in this area?
Where is there natural infrastructure like wetlands and floodplains, and what is its...
What are the major sources of water for human use (which streams, lakes, springs,...
What are state and federal designations for waterways?
Where are the riparian areas in the planning unit?
Where are floodplains (fish habitat distribution), and where have floodplain...
What amount of water is available in Oregon's reservoirs?
What are the watershed and administrative boundaries?
Where are there dams and reservoirs, and how much water do they store?
0
5
10
15
20
25
30
35
40
Conservation
Consulting
Forestry
Local Government
Utilities/Services
Other

Additional Questions:

- Where are the greatest influences of non-point source discharges?

Ranking 2:

Below is a list of questions that could likely be answered using data sets that will be available in Stage 3 of the Water Data Portal. These questions may rely on data sets that either don't exist yet or aren't in a core data system. Please select the top five questions that you think are most important from the list and rank those five questions from one to five, with one being the most important and five being the least important. If there are questions that are not listed here that you would include in your top five, please write your question/s in the space provided at the bottom of the list and rank them 1-5



Long Term Planning
Score per question and Count of times a question was ranked (21 respondents).
Note: Scores were adjusted a 1 was scored as 5 points, and 5 scored as 1 point.
2 What are the annual budgets for surface water and groundwater? 7 30
4 9 28
10 Where and when are instream flows being met, and where and when are they not? 6 25
16 7 20
15 When planning a restoration project, how can I find current information about climate... 6 20
1 6 17
9 Where are the priorities for restoring streamflows? 3 10
30 4 9
19 How is wetland extent and condition changing over time, given climate projections for... 3 9
13 3 9
12 What is the status of snow this year, and how will that affect water supplies? 2 9
6 2 9
37 What are instream flow requirements for a given stream? 3 8
18 3 8
32 Where are there groundwater dependent ecosystems? 4 7
26 2 6
23 How is a particular water quality sample (DEQ/OHA) related to a well log, water levels, and... 2 6
11 2 6
5 What infrastructure is there to direct and convey water? 2 6
34 2 5
25 Where, when, and how much will sea level rise impact coastal communities? 1 5
8 2 5
3 How much water is used in a watershed? 2 5
27 3 4
17 When and where is water forecast to be unavailable or in shortage? 1 4
28 1 3
24 Where are there funding opportunities to address water supply or quality issues? 2 3
21 1 3
36 Where and how great are the risks from natural water hazards (floods, sea level rise)? 1 2
31 2 2
20 Which groundwater rights capture water from a given stream? 1 2
35 0 0
33 What is the status of water storage in reservoirs? 0 0
29 0 0
22 When within an irrigation season is water being diverted or pumped from a given... 0 0
14 0 0
7 What invasive species are there and where are they located? 0 0
0 5 10 15 20 25 30 35
Count Score


Scores per Question by Self Identified Category - Long Term Planning
What are the annual budgets for surface water and groundwater?
Can we show improvements in floodplain habitat and riparian vegetation restoration over...
Where and when are instream flows being met, and where and when are they not?
What are the likely impacts of climate change on water quantity?
When planning a restoration project, how can I find current information about climate...
What are the likely impacts of climate change on water quantity?
Where are the priorities for restoring streamflows?
How much uncertainty is associated with the data and information presented through the...
How is wetland extent and condition changing over time, given climate projections for...
What are forecasted water demands from different sectors and regions?
What is the status of snow this year, and how will that affect water supplies?
What is the current condition of key water infrastructure?
What are instream flow requirements for a given stream?
When planning a floodplain restoration project, how much water is stored in a system,...
Where are there groundwater dependent ecosystems?
Which fish species are observed in different water bodies in different months, and with...
How is a particular water quality sample (DEQ/OHA) related to a well log, water levels, and...
What do we know about groundwater quality, and are there concerns?
What infrastructure is there to direct and convey water?
What land use data and zoning rules exist in a given area?
Where, when, and how much will sea level rise impact coastal communities?
Where and how can we design a system to allow for groundwater recharge?
How much water is used in a watershed?
When and where is water forecast to be unavailable or in shortage?
When and where is water forecast to be unavailable or in shortage?
Where are there funding opportunities to address water supply or quality issues?
Where are there funding opportunities to address water supply or quality issues?
When and how often is a given water right regulated off in favor of a senior right?
Where and how great are the risks from natural water hazards (floods, sea level rise)?
Where are surface water and groundwater known to interact?
Which groundwater rights capture water from a given stream?
Where are invasive species? How long have they been observed there?
What is the status of water storage in reservoirs?
Where, when, and how much will sea level rise impact coastal communities?
When within an irrigation season is water being diverted or pumped from a given watershed?
What are current climate conditions in each sub-basin?
What invasive species are there and where are they located?
0
5
10
15
20
25
30
35
Conservation
Consulting
Forestry
Local Government
Utilities/Services
Other

Additional Questions:

None added.

Please describe any general concerns that you have with the development of a Water Data Portal that were not yet already shared during a listening session.

- Ease of use, data origin, misuse of data, and accessibility.
- "This survey is impossible to answer--too many choices and some choices are region focused rather than overarching data needed for ALL regions of Oregon.
- Concerns: Assuring that the data from multiple agencies can be coordinated and used easily. Also that the general public can get the answers they might want even though much of this data may be in more scientific language. "
- Is the data reliable; will data without sufficient QA/QC be included in the data collected?
- Inclusion of federal and tribal data
- Since the data provided will be used for a wide variety of purposes the scale, accuracy, and updating of information needs to be known to effectively use the data.
- Concerned the portal will not be able to provide the information needed to make informed timely policy decisions.

Please describe any hopes or wishes for a Water Data Portal that were not yet already shared during a listening session.

- We just have so many data gaps throughout the state. Part of me wants this beautiful portal, but the other part of me just wants to see all the money go towards crucial data collection so that we can better understand the current state of resources, and debate some solutions.
- Above
- No comment.
- I think I did share this, but I think for questions that can be answered with an existing dataset, I think the value of this tool is still in answering interdisciplinary questions--bridging agency responsibilities in one spatial application. So although we have existing datasets that can answer questions about water quantity and water quality that are currently separate, the examples of questions provided in the first ranking question don't need to treat these areas as separate. A question like "what is the relationship between water quality and water quantity in a given watershed?" would be a better example of the type of questions that could be answered using available datasets that this tool would be uniquely well-suited to resolve. If my question was only about water quality or water quantity, I would continue to use the existing OWRD and DEQ tools I'm familiar with.
- Inclusion of riparian and wetland conditions is an important need along with the presence/condition of groundwater dependent ecosystems.

Welcome to the Oregon Water Data Portal **Scoping Project**

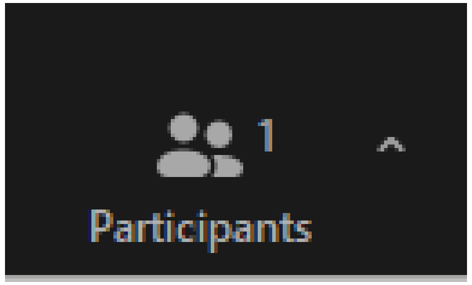
Listening Session Oct. 12, 2022

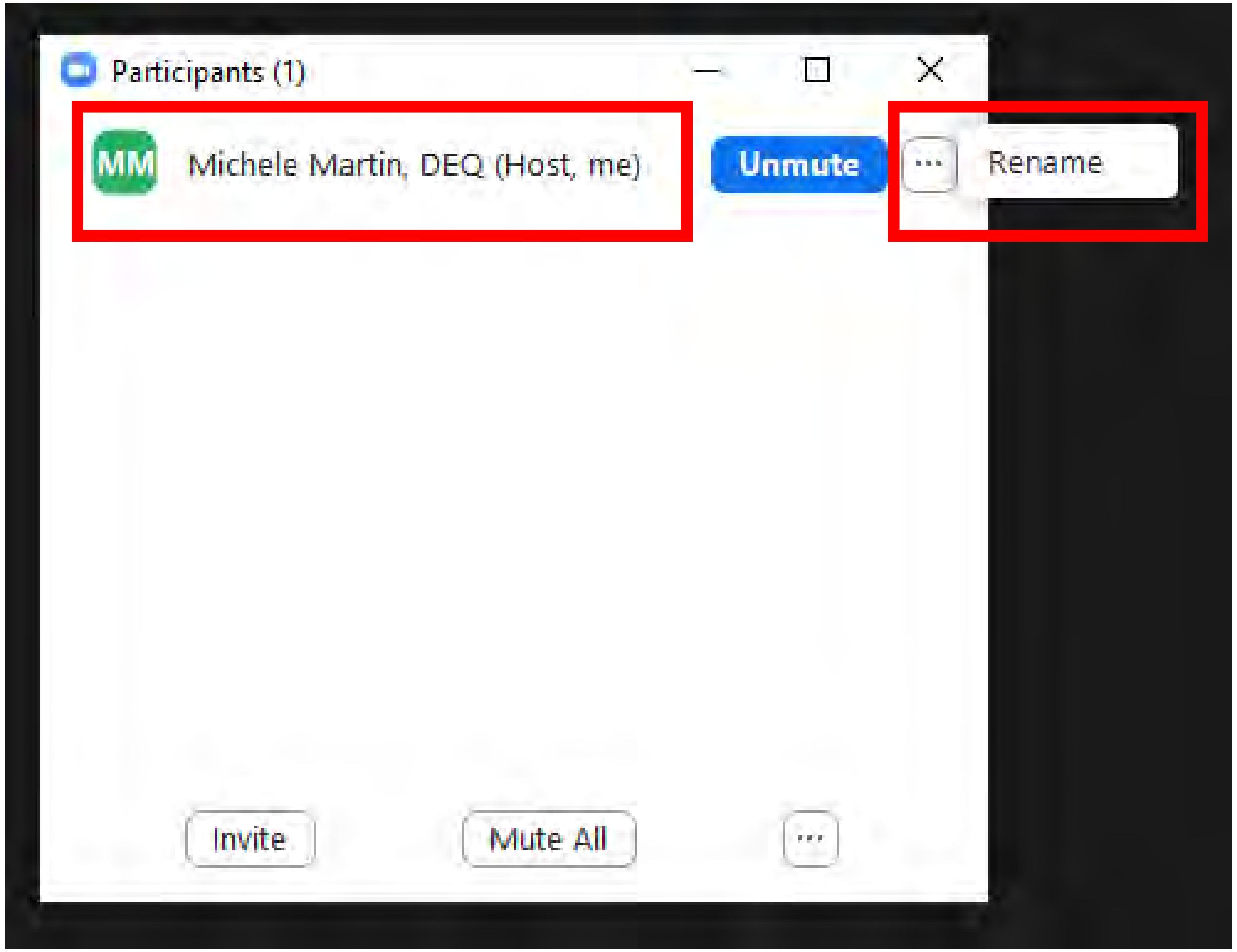
Agenda

Michele.Martin@deq.Oregon.gov

Time	**Topic**
1:00 p.m.	Welcome
1:05 p.m.	Agenda review
1:10 p.m.	Zoom logistics and ground rules
1:15 p.m.	Project information and background
1:50 p.m.	Discussion of concerns and benefits
2:10 p.m.	**Break – 10 min.**
2:20 p.m.	Discussions and breakout session 1
2:50 p.m.	**Break – 5 min.**
2:55 p.m.	Cont. discussion and breakout session 2
3:30 p.m.	Next steps
4:00 p.m.	Adjourn

Add your organization to your name in Zoom





Oregon Water Data Portal Project Meeting Oct. 2022

Zoom logistics and meeting ground rules

Use chat to:

- Ask questions
- Provide informational resources
- Second good ideas/issues

If using phone: press *9 to raise hand, *6 to mute/unmute

Water data portal opportunity

Poll: How easily can you find the Oregon water data you use to make decisions?

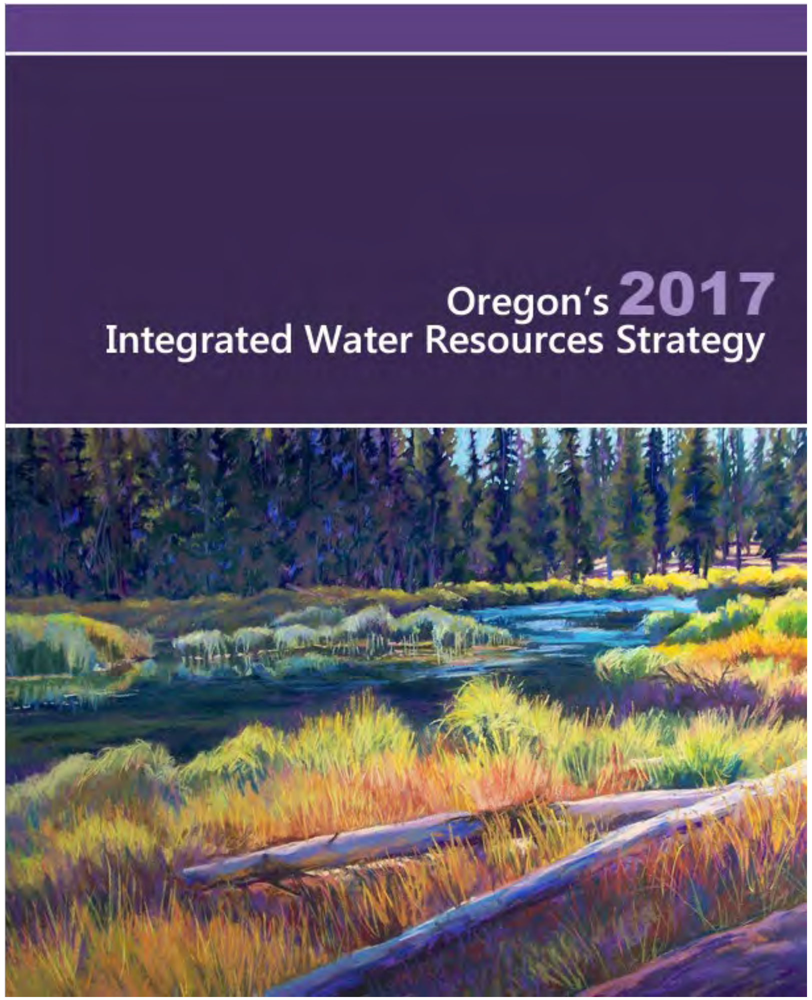
Decision-makers, communities, and regular users of water-related data do not have easy access to the necessary **data** and **information** upon which to base long-term strategic water and water infrastructure-related decisions, including planning and investment.

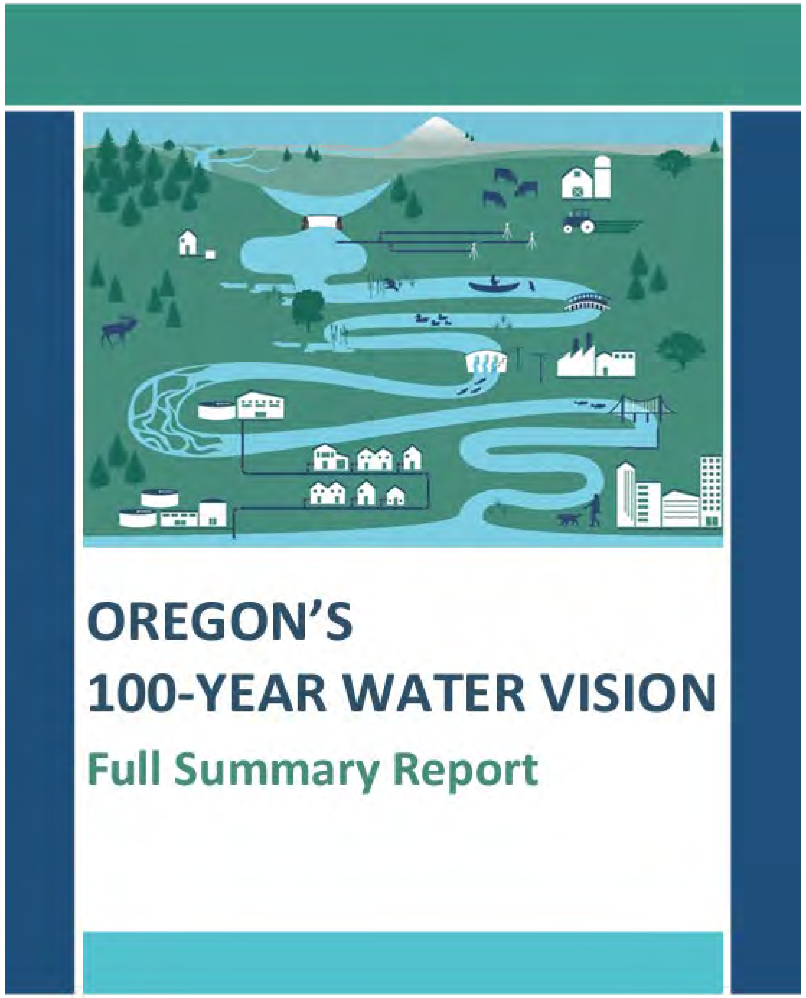
Goal for today’s meeting

Engagement

Oregon Water Data Portal Project Meeting Oct. 2022

Implementation of the Strategy and Vision





OWDP will use relevant technology and data standards established by Oregon Department of Administrative Services and/or legislature.

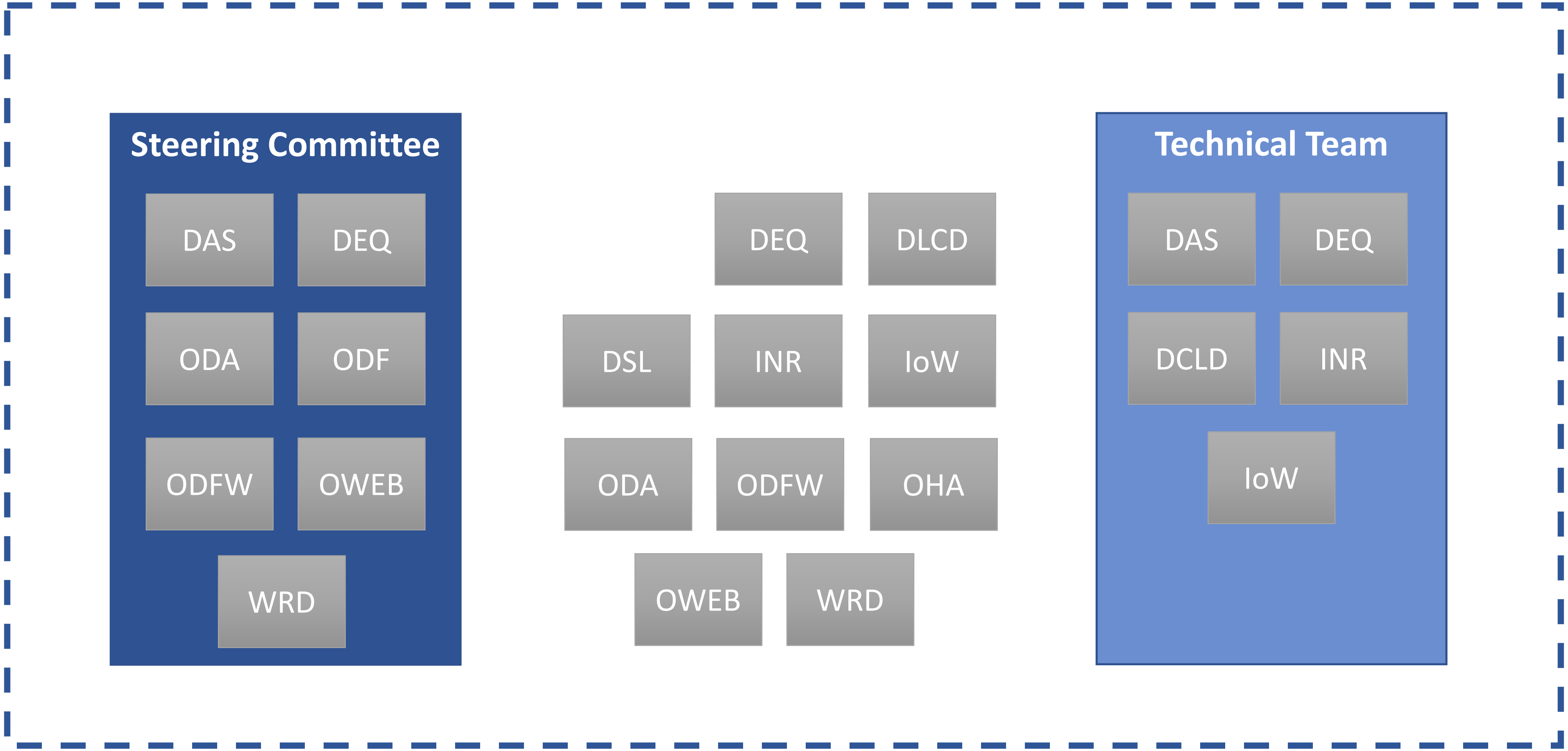
OWDP will consider complementary data and mapping approaches developed by other entities and states.

Platform examples

Oregon's Open Data Standard and Portal	Oregon's Environmental Justice Map Tool (Planned)	EcoTrust/USFWS Regional **Aquatic Prioritization and Mapping Tool**
The Freshwater Trust StreamBank **Toolkit**	**WRD Water Rights Mapping Tool**	Western States Water Data Exchange (WaDE)
City of Portland Environmental Services WebPortal	INR Oregon Explorer Map Viewer	New Mexico Water Data Portal-IoW
Oregon Watershed Restoration Tool - Explorer	Texas Water Data Hub-IoW	California Water Data Portal(s)-IoW

Project appropriation

Oregon Water Data Portal project teams



Oregon Water Data Portal Project Meeting Oct. 2022

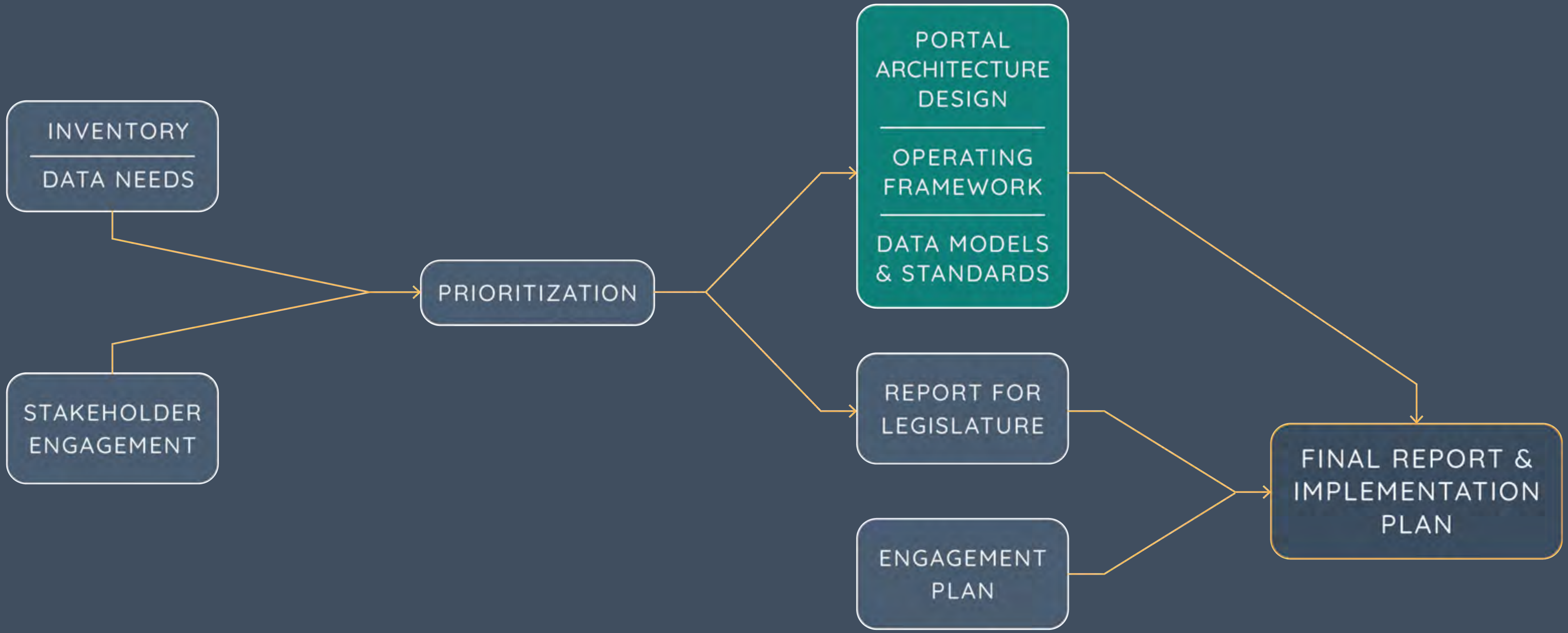
Oregon Water Data Portal draft project stages

1 **Jan. 2022 – Jun. 2023** Plan project

2 **Jul. 2023 – Jun. 2025** Pilot project

3 **Jul. 2025 and beyond** Agency Data Projects and Portal improvement processes

Stage 1 Process

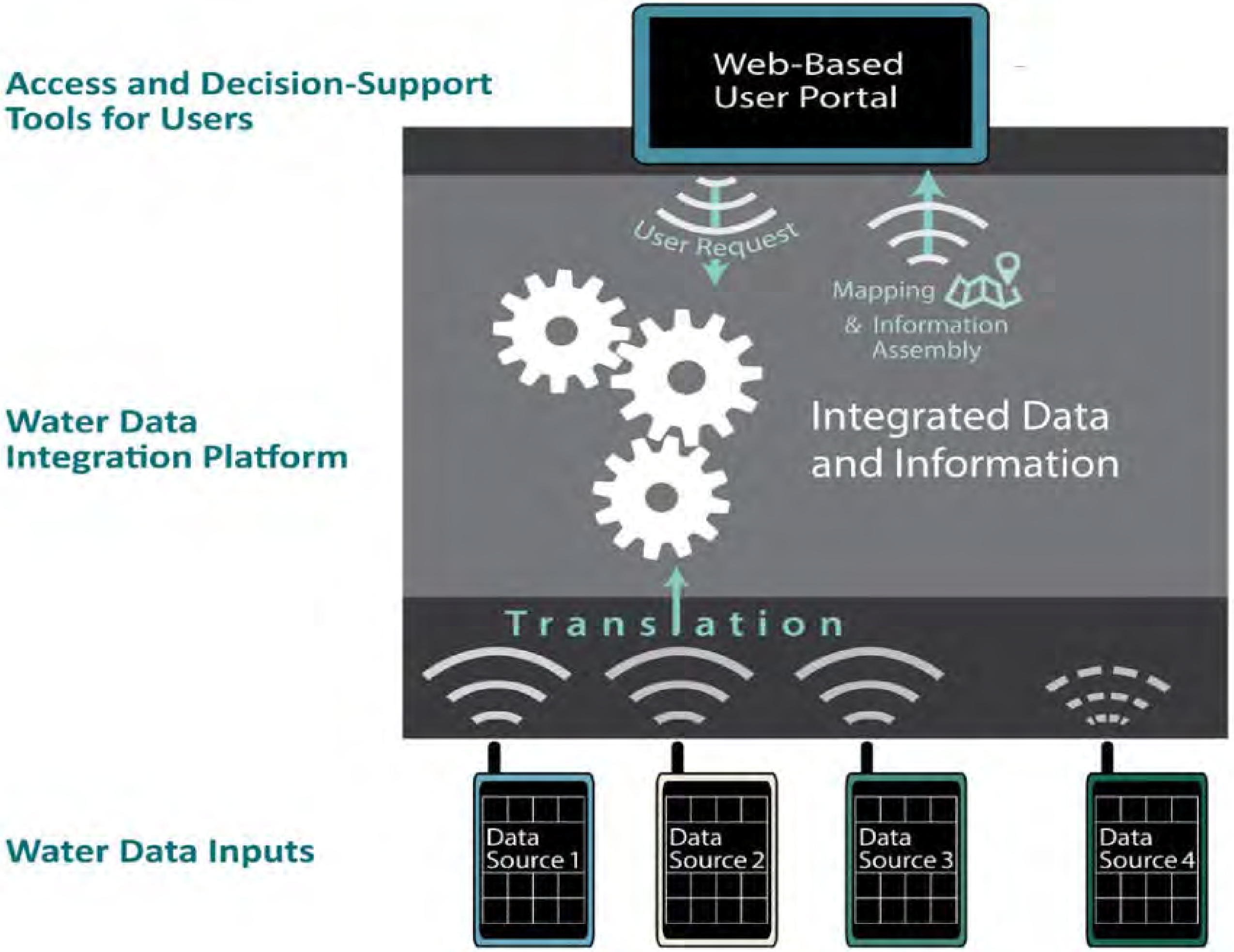


Internet of Water COALITION

Oregon Water Data Portal Project Meeting Oct. 2022

Oregon Water Data Portal Project Meeting Oct. 2022

Oregon Water Data Portal



Questions?

Discussion ground rules

- Explain reasoning and intent
- Focus on interests not positions – identify needs that solve a problem

Providing input to the Water Data Portal team

- Discussion, polls, chats, and breakout sessions during this meeting
- Follow-up survey to provide additional feedback
- Contact team members after this listening session.

Respond in chat or raise hand:

What are the challenges or concerns about a statewide Oregon water data portal?

What are your solutions?

Water Data Portal benefits

Respond in chat or raise hand:

What could this portal do that you cannot efficiently accomplish in the current state of data availability in Oregon?

Break 10 min.

Water Data Portal prioritization

- Near term (pilot): Example questions that could be answered with readily available state agency data

- Longer term: Example questions that require new data collection or management

We seek your input to help us prioritize the data portal's utility

Examples of questions and datasets

Question
Where and when is surface water available for allocation?
Where have watershed restoration projects occurred?
What is the groundwater budget for my basin's lowland aquifer system?
What is the groundwater budget for my aquifer?

Examples of questions and datasets

Question	Supporting datasets
Where and when is surface water available for allocation?	Water Availability Reporting System
	Location-Specific Rules
Where have watershed restoration projects occurred?	Oregon Watershed Restoration Inventory
What is the groundwater budget for my basin's lowland aquifer system?	Water Right Information System
	Basin-scale upland/lowland groundwater recharge estimates
What is the groundwater budget for my aquifer?	Water Right Information System
	Groundwater Basin Studies
	Detailed aquifer delineation, interconnections, and detailed recharge and discharge

Examples of questions and datasets

Question	Supporting datasets	Dataset status
Where and when is surface water available for allocation?	Water Availability Reporting System	Ready across most of the state
	Location-Specific Rules	Ready
Where have watershed restoration projects occurred?	Oregon Watershed Restoration Inventory	Ready
What is the groundwater budget for my basin's lowland aquifer system?	Water Right Information System	Ready
	Basin-scale upland/lowland groundwater recharge estimates	In progress, expected 2026
What is the groundwater budget for my aquifer?	Water Right Information System	Ready
	Groundwater Basin Studies	Complete in 3 basins, ongoing
	Detailed aquifer delineation, interconnections, and detailed recharge and discharge	Not available as a statewide dataset

Examples of questions and datasets

Question	Supporting datasets	Dataset status	Readiness for inclusion in Water Data Portal?
Where and when is surface water available for allocation?	Water Availability Reporting System	Ready across most of the state	Pilot project ready
	Location-Specific Rules	Ready	
Where have watershed restoration projects occurred?	Oregon Watershed Restoration Inventory	Ready	Pilot project ready
What is the groundwater budget for my basin's lowland aquifer system?	Water Right Information System	Ready	Mid-term project
	Basin-scale upland/lowland groundwater recharge estimates	In progress, expected 2026	
What is the groundwater budget for my aquifer?	Water Right Information System	Ready	Long-term project
	Groundwater Basin Studies	Complete in 3 basins, ongoing	
	Detailed aquifer delineation, interconnections, and detailed recharge and discharge	Not available as a statewide dataset	

Example questions that could be answered with readily available data

*Reference the **Questions to Consider** from meeting materials for breakout session 1.*

Oregon Water Data Portal
Listening Session
Questions to Consider

October 2022

Project team contacts

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Listening session

The Oregon Water Data Portal project is about improving access to statewide data and information to make water and water infrastructure decisions. The concept of a water data portal was described in the implementation portion of Oregon's 2017 Integrated Water Resources Strategy and Oregon's 100-year Water Vision. At this listening session, we will ask for input on the different water-related questions the portal could be used to answer, and for input to further prioritize data relevant to the development of an initial water data portal.

We anticipate many of the desired capabilities are going to take a long time to implement. This listening session is an opportunity to have conversations with stakeholders and tribes about prioritizing data and information for the data portal. Members of the project team from Oregon Watershed Enhancement Board, Water Resources Department, and Oregon Department of Environmental Quality will be leading and supporting this listening session.

This interactive listening session will use meeting polls, breakout sessions, chat responses, as well as conversation, to gain feedback from attendees during the meeting. Some of the questions we talk about are below. We will also provide an additional opportunity for feedback after the listening session.

Breakout session 1: near-term data priorities

Among the example questions that could be answered using available data sets, which ones are most important?

1. In your breakout group, identify and discuss priority questions from the meeting materials ***Questions to Consider***
2. Feel free to add comments into the chat for your breakout group, explaining how you would use the results

Any ah-ha moments?

Did your group identify any additional questions ready for Water Data Portal pilot project?

Break 5 min.

Oregon Water Data Portal Listening Session Questions to Consider

October 2022

Project team contacts

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Oregon Water Data Portal Project Meeting Oct. 2022

Breakout session 2: medium-term data priorities

Among the questions that require additional data collection and/or management to answer, which ones are most important?

1. In your breakout group, identify and discuss priority questions from the meeting materials ***Questions to Consider***
2. Feel free to add comments into the chat for your breakout group, explaining how you do or would use the results

Any ah-ha moments?

Next steps

- Follow-up/input from listening session
  - Please look for an email from the team with a survey
  - The PowerPoint from today will be included in the follow-up email

- Project team to report to the legislature in January 2023

Please contact the project team with any questions

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Appendix D: Technical Workshop Stakeholder Engagement

The Technical Workshop

This document is an excerpt from Oregon's 100-Year Water Vision. The full document can be found at https://www.oregon.gov/oweb/Documents/OWV-Full-Report.pdf. This excerpt consists of the Technical Workshop write up (pages 171 – 209 from the original document) including the Key Data Gaps table (pages 206-209), and a detailed Technical Workshop Meeting Summary held for the development of the 100-Year Water Vision (pages 408 – 443).

Oregon's 100-Year Water Vision was envisioned to realize the principles found in the 2017 Statewide Integrated Water Resources Strategy https://www.oregon.gov/owrd/programs/planning/iwrs/pages/default.aspx. The 100-Year vision worked extensively with tribes and Stakeholders to determine important components in a water vision and plan. The information below is taken from one of the technical workshops from the vision planning. Elements from this workshop became the philosophical foundation of the Oregon Water Data Portal(OWDP) project. The OWDP considers this 100-Year Water Vision technical workshop to be primary information from tribal and stakeholder input.

Technical Workshop

To engage in a conversation about the management and data needs of water managers across Oregon, the state hosted a full day technical workshop to stage that discussion. This section contains the agenda from the technical workshop, a memo that summarizes the state's current data inventory and framed the data discussion, and a synthesis of key the data needs and gaps that water managers identified during the workshop.

Technical Workshop Agenda

Technical Workshop Agenda

November 14, from 8am to 4pm

Willamette University, Salem, Oregon

Purpose

The State of Oregon is convening this Technical Workshop to bring together data users (people who use the data produced by the state, federal agencies, and private sector to make water management and infrastructure decisions) to identify important management questions that require good data, and what form and function that data is in /should be in to support good decisions for users. The Workshop is coordinated with the 8 regional Community Conversations recently held in late October early November to identify challenges each region is facing and provide input to the 100 Year Vision. The Vision is a way to craft the investment and implementation actions linked to the Integrated Water Resources Strategy.

Objectives

What decisions do we need to support? With information in which form and function? The workshop would ask these questions relative to A) water availability and use, water infrastructure condition, and funding and finance; and B) the 4 goals of health, safety, environment, and economy.

8:00-8:30am Registration and Coffee

8:30-8:45am Introductions and Welcome

8:45-9:00am An Overview of the 100-Year Water Vision

- What's in it, and why now? What comes next for the Vision
- What is the overall frame being used—how's that working for you?

9:00-10:00am Grounding in What We Think We Know
Part 1: Important Water Management Questions

- Brief presentation - examples of water management decisions that need good information
- What are the most critical kinds of water management and investment decisions you need information for right now, in 5 years, in 20?
- Discussion in small groups with large group highlights

10:00-10:15am BREAK

10:15am-12:30pm Grounding in What We Think We Know
Part 2: Water Data Availability and Quality

- State agency panel shares highlights of data we have/data we think we need
- Full group participates in 10 stations focused on the data needed to support the decisions we talked about in Part 1

12:30-1:30pm Lunch

- Identify initial data priorities

1:30-2:00pm Initial Data Priorities

- Small group and large group discussion

2:00-3:00pm Where Do We Go From Here?

- What information/data asks do you have of the state or others?
- What can you offer?
- Small group and large group discussion

3:00-3:15pm Next Steps and Follow up

3:15-3:30pm Closing Remarks and Thank You

3:30-4:00pm Data Resources Networking

4:00pm Adjourn

Technical Workshop Summary

On November 14, 2019, more than 70 participants from local governments, environmental and agricultural groups, agencies, and others gathered to discuss the current water infrastructure and ecosystem management questions they are actively working to solve. Participants were also tasked with identifying data gaps in five topical areas: water availability and use, water quality, environment, funding and finance, and future trends. Each of these breakout discussions is generally summarized below.

The Need

From the workshop and from conversations and surveys with community water leaders, it is clear that Oregon's water managers need better, more cohesive, and more usable data and information about water to forecast their community's water needs and prioritize water investments. Some of the specific needs include:

- Water budgeting—forecasting and tracking water availability, demand, and use;
- Natural and built infrastructure condition and improvement needs/plans/costs; and
- Ecosystem status and trends.

Water managers have clearly identified that they want water information to be current, high quality, transparent, accessible, and usable. There is a desire that Oregon have more integrated water data that are accessible at a regional level for the purpose of enabling Oregonians to make smart water decisions that keep our communities thriving for the next 100 years.

Key terms

Throughout this document, several terms are used that, in other context, can sometimes be interchangeable. For the purpose of this document, however, they have specific meanings.

Key water management question: Significant decisions water managers (e.g., irrigation district managers, restoration contractors, foresters, farmers, city water engineers, wastewater plant operators, county flood managers, etc.) make on a regular basis that require information about current and future water quantity, quality, and ecosystem status and trends.

Framework: The agreements amongst data providers (agencies and others) on digital availability, data quality, format, and privacy protections that make it possible to have integrated access to the information water managers are asking for.

Platform (data and information): The data standards, technological connections, user interfaces, and other aspects of data and information systems that allow water data to be accessed, organized into information, and used to support decision-making.

Information: Data that have been organized, synthesized, presented, or analyzed in some way that begins to attach meaning to the individual bits of data. Information is often what is needed to support decisions, but you cannot have information without data.

Data: Characteristics of water (e.g., water quality, quantity, stream location, groundwater basin boundaries, or water use) that are collected, stored, and made available. Alone, data may have little meaning until they are organized into information.

Water managers: people who manage, plan, and maintain water systems, both built and natural, in communities across the state.

Key Management Questions

Oregon's water managers are making decisions each day about how to advance health, economy, environment, and safety. Many of those decisions require information that is created from high quality, current, and usable data. Participants were interested in a better understanding of which data and information are available, and a clear articulation of how reliable those data are (e.g., some data are better than no data, but really bad data are not necessarily better than no data). There was also interest in getting higher resolution and more real-time foundational data (e.g., hydrology, weather, and hydrogeology).

Overall, water managers were interested in ways to build a more integrated water information framework to make existing water data more usable as information. Questions around managing water data and information included:

- Are there better ways to provide and present information to support water planning;
- What are some indicators water managers can use, both for their own tracking and also for reporting at a statewide level (e.g., for Washington's salmon recovery efforts); and
- Where are there duplications of effort and opportunities to consolidate data collection and sharing across agencies?

This section contains a summary of the key water management questions workshop participants identified as needs for information during the workshop. Based on the input received, questions are organized by theme:

- Water availability and use
- Water quality
- Ecosystems
- Infrastructure
- Funding
- Regulation
- Process
- Education and culture change
- Future trends

Water availability and use

Overall, people were interested in knowing (as close to real time, and as fine a resolution as possible):

- How much water, both surface and ground, is available and used, for which uses, where, and when?
- What are current flows in stream, especially in smaller streams?
- What are sustainable levels of water extraction (groundwater and surface water) that are protective of the environment and practical for communities?
- What is the projected water availability and demand in the future—both near and long term forecasts?

Balancing water needs

Participants recognized that better information was needed to balance the multiple demands on water. What do water users actually need to maintain essential functionality of the activity they are using water for, and how should these needs be prioritized? What are the impacts of these different water uses?

How water flows, and how ground and surface water are connected

Participants were interested in data that could provide water managers more information on how water actually moved through the watershed—from ground to surface, and across the landscape. What are the links between surface and groundwater? How much water flows from public lands and other headwater forests and what is the relationship between forest health/forest management and water?

Agriculture and municipal water

Agricultural and municipal water managers each had specific information needs. For agriculture water uses, how much water is available (when/where/how much) instream and out of stream, actual water usage, and the associated impacts of that usage on water quality, supply, and overall watershed health were of key concern. Managers also wanted to know where the specific places of use and points of diversion for water are, and where water is overallocated.

For municipal water uses, questions around current and future community needs over time, as well as water usage upstream when water rights are considered were discussed.

Water conservation and reuse

Participants were interested in ways to make more efficient use and reuse of the water we have. What is the total potential for water conservation, and where is the greatest opportunity? How do we incentivize water conservation? Can we reuse water? How do we efficiently recharge our ground water?

Storage and backup / redundant water supplies

Participants where interested in how water could be available when needed—either through storage or backup water supplies. What is the statewide and local need for storage in light of climate change? How can local communities site, build, and use resilient storage systems? Where is and where isn't there redundancy, and where are the greatest opportunities to build in redundancy to water supplies?

Water quality

Water quality is a function of hydrology, surrounding land uses, and pollution loading. Participants were interested to know:

- What current pollution sources and loading are occurring at the tributary scale?
- What drives harmful algal blooms, and how can they be identified and prevented?
- How can safe drinking water be provided to our community, now and into the future, given fiscal and regulatory challenges?
- How can we monitor and prevent introduction of new, and remove existing, emerging contaminants from water?
- What is the future need for water treatment, and how can natural infrastructure be utilized?
- How do we understand ocean and estuary water quality?
- What are status and contamination risks in source watersheds?
- How can we accomplish and understand real-time monitoring of water quality and biological metrics for watershed health?
- How are current sources complying with current regulations?

Ecosystems

A range of topics and questions were identified relative to better understanding ecosystems including:

- Current ecosystem condition and function
- Status and trends of instream flows
- Opportunities for restoration and protection of water instream and of habitat and other natural infrastructure
- Where has flood irrigation existed so long that habitat could be altered with more efficient irrigation systems?
- Mapping to identify land use in relation to coastlines, rivers, seagrass beds, etc.
- How much water and of what quality/location/timing is needed to support fish
- Where should restoration investments occur to respond to climate change? Where are fish passage barriers? What is the potential and opportunity for beaver restoration?
- Where are restoration projects occurring?
- What is the change in fish survival as a result of large woody debris projects?
- What are the key indicators/metrics that drive watershed health conditions in urban and rural areas?

Infrastructure

Participants were interested in answering a range of infrastructure questions, such as:

- What infrastructure investments are needed in next 5, 20, and 50 years?
- How much infrastructure has reached or exceeded its design life/expectancy?
- What contaminants does old infrastructure contain (e.g., toxins in sediment behind

dams)?

- Is new infrastructure “properly” built?
- How can infrastructure be kept affordable?
- How will future capital improvement plans for one water collectively impact the ratepayer?
- Is the current pricing/cost of water to companies, residents, and others reflective of the true cost of water?

Natural infrastructure

Many questions centered on the potential for natural infrastructure. What natural infrastructure is there and what are its conditions? Where can we use our natural and working landscapes to clean, manage, and store water? More specifically, how do we restore floodplains to keep our communities and property safe? What built infrastructure needs can natural infrastructure address, and how do we pay for those projects?

Safety

Participants were interested in information that could support preparedness for disasters, especially earthquakes. What is the plan to replace water treatment, delivery, and storage infrastructure post disaster? How do we best communicate with residents about emergency plans in catastrophic events?

Infrastructure removal and upgrades

Not all infrastructure needs to be replaced—some dams, levees, and culverts need to be removed. Other infrastructure needs upgrading. Participants asked which built infrastructure needs to be removed, and which built and natural infrastructure needs to be upgraded/restored to meet future conditions and pressure?

One infrastructure, multiple purposes, multiple benefits

Where are the opportunities to co-locate electric power, fiber optic cable, and broadband data cable with water infrastructure? And how can one infrastructure investment provide as much public benefit as possible (e.g., irrigation modernization also restoring instream flows)? Also, what is the aquifer storage and recovery capacity and potential in each basin?

Funding

Management questions around funding included:

- Into what do we invest limited funding that is most effective?
- Which communities and watersheds are a priority for that funding?
- Where are the current resources to replace, repair, or remove built and nature infrastructure?
- How do you ensure a public benefit from investment?
- What do state agencies need to implement a 100-Year Water Vision?
- What are the resource needs for water planning and infrastructure improvements?
- What is the workforce capacity to implement projects effectively?

Regulations

So much of how water gets managed in driven by federal, state, and local regulatory requirements. Participants wanted answers to such questions as:

- What are current regulatory frameworks and how can regulatory certainty be provided?
- What operational and infrastructure changes will be required by future regulation, and when—with enough lead time to build and make changes?
- What flexibility will there be to adapt existing rules and regulations to today's conditions and future innovations?
- Are there opportunities for outcome-based regulations, rather than practice- or process-based regulation?

Participants were also interested in information that could better align water rights, use, and availability. Questions included:

- Where is water being used without or in exceedance of water rights?
- Where is there opportunity to "clean up" existing water rights to make more water available?
- Where have water rights been adjudicated? Where do they need to be adjudicated? What data are needed to support adjudication?
- How are planned changes in water use communicated to others so that consequences can be better anticipated and planned for?
- What are the levels of compliance with current regulations, both for water quantity and quality?

Process

Participants recognized that much of managing water is getting the information needed to improve coordination and make good decisions. Some of those questions included:

- What are the best ways to value different uses of water, and how do we plan development around those different values?
- What are the policies, regulations, and processes needed to make sure the decisions of one place positively affect the water in the next place?
- What are the communication tools and coalitions needed to create common cause for the long term, especially among municipalities and agriculture?
- What are the best practices for building trust amongst those in conflict, and what are some of the best practices for building partnerships?
- How do we know different voices are being heard in decision processes?

- What are the different roles needed for coordinated water management and encouraging best practices, and who fills them?
- What are the best ways to get to "one water" management across agencies and to integrate agency decision processes and missions so as to enable the kinds of environmental and built infrastructure investments needed to solve problems?
- How can basins and agencies best coordinate data collection, turn it into information, and use it to make technical and policy decisions, and communicate that information and decisions out to the public and other partners?
- How can multiple local governments work together in a process to combine resources and invest in multi-objective projects?
- How can local governments and the state work together to prioritize necessary system improvements, and how will we prioritize investments in Research and Development and in generating water information?

Education and culture change

Participants were interested in the types of messages and strategies that work best to change people's understanding, dialogue, and behavior relative to water in Oregon. This included questions such as:

- What changes are needed in water user knowledge, attitude, and behavior to match both the current and future water needs?
- What are the strategies that can shift how people understand and talk about the different water needs in different parts of the state?
- What messages and tools are needed to convey urgency to the public?
- How do we implement collaborative planning, equitably invest, and gain the trust of stakeholders and the general public?

Future trends

Participants were interested in more information that helps forecast future trends. Topics and questions included:

- Climate change impacts on the timing, quantity, and quality of water in specific locales
- What is needed to adapt to future climate scenarios given projected changes to snow, runoff, surface flows, and groundwater?
- What are the risks posed to current water resources and water systems?
- What are the future needs for ecological flows—both base and peak flows?
- Where are there periodic water spikes and droughts?
- Population forecasts that anticipate climate change migration patterns
- Projected changes in land use and how that land use can better accommodate ecosystem needs
- Future water availability and planning for land use and economic development needs
- Changing energy patterns and impact on water

- How can technological upgrades, specifically in rural systems, better inform future management decisions?
- Future crop production patterns
- What will the future hydrograph look like so that we can project water supplies when designing an irrigation, municipal, or other water transport system?
- What are the root causes of change in water reliability?
- What is the difference in water planning and needs for “growth in demand” vs. “reliable availability”?

Topical Breakout Groups

Following the discussion of management questions, participants joined a series of breakout groups (each participant joined 3 groups) on data gaps by topical areas, and were asked:

- Water availability and use: How much water do we have? How are we using it? How long will it last?
- Water quality: What do we need to know to ensure our water is swimmable, fishable, and drinkable?
- Environment: What do we need to know to ensure our ecosystems have what they need to thrive?
- Future trends: What information do we need to plan for the future?
- Funding and finance: How do we pay for the investments we need to make?

Across all of the breakout sessions, there were a number of identified gaps that pointed more toward a need for an integrated data platform for water information in Oregon. This was a specific concern for small and rural communities who often lack the capacity to do their own data collection and analysis. Some of those particular gaps included:

- Decision support tools, compatible with GIS, for predictive water planning
- Integrative models that combine the seasonality of snowpack, rainfall, instream flows and uses to predict water availability statewide
- High quality, accessible, public, statewide, real-time, and basin-specific data that has been accumulated, standardized, and aggregated across state agencies in a way that is accurate, accessible, and affordable (water quantity, quality, and habitat)
- Agency agreements for coordinated data collections and analysis
- A tool that harmonizes state, federal, and private sector data to understand climate adaptation and the connectivity between all water users and the ecosystem
- Stable funding for the maintenance of a tool like this

Water availability and use

In the “Water availability and use” breakout groups, participants were asked to identify specific data and information needs that impact the planning and management of water resources. Overall, people were interested in understanding a multitude of factors that impact water availability and use, including:

Ground and surface water connection – Communities need to understand groundwater quality and quantity and the connection between ground and surface water, as well as groundwater recharge rates.

Supply – Information is needed to better understand whether current water supplies in various areas of the state can meet current and future demands. Instream flow data and current and future precipitation trends will also be needed. Higher resolution hydrology data and a more robust stream gage network were specifically cited. Information that helps communities better understand sustainable levels of ground and surface water extraction will help decision-making for communities and the environment.

Storage – Information is needed on where water is stored and where potential/planned storage projects may be considered. For natural infrastructure, information is needed on climate change impacts on seasonal water storage for forests, soils, and snowpack.

Water uses – Information is needed regarding current water use**–**when it is used, and who is returning water to the river, and when. Seasonal projections are needed to understand water availability during the growing season, along with specific crop water needs. Instream data needs include base, peak, and ecological flow targets for fish, along with meteorological streamflow information.

Conservation and reuse – Information on best practices, policy options, and residential options are needed for both water conservation and reuse.

Water quality

In the "Water quality" breakout groups, participants were asked to identify specific data and information needs around planning and management of water quality. Participants were interested in understanding a variety of water quality factors, including:

Treatment practices – A full inventory and analysis of treatment techniques and key indicators to prioritize and evaluate the cost, benefits, return on investments, and potential unintended consequences of specific water quality treatment options is needed.

Watershed and pollution – Information is needed about nonpoint sources of pollution throughout a watershed, how upstream land use and management affects water quality, and the fate and transport of pollutants within waterways. Furthermore, established best management practices are needed for leveraging natural infrastructure to enhance water quality before toxins can enter aquatic ecosystems.

Public support and education – Communities need a better overall understanding of public awareness of water quality issues and support for water quality investments, especially within smaller water systems that have a larger potential cost burden on rate payers.

Management and regulations – There is a need for more holistic watershed analyses that take social, economic, environmental, and cultural factors, and real-time water quality data into account. Furthermore, case studies of successful management approaches can inform what strategies are improving water quality, effectively leveraging resources and community capacity, and interacting with the state regulatory framework are needed.

Environment

In the "Environment" breakout groups, participants were asked to identify specific data and information needs around water and the environment that are currently lacking in quality, accessibility, or accuracy.

A range of questions were identified relative to better understanding environment and ecosystems including:

Watershed health – Information about overall watershed health is needed in every basin. Communities need information on upstream land use activities and impacts, as well as the ecological impacts of disease, pests, and invasive species. Watershed models that incorporate climate change scenarios are also needed in every basin.

Species and habitat needs – There is a need for general aquatic species distribution, diversity, needs, indicators, productivity, and resiliency. Similarly, there is need for information about optimal habitat and water quality parameters for macroinvertebrates, beaver, and sensitive fish species as well as opportunities for habitat enhancement and restoration.

Instream flow and water quality – Real-time data on base, peak, ecological flows, and the timing of flows are all needed. Similarly, information on the ecological impacts of pesticides and emerging contaminants, such as microplastics and pharmaceuticals, is needed.

Natural Infrastructure –There is a need for standardized best management practices and an inventory of riparian buffers and storage capacity in natural infrastructure. Further discussions expressed a need to identify natural systems vulnerable to catastrophic impacts of climate change and natural disasters, specifically wildfire.

Regulations and management – There is a need for regulatory certainty for managers and natural resource industries (e.g., forests, farming, and other sectors that use natural resources). For regulatory certainty to occur, accurate water budgets and sustainable resource extraction models are needed.

Future Trends

In the "Future trends" breakout groups, participants were asked to identify specific data and information needs around future and emerging trends that impact the planning and management of water. Participants were very interested in more information that helps forecast future trends, including:

Climate Change – Climate models that specifically focus on source water and habitat vulnerabilities, instream flows, impacts on agriculture and utilities, and the overall cost impacts are needed.

Population – Population models that take into account climate refugee movement are needed to predict future shifts in geographic distribution in rural and urban areas.

Economy – Economic analyses that identify market shifts and emerging trends in commercial, industrial, residential, natural resource, and technology industry needs are needed.

Future development and land use – Communities need local housing demand projections as well as analyses of safe locations for future development.

Water quality – Information around emerging contaminants, when and where harmful algal blooms may occur, and best management practices for aquifer restoration are needed. Managers also need regulatory certainty to enable long-term planning.

Water quantity – Forecasts for surface and groundwater supplies, in both built and natural infrastructure, and future water usage for municipalities and agriculture are needed. Furthermore, communities need to know where back up / redundant water supplies could exist, and which groups of people are vulnerable to water insecurity.

Resiliency – Long-term community resiliency analyses to evaluate the potential impacts of seismic events, wildfires, and other natural disasters on local resiliency and water supplies is needed for future planning. Communities also need more information on decentralized reuse to expand water use efficiencies locally.

Funding and Finance

Oregon water leaders recognize the need for more investment in built and natural infrastructure to support the wide range of current and future water needs. Information needs included:

Revenue – Information on the current revenue sources available to water managers, and what is the current debt capacity for different special districts, local governments, and the state is needed. There is also a need for information on public willingness-to-pay and support of investments that will result in rate increases. The state also needs to identify potential new sources of revenue, and evaluate the feasibility of opportunities such as capturing the value created by “water exports” (e.g., beer, blueberries, or other water-intensive and high value products); and/or different approaches to water pricing to encourage efficient use.

Using the funding more equitably and efficiently – Communities need to identify opportunities to better coordinate and use existing revenue efficiently for better results, and how to ensure equitable access to current and future revenue for water investments. There is a need for information on funding needs and gaps by geography, between urban and rural communities, and across sectors. Resources to raise awareness of different funding sources, and better navigation of existing funding criteria and requirements, are also needed.

There is a need for more information on the opportunities to sync up and integrate different grant requirements, timelines, and loan repayment schedules, and to streamline multiple funding sources to coordinate investment priorities and share services. Communities also need to know the best practices for public-private partnerships. Likewise, there is a need for established strategies for making investments that produce multiple outcomes and reduce future costs.

Needs for more funding and different expenditures – Communities must be able to anticipate a need for additional resources and expenditures in specific areas, like data acquisition and long-term planning for climate change and shifting population dynamics. Similarly, communities need funding for entirely new investments, like building redundancy into existing water systems, or restoring natural infrastructure that protects source water.

Investment prioritization – Communities need to be able to prioritize investments, and to do that, they need first to understand who is the most vulnerable to water insecurity. Furthermore, cost-benefit analyses are needed to determine if money should be invested in built or natural infrastructure to address water quality problems upstream. Return-on-investment analyses of current systems are also needed.

Offers and Asks

Participants were given an opportunity to make particular asks of other participants and the state, and to offer data and information they had to others in the room. Participants asked for a variety of high-level commitments from the state. A few of which were consistent follow-through as well as inclusion. Furthermore, a large number of participants asked for a publicly available, consolidated platform with statewide data on water supply and use, ecological conditions, and population growth, on a basin-specific scale.

Consistent, transparent, good-faith engagement and collaboration were both requested of the state and offered by participants. There were a variety of other specific data and process asks and offers that are in the raw notes and are not summarized in this document.

Understanding the Current Condition and Future Needs for Water in Oregon

Water is perpetually moving. Starting as snow or rain at its source in the mountains, it flows into rivers, wetlands and the ground, supporting people, plants, fish and wildlife often on its way to the ocean. Sometimes there is an abundance of water, sometimes too little. As communities use water to grow food, get a glass of drinking water, generate electricity, make microchips, or sit along a river watching fish swim by—water is moving through both natural and built systems. Those systems need to be maintained, protected, and restored to achieve the goals of supporting health, economy, environment, and safety.

We know we need better, more integrated, and more accessible information to guide water planning, actions, and stewardship. This memo describes some of the important sets of information Oregon uses to better understand current and future conditions.

Figure 1. Oregon's Water System

Key Management Questions

In Oregon, a changing climate, underinvestment in aging infrastructure and natural systems, and rapidly shifting population dynamics, all place stress on Oregon's water. In the face of these challenges, it is important to plan for Oregon's water future. So which management questions should we be asking?

Addressing immediate and future water availability is critical. How much, when, and in which watersheds will water be available? Where is our water coming from, where is demand greatest, and how do we protect it such that it can meet a range of needs?

An evaluation of Oregon's water infrastructure also requires attention. How safe are our dams, tide gates, and levees? How can we prevent water loss from pipes and facilitate efficient irrigation? How can we enhance emergency preparedness for both large and small public water systems? What investments will be needed to modernize community drinking water, wastewater, and stormwater infrastructure?

Ultimately, planning and innovating for our communities—including those most vulnerable to water scarcity—will increase statewide resiliency. Which communities and ecosystems are at highest risk of experiencing water insecurity or infrastructure failure? How can innovative funding and management solutions be equitably distributed throughout the state?

As we attempt to address these big management questions, it's important to assess what information we have, and what information we need. For example, if we want to assess groundwater availability, we must have sufficient data and studies across the state. Do we have the data necessary, for ALL watersheds, to evaluate current and future projections of water availability? And how do we pay for these data and information needs?
This document is intended to be dynamic and will be continuously revised based on the information and investment needs identified by stakeholders. The following is the state's attempt at providing an overview of an inventory of the availability of information about water quality and quantity, natural and built water systems, and innovative funding solutions.

Framework for a Water System

Figure 1 shows how the range of natural and built water systems can provide people, fish and wildlife with the water they need at the right time. Whether Oregonians manage water systems for irrigation, drinking water, energy, or fish and wildlife, there are basic elements common to each:

Water Quantity & Quality: Oregonians, fish, and wildlife need an adequate supply of water that is safe to use and available at the time it is needed for all of our ongoing essential uses.

Understanding seasonal water availability and protecting source water areas is vital to ensure water that falls as snow or rain or is present as groundwater is available and usable. Gathering information on water quality, water availability, drinking water, agriculture, source protection, contaminated site cleanup, septic system inventory, and toxics control helps us identify current and potential gaps in water quality and water quantity.

Storage: Storage includes the dams, reservoirs, water storage tanks, groundwater storage, and healthy forests, rangelands and wetlands that store water and release it slowly for environmental, agriculture, and community uses. Strategies to reduce sedimentation into reservoirs (e.g., reducing fire or landslide risk) are important to protect existing storage capacity.

Transport: Water transport systems allow the movement of water away from a source to where it is needed. These systems include irrigation ditches, drinking water pipes and intakes, wastewater pipes, and pump stations, and the maintenance required to prevent and repair leaks in or out of those systems. Water transport also means ensuring adequate flows and removing obstructions to natural systems so that fish and aquatic wildlife can move upstream and downstream and utilize habitat. Actions such as removing fish passage barriers, protecting water for instream flows, connecting floodplains and estuaries, updating tide gates, and providing the clean, cool water (or cold water refuges) that fish and wildlife need can all improve water transport for natural systems.

Treatment: Usable water must be clean. Water may be used several times after it first falls as snow or rain. Treatment includes the buffering and filtering actions of forests, streamside areas, wetlands, and stormwater facilities and the wastewater and drinking water treatment plants that use technology to ensure water meets safe standards under the Clean Water and Safe Drinking Water Acts. Treatment also includes maintenance of infrastructure and implementation of best practices that limit, reduce, or eliminate the discharge of pollutants to our water systems.

Flood Water Management: The magnitude and impact of flood events can be managed and mitigated. Managing flooding includes providing space for rivers and coastal waters to move, through actions such as reconnecting floodplains and maintaining or increasing floodplain storage. Managing flood water also includes placing structures and infrastructure outside of high hazard areas when possible, and when not possible, building structures and infrastructure to withstand flooding. Levees, dikes, tide gates and dams, affect how floods play out on the ground. For example, moving dikes further away from water channels can increase flood protection and water storage while providing enhanced habitat for fish and wildlife and improving downstream water quality. Protecting and restoring floodplain wetlands can provide similar benefits.

Natural Systems for fish and wildlife: To meet the multiple water needs of the state while maintaining healthy ecosystems, we must understand fish and wildlife habitat needs, including proper flow and temperature of surface waters. Water transport also means adequate flows and removing obstructions to natural systems so that fish and aquatic wildlife can move upstream and downstream and utilize habitat.
All Oregonians benefit from protecting the water needs of fish and wildlife, economic vitality, cultural values and enjoyment are tied to these ecological systems.

Water Use and Innovation: To make wise decisions about water, we need accurate, timely and complete information to know where, when, and how much water is used. We also know that technology can improve water efficiency, through actions such as irrigation modernization that produces water and energy savings, use of distributed wastewater treatment systems, and employing more closed-loop systems that use water several times.

Funding Capacity: Infrastructure throughout the state is aging. We lack the information to evaluate the ways in which the condition of the infrastructure may impact public health and safety, may contribute to inefficiencies and water loss, and may negatively impact habitat and conditions for fish and wildlife. Much of the drinking water, wastewater, and stormwater infrastructure built by previous generations has exceeded its useful life. In order to bring agriculture into the 21st century in the most efficient manner possible, funding for modernization of irrigation equipment is not only needed but required. Without a coordinated effort to strategically finance water system projects, opportunities to leverage grants, loans, and other investments could result in reduced planning and implementation capacity. Furthermore, without baseline knowledge around on-going and future investments, including funding to support agencies and partners, we run the risk of disjointed and duplicated efforts. Water Quantity & Quality

Why It Is Important

The amount of water we have and how water is being used are foundational to managing our water systems. Clean and available water is critical for our environment, industry and communities.

What We Know

Water quality and water quantity data is collected, analyzed and used by several agencies tasked with protecting and maintaining Oregon’s water quality and quantity and to understand the state of landscape conditions that affect water quality (streamside vegetation, bare soil, etc.) There have been efforts amongst the state agencies to coordinate collection of stream data for flow, water quality, and other factors.

i. Water Quantity

The Oregon Water Resources Department (OWRD) maintains the Water Availability Reporting System, which calculates natural and expected stream flows, consumptive uses, and water available for new uses based on historical stream flows for many parts of the state. OWRD maintains the Groundwater Site Information System and has completed several groundwater basin studies; however, new data needs to be integrated into the Water Availability Database and more studies need to be completed so the state has a comprehensive understanding to guide decision making. Communities also need more information about water resources including quantity and quality in order to make decisions. The state has locations of water diversions (OWRD Points of Diversion); however, those locations are not always mapped for older water rights. We know where stream gages are located (Gaging Stations Database), and associated stream flows for those gages. OWRD tracks well construction and location (Oregon Water Resources Department Well Report Query); however, not all information has been digitized or verified for accuracy. OWRD also receives water use information from governmental entities, and others that are required to report water use.

In addition to OWRD, other state agencies track a range of factors affecting or related to water resources. The Oregon Department of Forestry (ODF) maintains information on water sources and locations for firefighting. The Department of Land Conservation and Development (DLCD) tracks information about current land use and population projections that can be used to project future water demands. The Institute for Natural Resources (INR) (co-located at OSU and PSU) has land cover data that can be used as a base layer to identify risk areas for source water protection.

ii. Water Quality

The Department of Environmental Quality (DEQ) assesses water quality and prepares reports detailing the condition of Oregon's waters relative to Oregon's standards. DEQ and the Oregon Health Authority (OHA) also know where water treatment facilities are (DEQ NPDES permit locations and OHA drinking water treatment plants).

Drinking water protection is implemented through a partnership between DEQ and OHA. The program addresses over 2500 public water systems in Oregon. More than 600,000 Oregonians get their drinking water from individual private water wells. OHA requires monitoring of municipal and community water systems. Groundwater serves as the water supply for over 70 percent of residents in Oregon[1], and about half are identified as highly sensitive groundwater management areas. DEQ provides ongoing monitoring and assessment of groundwater management areas that cover these public drinking water sources. Business Oregon partners with DEQ and OHA in the funding of drinking water source protection projects.

Forestlands supply abundant, clean water for Oregonians. Oregon communities have identified $298 million in source water protection investment need.[2] Fire protection, enforcement of the Forest Practices Act and other laws, active management of forest lands, and voluntary measures by forestland owners all contribute to the health and responsible stewardship of forestlands, which is the source for almost all water Oregonians use.

Gaps in What We Know

Although we know the rough locations of points of diversion and points of discharge, there is limited information about how much water is actually used (diverted) and consumed (evapotranspiration).

We have little or no information about the safety of drinking water served by individual private wells or by water systems so small that they are below regulatory thresholds. OWRD has records of wells; however, there are gaps in this data. We need an accurate inventory of the location, and drinking water quality of small unregulated water systems. We need to know which communities have water supply vulnerabilities and require additional supply due to diminishing sources or increased demand.

There is missing information on which areas are covered by current drinking water source water protection plans, when those plans were last updated, and which source water protection activities are already occurring. We need to identify strategic investments required for source water protection.

For much of the state, particularly on agricultural lands, we need to understand streamside vegetation conditions, opportunities for improvement, and areas in need of restoration.

We also need to better understand, forecast or otherwise anticipate and plan for the likely spatial and temporal patterns associated with climate change. Where is sea-level rise going to impact coastal communities? How will changes in temperature reduce snowpack levels, timing of flows, and instream temperatures at the local scale? Where will changes in precipitation increase floods?

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[1] There about 2,000 groundwater public drinking water sources (ASCE, 2010).

[2] EPA Drinking Water Infrastructure Needs Assessment (2015): https://www.epa.gov/dwsrf/epas-6th-drinking-water-infrastructure-needs-survey-and-assessment

IWRS – Recommended Actions

Several recommended actions in the Integrated Water Resources Strategy (IWRS) address water quantity and quality information needs including:

- 1.A Conduct Additional Groundwater Investigations
- 1.B Improve Water Resource Data Collection and Monitoring
- 1.C Coordinate Inter-Agency Data Collection, Processing, and Use in Decision-Making
- 2.B Improve Water Use Measurement and Reporting
- 5.A Support Continued Basin Scale Climate Change Research
- 6.A Improve Integration of Water Information into Land Use Planning (and Vice Versa)
- 12.A Ensure the Safety of Oregon's Drinking Water

Storage

Why It Is Important

Water storage will continue to be essential in the face of a changing climate. The volume of water stored as snowpack is projected to decrease by 30% by mid-century and by 40–50% by late-century in the Pacific Northwest under low to high carbon emissions pathways (Mote et al., 2014). A well-maintained, safe and modern water storage infrastructure supports Oregon's economy, hydroelectric generation and is especially vital for those communities that rely on stored water for drinking water, agricultural and recreational needs.

What We Know

Across Oregon, about 1,200 reservoirs (that are 10 feet or more in height and store more than 9.2 acre-feet) are estimated to collectively store about 13,300,000 acre feet of water behind dams. Of those dams, approximately 950 are state regulated, and 234, including most of the largest dams, are federally regulated.

US EPA's 2015 survey of drinking water providers identified $1 billion in needed storage project investments in Oregon, and the League of Oregon Cities survey identified 73 communities with similar water needs.

There are over 200 (out of 351 total) communities in Oregon that serve less than 2000 people; of these communities, few have reservoir storage for more than 3 days.

Gaps in What We Know

While we know the total volume of water stored in snowpack will decrease, we do not yet know what that means for water availability in terms of water basins and timing of water runoff.

We do not know the rate of sediment loading going into most of these reservoirs, or the rate at which we are losing storage capacity. We do have information on streams subject to debris torrents on state and private forestlands (ODF), but have very limited direct information on how fast sediment is filling most reservoirs.

There is limited understanding of total groundwater storage capacity, current levels, and recharge capacity. There is limited understanding about where current land use and projected activity pose a risk to groundwater recharge.

We have incomplete information on the forest structure, conditions, and locations most likely to retain snowpack as long as possible into the spring, which forested areas have already been treated and/or restored, and which areas are NEPA-ready and could be restored.

The state's inventory of potential dam storage sites includes very few off-channel sites. Off-channel sites have much less effect on fish and aquatic life, so could be the focus of future investigations.

We need more complete information on current natural storage locations (e.g., alpine meadows, wetlands, near-surface groundwater and natural groundwater recharge areas.

Most state-regulated, high-hazard dams still need to be assessed for seismic resiliency, structural integrity, and spillway capacity to pass flood flows. Evaluations also need to be done for the 146 state-regulated significant hazard dams. These assessments could result in more dams being classified as "poor" or "unsatisfactory." For the privately owned dams that are in poor or unsatisfactory condition, the OWRD does not have a good estimate of the cost to address critical safety improvements. Individual engineering assessments would need to be conducted.

IWRS Recommended Actions

Several recommended actions in the IWRS address water storage needs including:

- 5.B Assist with Climate Change Adaptation and Resiliency Strategies
- 7.C Ensure Public Safety/Dam Safety
- 10.B Improve Access to Built Storage
- 11.A Improve Watershed Health, Resiliency, and Capacity for Natural Storage.

Conveyance / Transport / Delivery

Why It Is Important

Water is moved via pipes, canals, pumps or streams and rivers downhill from point A to point B or uphill from Point B to Point A. Transporting water does not include strategies that source or store water, or that treat water. Transporting water includes the movement of drinking water, industrial water, wastewater, and irrigation water.

Water transport also includes water to support the movement of fish and wildlife in streams and rivers. Just as water needs to move downstream through a pipe without blockages to a treatment plant, fish need to be able to move upstream and downstream without barriers to upriver spawning grounds or downriver to the ocean.

What We Know

In Oregon, there are thousands of miles of pipes and canals, including pumps and drains that move water to serve almost 90,000 water rights and a population of over 4 million people. Many of these engineered transport systems of pipes and canals are several decades old, some upwards of 100-years old. US EPA's 2015 survey of drinking water providers identified $3.7 billion in needed distribution system investments in Oregon over the next 20 years.

Streams need to have adequate water and freedom of movement to allow fish and other ecosystem functions to move and flow where needed. In Oregon, instream water rights allow for movement of fish, pollution abatement, and recreation. In addition, Oregon has identified 600 priority fish passage barriers out of 52,780 known artificial passage barriers.

A recent tide gate inventory identifies approximately 1,000 tide gates in the lower Columbia and along the coast. In Oregon, tide gates are commonly used to control water in tidally influenced areas along the coast and lower portions of the Columbia River Basin, but can also impact estuaries and prevent fish from migrating upstream.

Gaps in What We Know

Most of the information on water pipes and canals sit with local municipalities and special districts. They may know the location of many of these pipes and canals, but less information is available on their condition (e.g., water lost to leaks or gained from groundwater seeping in, frequency of service loss from failed pipes, or remaining life).

Tide gates serve a critical role in protecting Oregon's coastal communities, public infrastructure, and agricultural land. A state-wide inventory is still in the process of being finalized. Even with an inventory of tide gates, limited information is available about condition and function.

There are similar issues with Oregon's levees. While dikes and levee-like landscape features have been mapped comprehensively along the coast, and the lower Columbia River, the inventories did not assess construction methods or intent of these features, and do not contain information regarding feature condition

Oregon has instream water rights on some streams for recreation, pollution abatement, and maintenance for fish and wildlife and their habitats which vary by priority date and location. The state, however, does not know how effective the instream water rights system is in meeting the needs of fish and wildlife, or how fish and aquatic wildlife populations and their habitat will be altered by climate change. While Oregon has identified 52,780 known fish passage barriers, very little information is known about the condition of most barriers or the passability of these barriers for fish.

Larger public water systems typically have master plans and asset management plans to identify the location, age and condition of piping and to prioritize and plan for replacement. Less is known about smaller public water system needs. As of 2018, larger public water systems are required to include in Master Plan updates an assessment of risks and a mitigation plan related to a Cascadia-type earthquake. The costs for mitigating these risks is unknown but will be determined as plans are updated over time.

IWRS Recommended Actions

Several recommended actions in the IWRS address conveyance/transport/delivery needs including:

- 5.A Support Continued Basin-Scale Climate Change Research Efforts
- 5.B Assist with Climate Change Adaptation and Resiliency Strategies
- 5.5A Plan and Prepare for Drought Resiliency
- 7.A Develop and Upgrade Water and Wastewater Infrastructure
- 10.A Improve Water Use Efficiency and Water Conservation
- 11.D Protect and Restore Instream Habitat and Habitat Access for Fish and Wildlife

Treatment

Why It Is Important

Water treatment ensures the water we use to drink, irrigate crops, and release back into streams is clean. Prior to 1970, water quality conditions were much worse than they are today. Wastewater and drinking water treatment facilities were extensively upgraded in the 1970s and 1980s dramatically improving water quality. Now we have better treatment technology available to meet current and future needs for water uses, protect human health, and ensure functioning ecosystems.

What We Know

There are 215 centralized wastewater treatment systems serving 3.6 million people.[3] There are 2,699 public drinking water systems[4] serving more than 3 million people. Seven Oregon municipalities are using both natural and built infrastructure to clean wastewater.

i. Wastewater Treatment

In a 2016 survey of member cities, the League of Oregon Cities projected a need of $7.6 billion to address municipal drinking water and wastewater infrastructure needs over the next 20 years. Oregon's Clean Water State Revolving Fund has financed over $1 billion over 30 years in loans to municipalities investing in wastewater and storm water improvements as well as irrigation districts for improving the transmission of water for agricultural uses. Costs can include capital construction and maintenance, transmission, storage, treatment, and distribution. These costs involve routine construction and maintenance, and do not include the billions of dollars' worth of seismic retrofits and emergency preparedness efforts, and infrastructure investments that Oregon needs to undertake in the coming years.

DEQ has information on the location of facilities covered under many NPDES permits, which includes industrial, municipal wastewater and municipal storm water for Oregon's largest communities. DEQ also has water quality information for all of Oregon's watersheds from various sources across the state.

As these investments are made, costs are passed on to ratepayers. In Oregon, 78 census tracts are at risk for rate affordability where sewer treatment costs exceed 2.5% of household income, and where there is a cluster of households with income below $35,000.

ii. Septic System Treatment

In Oregon, 35% of the population (or about 1 million people) treat their wastewater via on-site septic systems (ASCE, 2010).

iii. Drinking Water Treatment

OHA has an inventory of the regulated public water systems in the state. While many

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[3] USEPA identifies 182 publicly-owned wastewater treatment plants (down from 215 in 2008).

[4] These are systems subject to the Safe Drinking Water Act (ASCE, 2010). 882 are community systems serving 3 million people. 346 are non-community systems serving schools or workplaces with independent water supply systems. 1,471 are transient non- community water systems (parks, campgrounds, restaurants). 921 are private very small water systems serving 4-14 homes. 600,000 people get drinking water from individual domestic wells (about 205,000 licensed wells + 150,000 unlicensed wells) not covered by state or federal drinking water standards.

ground water sources require no treatment to meet drinking water standards, public water systems served by surface water typically require disinfection and filtration. In addition, ground water sources that do not meet standards or that are under the influence of surface water also require treatment. Of the 3,400 public water systems in Oregon, 1,442 have some form of treatment system.

USEPA's 2015 survey of drinking water providersidentified$1 billion in needed treatment system investments in Oregon over the next 20 years. OHA and Business Oregon partner to fund drinking water infrastructure projects through Oregon's Drinking Water State Revolving Fund.

iv. Natural Systems Treatment

Wetlands, riparian areas, floodplains, and other natural systems can also treat and clean water. There are several wastewater treatment facilities who have incorporated natural treatment systems into their facilities including Roseburg, Prineville, Albany, Ashland, Eugene, St. Helens, and Clean Water Services in Tualatin.

According to the Oregon Watershed Restoration Inventory, through restoration activities such as replanting riparian corridors, enhancing instream habitat and dam removals, Oregon has restored 7,172 miles of riparian forest areas that not only provide habitat, but also act as filters and natural treatment. Although extensive, the Inventory does not include conservation actions funded by USDA Farm Services Agency or Natural Resources Conservation Service. An example of a state program that supports riparian restoration is the joint state-federal Conservation Reserve Enhancement Program. Between 1999 and 2017, this program has enrolled over 39,000 acres in long-term agreements that protect and restore riparian areas.

DEQ invests in non-point pollution projects via its 319 program. The program distributes grant funds to NGOs and government agencies to conduct water pollution control projects that reduce nonpoint source contributions to Oregon waterbodies. Projects must be designed to achieve measurable water quality improvements. Funded projects are required to report back any measurable shifts in environmental improvement to DEQ.

The state's Coordinated Streamside Management initiative has identified 2,174 watersheds with agricultural activity. Of these, 1,018 watersheds were identified with water quality impairments. This initiative also identified 812 watersheds as priority for fish restoration. ODA completed Strategic Implementation Areas(SIAs) in 29 watersheds from 2013 to 2018 and will be adding approximately 30 watersheds in 2019. ODA evaluates landscape conditions in these areas and works with partners and producers to maintain and improve water quality. In addition, ODA is working with state agencies and local partners to design and implement monitoring plans in each SIA.

Gaps in What We Know

We do not have an up-to-date and complete inventory and assessment of the location and condition for municipal and non- municipal waste water, storm water, and drinking water treatment systems. Note: EPA has currently discontinued this inventory and the latest published report was in 2012. DEQ's data set on capital investments needs for publically-owned treatment works is out-of-date. The State does not have a complete inventory of the locations of private water treatment facilities, and their effect on water quality. We also need a complete inventory of streamside vegetation conditions, particularly along agricultural lands. This will help agencies and partners prioritize work and identify opportunities for uplift.

IWRS Recommended Actions

Several recommended actions in the IWRS address water treatment needs including:

- 7.A Develop and Upgrade Water and Wastewater Infrastructure
- 7.B Encourage Regional (Sub-Basin) Approaches to Water and Wastewater Systems
- 11.A Improve Watershed Health, Resiliency and Capacity for Natural Storage
- 12.A Ensure the Safety of Oregon's Drinking Water
- 13.E Invest in Implementation of Water Resources Projects

Flood Water Management and Coastal Impacts

Why Is It Important

Flooding is a known hazard, which occurs at various intervals and at various magnitudes throughout the state. Yet, while flooding can and does create hazards, periodic flooding also creates and maintains important habitat for fish and wildlife, enhances soil makeup that benefits plant growth, and provides a filter for pollutants. Over 2 million acres in Oregon are within the special flood hazard area mapped by the Federal Emergency Management Agency(FEMA). Long range Oregon weather forecasts predict more frequent occurrences of flood events, especially west of the Cascade Crest.

Flood water management includes: avoidance strategies to keep people and businesses out of harm's way; regulatory measures to ensure that what is built will withstand flood forces; and flood control infrastructure, to reduce the velocity and elevation of floodwaters so that, when floods occur, the human and economic impacts are reduced. For fish, flood water management means preserving access to slower moving water through access to floodplains and off-channel habitat when rivers are raging.

Maintaining the storage and transport functions of natural floodplains decreases the need for manmade flood control structures and benefits fish and wildlife and their habitats.

What We Know

Climate change is predicted to increase the frequency of flood events. Oregon has 22 communities with FEMA-identified high risk flood hazard areas. Since 2006, Major Disaster Declarations for events that include flooding resultedin$185 million in uninsured damage to public infrastructure and emergency response cost to local governments. This figure represents only a portion of the real economic, cultural, and social costs of these events.

Some information is available to support flood water management. Oregon has completed a study to evaluate the susceptibility of rivers to channel migration based on generalized basin characteristics, but very few river specific studies have been conducted. State data identify the location of 2,000 miles of human created dikes and levees that affect or constrain the movement of water in estuaries and along the Columbia and Willamette Rivers. Federal data detail the location and condition of levees and floodwalls built specifically to protect communities. Yet both the state and federal data sets are incomplete. Dams also provide important flood management functions. Most dams operated by the Corps of Engineers are managed for flood control. Most other dams provide only limited flood protection. Unsafe dams can cause catastrophic flooding if they fail.

Along the coast and lower Columbia, there are approximately a thousand tide gates. Many protect lands from on-shore flooding and allow for agriculture, development and other types of land use in areas historically subject to tidal inundation. An inventory planned for completion in 2019 will improve our understanding of where tide gates are, their flood mitigation function, and their impact on habitat access. OWRD has an interactive web mapping tool to estimate the magnitude of peak discharges at various frequencies for rural, unregulated streams in Oregon. This tool can be used by scientists, engineers, and land managers to obtain information needed to make informed decisions about development and restorations efforts in or near watercourses. In addition, OWRD's Peak Flow Program can help to estimate the frequency of flood events within watersheds up to 500-year floods.

Oregon has additional data on Debris Torrent Prone Streams and High Landslide Hazard Locations. Like flooding, these hazards are associated with high levels of rainfall and snowmelt and can impact municipal water systems when debris and sediment enter waterways. Data also are available to support natural infrastructure solutions to floodwater management. DLCD and ODFW developed the Oregon Shore Zone Project to plan for the dynamic changes taking place along the coast (e.g., increasing storm frequency and coastal erosion). The Oregon Conservation Strategy identifies altered flood regimes as a Key Conservation Issue and outlines a series of goals and specific actions to address the issue. DSL also maintains data on removal fill permits for streams and wetlands.

In coastal areas, sea level rise and storm events will contribute to flooding. We know communities have key infrastructure at risk from sea level rise and coastal erosion. Oregon has created models that predict changes to the inland extent of tidal waters and a risk exposure analysis for infrastructure and other assets in estuaries has been completed. The potential effects of erosive wave action on the coastline has also been modeled.

Maps of land use, land cover, and zoning are available statewide. These data aid our understanding of how floods, and other hazards associated with severe rain events, might affect the built and natural landscape, and in turn, how the built environment influences flooding and other hazards.

Gaps in What We Know

There is no state agency that deals with flood mitigation/flood control and other technical aspects of flooding. DLCD coordinates the FEMA National Flood Insurance Program which provides minimal flood management. DOGAMI has mapped floodplains as part of risk map. But there is no agency that handles overall coordination of flooding issues or any other aspect of flood water management especially from a technical standpoint.

Uncertainty in precipitation information coupled with climate change and more extreme precipitation events has significant implications for the safety and resiliency of water resources infrastructure. The design of dams, wastewater facilities, bridges, and culverts depends on accurate precipitation estimates for extreme events. The National Weather Service can update precipitation frequency estimates if it receives funding for such work. Oregon now relies mostly on information from 1973, with a very partial update completed in 2008. An analysis of precipitation frequency information with resulting maps and tables would provide designers and operators of water infrastructure with the most current and reliable precipitation frequency estimates to withstand floods.

While Oregon has over 600 stream gages, there is potential to improve spatial coverage in areas with little data or significant water management challenges. More stream gages are needed in Oregon to improve the accuracy of flood maps and tables across the state.

We need to update our data bases and maps to reflect improved topological data.

We do not have a statewide inventory of the location and condition of all levees and dikes that were built to protect developed areas and converted agricultural lands from flooding.

Information on coastal erosion rates has not been translated into a risk exposure assessment for public infrastructure.

IWRS Recommended Actions

Several recommended actions in the IWRS address flood water management and coastal impacts including:

- 5.5B Plan and Prepare for Flood Events
- 5.5C Plan and Prepare for a Cascadia Subduction Earthquake Event
- 7.A Develop and Upgrade Water and Wastewater Infrastructure
- 11.A Improve Watershed Health, Resiliency, and Capacity for Natural Storage

Natural systems for fish and wildlife

Why It Is Important

Natural systems can provide many of the same functions for people that built infrastructure does—storing water, moving water, and cleaning water, and in some cases at a lower cost. In addition, natural systems also support the fish and wildlife that have thrived in Oregon since time immemorial—salmon that are part of culture and history, beaver that act as nature's engineers, and elk that rely on healthy streams and forests, among others. All Oregonians benefit from understanding and protecting the water needs of fish and wildlife as our cultural values, economic vitality, and enjoyment are tied to these ecological systems.

What We Know

As climate change causes increases in temperature and changes to precipitation patterns, we know that many fish and wildlife habitats will be impacted. For example, climate models suggest the frequency of extreme winter precipitation may increase, which risks scouring fish eggs buried in the streambed and displacing juvenile fish. Rising air temperatures are also expected to cause earlier snowmelts, which will shift peak annual streamflow to earlier in the season and reduce the quantity of late season flows. This may cause a mismatch between the timing of flows that trigger fish movements and historic fish migrations. Combined with increased air temperatures, these changes also risk exposing native fish to lethal stream temperatures. As a result, cold-water refuges and healthy riparian habitats will continue to be critical to maintaining many salmonid and cold-water fish populations. Coupled with drought and increased fire risk there may be additional factors that challenge natural systems to support water quality, fish and wildlife, and human use of water. The Oregon Conservation

Strategy identifies water quality and quantity as key conservation issues critical to support "at risk" species and their habitat needs. We know that currently there are streams that do not have adequate instream flows or water temperatures to support fish and wildlife during some parts of the year.

Another important strategy is maintaining forestland to ameliorate potential impacts from climate change. Oregon's Forestry Program supports the goal of protecting and improving the physical and biological quality of forest soil and water resources and conserving diverse native plant and animal populations and their habitats. Nationwide, the total area of private forestland has been gradually declining since the mid-20th century. In contrast, as of 2009, Oregon has maintained 98 percent of all nonfederal land and 98 percent of private land that was in forest, agricultural, and range land uses since 1974.

In addition to adequate instream flow, fish must to be able to make their way past artificial barriers to get where they need to go. In Oregon, we have 52,780 known fish passage barriers. ODFW has identified 600 of these as a high priority for removal. The estimated cost to remove these priority barriers, ranging from $10,000 to upwards in the millions, is highly variable based on type of structure, size, amount of fill, and the hydrological characteristics that determine the constraints of construction.

DLCD and ODFW also developed updated habitat maps of all estuaries in Oregon using the Coastal and Marine Ecological Classification Standard (CMECS). ODFW also maintains numerous data sets related to fish and wildlife and their habitats, including maps of Strategy Habitat, such as wetlands and estuaries, identified in the Oregon Conservation and Nearshore Strategies.

Gaps in What We Know

In order to address current and future water challenges it is critical to understand the needs and vulnerabilities of fish and wildlife species relative to stream habitat, temperature, and flow, now and in a future of climate change.

ODFW is taking a statewide approach to inventory species' needs and compare them against both current protections and those necessary under a future of climate change. For example, we do not have a statewide map identifying the location of cold-water resources or places that provide refuges for species when stream temperatures are elevated. The effectiveness and extent of current instream protections have not been evaluated across the state nor have they been done at a scale that can be used in local planning efforts. We don't know the Location and extent of aquatic and riparian invasive species that degrade water quality and habitat conditions. We also have not identified the highest priority habitats that will sustain species over time and the risk those habitats face with a changing climate. The ODFW and

OWRD streamflow restoration priorities were developed 20 years ago, and our understanding of species distribution, species vulnerabilities relative to stream temperature, and flow has greatly progressed since then.

Oregon's reliance on hydroelectric generation requires a closer look at the impacts to natural systems. It may be beneficial to include a systematic inventory of hydroelectric generation plants by basin and stream, as they (may) affect water flows, timing of releases, and temperature in streams with cold-water fisheries. FERC relicensing of hydroelectric plants (often/almost always) triggers requirement to improve/add fish passage, it will be useful to know when various licenses are expiring. And finally, adding power to unpowered dam would similarly (almost certainly) triggers a requirement to improve fish screen on intake, and/or allow/improve fish passage, so it would be useful to have a cross-referencing inventory of unpowered dams where hydroelectric development is being seriously considered now or in the future.

Oregon is challenged to quantify how existing regulatory or non-regulatory programs contribute to overall function and maintenance of water quality and fish and wildlife resources. Oregon does not have specific data on how programs implemented by many state agencies may already contribute to improving and/or maintaining water quality and fish and wildlife.

Knowing more about how ecosystems, fish and wildlife interact and may benefit from improvements to the natural infrastructure is fundamental to this long-term vision.

IWRS Recommended Actions

Several recommended actions in the IWRS address natural systems for fish and wildlife information needs including:

- 3.A Determine Flows Needed (Quality and Quantity) to Support Instream Needs-Dependent Ecosystems
- 3.B Determine Needs of Groundwater
- 5.B Assist with Climate Change Adaptation and Resiliency Strategies
- 11.B Protect and Restore Instream Habitat and Habitat Access for Fish and Wildlife
- 11.C Prevent and Eradicate Invasive Species
- 11.D Protect and Restore Instream Habitat and Habitat Access for Fish and Wildlife
- 11.E Develop Additional Groundwater Protections

Funding

Why It Is Important

For the last 50 years, we have collectively underinvested in our built and natural water infrastructure. For example, many of our dams, levees, and tide gates are aging, and we lack the information necessary to evaluate their safety. Without a coordinated effort to strategically finance water system projects, opportunities to leverage grants, loans, and other investments could result in reduced planning and implementation capacity. Furthermore, without baseline knowledge around on-going and future investments, we run the risk of disjointed and duplicated efforts.

What We Know

We know that in a 2016 survey of member cities, the League of Oregon Cities projected a need of $9 billion to address water and wastewater infrastructure, and $7.6 billion in water quality and water supply infrastructure needs over the next 20 years. Many of these cost projections involve routine construction and maintenance, and do not include the billions of dollars needed for critical seismic retrofits and emergency preparedness.

We know that there is a variety of federal, state, local, and nonprofit funding opportunities to assist in the planning and implementation of water projects and studies. Water credits, grants, loans, and state revolving funds are just a few examples of the water project financing options available to municipalities, counties, special purpose districts, Native American Tribes, nonprofit corporations, and private citizens. Unfortunately, many communities are unaware of the funding opportunities or do not have the staffing to apply.

i. Federal

The USDA provides multiple planning and implementation grants for water and wastewater systems, built infrastructure repair and improvement, watershed projects and infrastructure upgrades, farmland energy efficiency improvement, agricultural conservation and innovation, and emergency mitigation. The USDA Rural Development offers grants and loans for rural areas.

The Natural Resources Conservation Service (within USDA) provides funding for on-farm water conservation efficiencies and irrigation system improvements for irrigation districts.

The Federal Emergency Management Administration (FEMA) also provides funds for pre-disaster emergency planning, primarily for climate resiliency and flood management projects.

The Bureau of Reclamation, US Economic Development Administration and the Department of Interior offer grants that focus on promoting community based, long-term economic development projects and improving economic stability in historically marginalized communities. In general, these grants are broad-based and require community widespread community support. The Bureau of Reclamation's WaterSMART program offers grants for small scale water efficiency projects, planning and marketing strategies, and allow for cost sharing opportunities. The EPA administers loans to be leveraged with the DEQ State Revolving Fund program that primarily support drinking water infrastructure projects. EPA also has funding available through their WIFI program for water and wastewater infrastructure through their WIIN Grants for small and disadvantaged communities and for brownfields to asses and implement site water quality clean-up actions.

The Department of Housing and Urban Development offers Community Development Block Grants for infrastructure.

ii. State

The Oregon Watershed Enhancement Board (OWEB), Department of State Lands (DSL), DEQ, and DLCD each offer a range of grants and loans for, surface and groundwater quality and infrastructure improvements, as well as restoration and watershed improvement and monitoring projects.

The Oregon Water Resources Department offers Feasibility Study Grants to investigate the feasibility of water conservation, reuse, and storage projects. Funding to develop water resources projects with economic, environmental, and community benefits is available through Water Project Grants and Loans. Planning has been supported through a pilot phase of Place-Based Planning grants.

DEQ's Clean Water State Revolving Fund provides loans and bonds for planning, designing and implementation of natural and built infrastructure projects. DSL also administers the Removal-Fill Mitigation fund, which provides revenue to facilitate wetland mitigation.

The Oregon Health Authority and the Infrastructure Finance Authority (Business Oregon) administer the Safe Drinking Water Revolving Loan fund for drinking water infrastructure and source protection projects. These agencies also provide Community Development Block grants and the Water Fund, to finance publically owned water system improvement projects.

ODFW offers both a cost-share program and tax credit to assist with installation of fish screening devices and passage facilities.

iii. Other Funding

Rural Community Assistance Corporation environmental infrastructure loans provide support for built infrastructure feasibility studies, and project pre-development, planning, and construction.

The League of Oregon Cities, Association of Oregon Counties, and Special Districts Association of Oregon each have funding mechanisms for their members.

The Energy Trust of Oregon (Pacific Power and Portland General Electric) and some BPA-served public utilities offer incentives for improvements in on-farm irrigation systems, irrigation pumps and controls. Energy Trust Funding and other energy incentive funding is available/has been used as part of total funding packages for irrigation delivery piping projects that add small hydroelectric facilities.

There may be other energy related incentives from utilities for energy efficiency for pumping and water treatment, and for anaerobic digestion biogas and other renewable energy projects at water treatment plants.

Private foundations have begun to offer funds to address community capacity and critical infrastructure needs in some areas.

Gaps in What We Know

With the increasing number of investments that need to be made, it is critical to leverage financing, planning, and implementation capacity to maximize the impact of each water project. In order to strategically implement water projects and investments, we must first identify where there are gaps in funding, in terms of geography, project type, implementation and technical capacity, and state of development (planning, design, implementation, and post- project monitoring. We must also identify where and how gaps may occur due to eligibility criteria. We need this information to help identify where critical investments need to be made in the near, intermediate, and long-term timeframe.

It is also important to address mechanisms for better data sharing amongst federal, state, local, and private entities, to help identify the needs more accurately and reduce disjointed and duplicated investments.
The state is looking to work with our partners – federal and local agencies, Tribes, industry and conservation to help identify the current and foreseeable future challenges, opportunities, and strategies used to finance water projects. There is a critical need to identify innovative mechanisms that expand and maximize the efficiencies of existing and future water funding opportunities.

IWRS Recommended Action

Several recommended actions in the IWRS address funding needs including:

- 13.B Fund Water Resources Management Activities at State Agencies

- 13.C Invest in local or regional Water Planning Efforts
- 13.E Invest in Implementation of Water Resources Project

Conclusion

This memo is intended to be a dynamic document that will be continuously revised based on stakeholder feedback. The information needs and initial investments outlined below give the State and local government together with industry and conservation partners the information they need to invest wisely in water systems both built and natural that reliably meet current and future needs.

Table 1. Identified data gaps and assessment needs: water quality and availability, storage, conveyance/transport, treatment, flood water management, and ecosystems, fish, and wildlife (funding TBD).

Data Gaps	Priority Timeframe
a) Ground Water basin studies and comprehensive view of groundwater	Near term
b) Information about how much water is used	Near term
c) Likely spatial and temporal patterns due to impacts of climate change (flow, temp, persistence of habitats)	Near term
d) Number and type of safety deficiencies associated with state regulated dams and the cost to address these issues	Near term
e) Water quantity in terms of changes to volume and timing of run-off for different basins due to climate change effects	Near term
f) Total groundwater storage capacity, current levels, and recharge capacity	Near term
g) Conditions of conveyance systems (e.g., pipes and canals)	Near term
h) Statewide Tide gate Inventory	Near term
i) Assessment of instream protection and instream demand	Near term
j) Assessment of supply vulnerabilities and future increased demand for	Near term

drinking water, irrigation, and industrial water supply.	
k) Inventory, location and assessment of condition for municipal and non- municipal waste water systems, including septic systems	**Near term**
l) Inventory, location and assessment of condition for municipal and non- municipal storm water systems.	**Near term**
m) Inventory, location and assessment of condition for municipal and non- municipal drinking water supply treatment systems.	**Near term**
n) Gaps in state inventories of dikes and levees (federal and non- federal entities)	**Near term**
o) Gaps in federal inventories of the location and condition of levees and floodwalls built specifically to protect communities	**Near term**
p) Inventory of species, flow, temperature and habitat needs	**Near term**
q) Update streamflow restoration priorities	**Near term**
r) Recognize which communities are experiencing water access disparities (using existing data)	**Near term**
s) Update water scarcity models	**Near term**
t) Stream flow and temperature data (robust system of stream gages)	**Intermediate term**
u) Drinking water source water protection plans - Inventory and status	**Intermediate term**
v) Inventory of current natural storage locations that considers forest structure, conditions, and locations most likely to retain snowpack and winter precipitation.	**Intermediate term**
w) Inventory of potential off-channel storage sites including ecological considerations	**Intermediate term**
x) Location and quality of drinking water supplied by private domestic wells or water systems. Private wells and small unregulated water systems.	**Intermediate term**

y) Locations for habitat improvements that could benefit water quality	**Intermediate term**
z) Location-specific studies on stream segments with high and medium susceptibility to channel migration identified	**Intermediate term**
aa) Updated flood maps that reflect better topological information	**Intermediate term**
bb) Coastal erosion rates and risk exposure assessment	**Intermediate term**
cc) High water mark data set	**Intermediate term**
dd) Locations of cold-water resources	**Intermediate term**
ee) Better understand water insecurity challenges faced by communities and households by using proven survey methods	**Intermediate term**
ff) Complete map of Oregon municipal water systems	**Intermediate term**
gg) Statewide water quality assessment	**Long term**
hh) NPDES permits that describe discharges that affect water quality	**Long term**
ii) Opportunities for restoration based on information about natural storage locations	**Long term**
jj) Reservoir Sediment loading	**Long term**
kk) Assessment of infrastructure hazards associated with channel migration	**Long term**
ll) Statewide mapping survey of points of diversion and water use	**Long term**
mm) Riparian vegetation conditions	**Long term**
nn) Precipitation Study	**Long term**

Technical Workshop Meeting Summary (pages 408 – 443)

Technical Workshop Meeting Summary

To engage in a conversation about the management and data needs of water managers across Oregon, the state hosted a full day technical workshop to stage that discussion. In total, 100 people were in attendance, representing cities, counties, federally recognized tribes, environmental groups, watershed councils, irrigation districts, and many more. We discussed the information needed to address specific water management questions. A natural resource agency panel gave an overview of data that the state has, and data gaps, which framed a series of breakout groups focused on data around future trends, water quality, water availability and use, the environment, and funding.

The bullet points below were taken from the large group conversations and associated flip chart notes. They do not necessarily represent all the viewpoints in the room, and are not intended to be shared opinions across the entire group.

What questions do water managers need information to support?

Large Group Discussion

- Where does the money come from for big infrastructure projects?
- How do we develop plans to replace aging main infrastructure, not likely to stand an earthquake?
- How do we secure water supply for the future, both quality and quantity
    - What does the funding look like
    - What regulatory structure are we working in
- How much water will we have and when?
- Can out farmers get ahold of the water they need
- What codes do we need to abide by?
    - Code and policy modifications needed to upgrade our legal framework for water availability
- What will happen to agriculture as climate change continues (concerns around food)
- What do water users actually need to maintain central functionality to maintain their work?
- What do water user ACTUALLY need? Want vs. need
- What are emerging contaminants in our water systems?
    - Are they safe? How do we treat them?
- How do we educate the public about emerging contaminants?
- Need real-time stream gages to project impacts of climate change
- What role does county government play in overseeing disperse water systems, especially in low-income areas?
    - The smaller, private, and other water companies and districts do not have resources. Many of these systems are leaky, old. How can the state work with

county to help with this? Who is in charge?

- Funding is the primary issue
- Metrics talked about for overall water availability are tied to climate change.
  - Would be great to have real-time stream gaging for all major streams and tributaries to create a water balance and determine what is available and what is being used
- Gaging stations closed by USGS and counties because of cost. Many of these long-term records are lost – the money really isn't that much.

Small Group Discussion

- How can we design a system to allow for groundwater recharge? Where will that recharge be beneficial?
- Where do we need to maintain functions currently provided by for flood irrigation? What are those functions?
- Where can we work in forest to improve water?
- We need flow and temperature data to determine impacts and opportunities to reduce impacts to both natural systems and agricultural systems
- I need constantly updated climate modeling that is scaled to my basin
- I need groundwater data to understand the groundwater/surface water interaction
- What changes need to be made in water user actions/education/attitude/etc. to match existing/future water supply?
- Designing an irrigation conveyance system and needing to know specific points of delivery/places or use
- Understanding so water use on a section or river to identify potential management/infrastructure
- Quantifying the impact of on the ground activities (e.g. infrastructure upgraded both built and natural) particularly assigning econ economic value to non-use impacts (e.g. improved habitat) so that we can receive federal funding.
- Where to regrow forests? Where to maintain buffers? Where to provide additional shade
- Infrastructure/system improvements or changes needed to match future water conditions need to know those future water conditions (amount timing how different from past, etc.)
- Water supply (and potential water use limitations/restrictions) for the upcoming year
- What will future hydrograph look like so that we can project future water supplies when designing an irrigation system?
- Where to co-locate power, fiber, mobilize data infrastructure with water infrastructure?
- Coho/chinook smolt survival as result of large wood debris projects

- What system upgrades need to be made, at what priority levels, timeline etc.?
- Need for more flow gauges in smaller streams and existing flow gauges are on large streams
- Where are all the fish passage barriers for salmon and steelhead?
- Need to know what operational or infrastructure changes will be required by state/federal regulators with enough lead time to build investments, make changes etc.
- Future demand/climate streamflow/water use data
- How to keep irrigated ag moving forward and staying viable along with other water needs
- Infrastructure funding for private water systems.
- Business or has done per their staff
- Aging infrastructure conservation funding support from state on water monitoring
- What do water users actually need to maintain essential functionality of the activity they are using water for?
- Where to focus investments for watershed health?
- Possible info: Forest health and the relationship between forest health and upland water storage and stream/spring flow
- Farmer/rancher and relationship between soil health and water storage and stream flows
- More measurements on water budget
- Method for prioritizing necessary "system" improvements
- What ware our water needs? How much water available? How much water would be available in future?
- How much water can I conserve?
- What are the water demands in my community?
- Management decisions: Communicate planned uses changes to others and anticipate consequences
- It is as much about generating new data or implementing actions based on data we already have and understand?
- Will definitions of beneficial use change in 100 years?
- Is there a contamination threat to a water source?
- Can we change water use through education?
- Are there reliable models for how water availability will change with climate change?
- What data exists? Unreliable data better than no data? 80/20 rule: so/80 rate 20% of efforts result in 80% of gain
- Duplication of effort? Consolidation of agencies sharing data GIS platform watershed/basin approach permits at city/county
- How do we manage water loss old infrastructure leaks on customer side who do not

care that there is leak

- Is new infrastructure "properly" built?
- MGMT issue uncertainty of regulatory compliance for innovative approaches for innovative approaches to achieving water vision goals
- Do existing rules (written in the past) apply to today's conditions?
- How do we build trust among those in conflict?
- How do we get other districts water partners to work together? Share info partner in projects? Equipment needs
- How can we manage stormwater to simulate natural hydrology, especially in urban areas (huge effects on water quality and quantity and aquatic systems)
- Water resources environmental benefit/impacts of maximizing in stream flow vs water reuse?
- 70% of the state has had water rights adjudicated but the Umpqua has not. There not good data on water usage in the basin and allocations for different water needs.
- What is the water usage for the Umpqua basin and current water quantity predictions?
- Managing for water quality for all users data gaps in water rights who is using it and how much
- Managing for voter quality accountability for ignoring 303d listed bodies of water
- How will local government engage in a process to prioritize projects, collaborate/combine resources to invest in projects that create positive collective multi-objective impacts (WQ floodplain fish health etc.?)
- What "natural infrastructure" projects will address identified needs where are they how do we participate how do we get funding?
- Need to be able to determine how what we will plan to address water quality needs and requirements of wastewater and stormwater in a cost effective way affordable to the public that will provide maximum benefit to rivers streams watersheds economy and communities 5,10,20,100,years
- River system needs statewide regulatory framework that will enable investments in projects that meet objectives of water vision how regulatory certainty will be provided etc.
- Where is water over allocated? Which basins or streams
- What are minimum preserve water quality?
- Where are water rights misused or invalid can they be cleaned up?
- How can future development better accommodate restored stream floodplains and wetlands
- Can we shift from beaver eradication to population restoration?
- How can we shift water use dialogue from a rural/urban debate?
- With diminished snowpack can we turn our soils into better "reservoirs"?

- Data that accurately reflects how municipal planners can allow growth
- Planning guidelines for new off channel storage
- Intent of state government to invest in water planning and infrastructure improvements?
- Purposeful communication with citizens about backup plans in catastrophic events. "Is there a plan b?"
- State needs to figure out how to integrate each agency's decision process and be able to support the type of permitting and regulatory framework that will enable and facilitate types of infrastructure and environmental investments needed to solve problems
- Data needed for state identify how to create regulation framework to efficiently and effectively support outcome we need
- Drought planning data flows, understand basin hydrology, climate change, surface water and groundwater
- Adapting to climate change data projectors snow runoff surface water groundwater
- Algae bloom management data environmental conditions water quality upstream drivers of blooms
- Tributary water quality management data flow soils erosion
- Hydrogeology how do you plan for long term resiliency if you don't understand how water moves through the system?
- Environmental compliance flows hydrology basin scale surface and groundwater integration fish persistence thermal impacts
- Basin resource management data to inform policy management hydrology meteorology hydrogeology
- Better understand hydrology data and data analysis
- Protection and restoration of stream flows
- Need base peak and ecologic flows and demand forecasts
- floodplain hazard mitigation floodplain storage protection and restoration data to support floodplain mapping
- Better understanding of groundwater/surface water interconnections and how this effects watershed hydrology
- WQ compliance data. What do fish need to swim and thrive temp and habitat equality
- Sustainable groundwater management groundwater studies and measurement needed
- Timely information back from state agencies regarding water rights
- Public information how do we make the general public actually care? How do we get information packaged in an easily digestible format?
- Funding priorities public benefit for public monies
- water use management need water use data water availability stream gauge and accurate water rights data and location

- Aquatic habitat interventions where are -----blank---- when?
- How can WRD manage the ongoing uncertainties regarding water availability in the face of shifting environmental regulations of the natural and built systems
- Irrigation modernization ensuring it's not just using and piping but is holistic and includes public benefits flow efficiency fish pop
- resolving complex water issues
- Climate change resiliency ecosystems communities farms recreation
- The translations of complex data into more digestible info for general public
- Data on agricultural water use in multiuse watershed what is the agriculture impact in terms of WQ and water supply?
- Green infrastructure is working? What hasn't worked? What context is important to consider when planning for these projects?
- Managing demand how can we use less water for domestic uses? Information on messaging and innovations to reduce domestic use
- Treatment new chemicals of emerging concern are always on the horizon. Where can I get information on how to adapt current treatment processes or on new processes that will help in the future
- Redundancy key for emergency management but some systems have no alternative sources what resources are available to systems that need to seek alternatives is a man source goes down?
- Removal of outdated dams and or infrastructure
- Water transport aging fish passage barriers bridges tide gates. Impact on roads emergency preparedness. Impact on wildlife. Funding
- Ocean impact (acidification) coast and bay PH carbonate chemistry temperature
- Freshwater bacteria(ag) sediment(forestry) pesticides temperature (industry) microplastics TMDL limits (DEQ)
- Lidar of coastlines and rivers. Somal or other mapping of seagrass and kelp beds. Mapping of habitats and adjacent land uses
- Our management decisions are often driven by the regulatory framework. i.e. HAB monitoring and treatment seismic standards water right acquisition
- Investment decisions are driven by funding sources around rates and admin burden
- Regulatory reassurance and recurring supplies water quality and infrastructure standards
- The Tualatin basin has a great model to coordinate date collection, management and turning it into information. It connects stakeholders on technical and policy issues. It includes state and local partners
- Key management decisions for drinking water is how to supply safe reliable drinking water to our future community? Our challenges are financial regulatory

- Ability to use treated waste water as municipal water treated efficient reuse regulatory hurdles
- Regulatory framework changes arbitrary and capricious make it difficult to plan
- Measurement of ag water withdrawals
- Ag water use is a huge part of the pie where are they in this conversation?
- Crops of the future what will be grown and how much water will be needed to supply them?
- How much water does my community truly have over time compared to our downstream neighbors when water rights are considered as water availability lessons
- Getting water to community post disaster or emergency event
- Develop a plan around the replacement of our main water reservoir (50yrs old) and the lines that go to it from our springs/water plant. Masterplan says RSV will not withstand quake
- Reached its life expectancy
- Pipes to it are the old asbestos pipe (50 yrs. old)
- No secondary water source
- To support and fund major infrastructure improvements in cities while planning and systematically diversifying water storage and use in light of climate change. Do we have all of our water storage needs (eggs) in one (dams) basket? and should we be looking at statewide storage and use differently than before
- Role of country government in coordinating water supply issues for rural and urban communities plus encouraging best practices of water use and protection on agricultural land and forests
- Periodic water spikes
- What is the cause? Tested for more than 10 years!! no single cause or source
- Understanding the energy impacts of a changing aquifer which implementing 680 po... energy use
- More prescriptive path for geothermal well implementation
- Designing a college campus with minimal water use
- Implementing the plan with limited funding
- Ensuring our implementation reaches the goal of a net zero water use campus
- Better water planning support information
- Funding sources available to support need/project identifies in masterplan beyond rate increase to consumer low interest loan etc.
- Ways counties can find funding for infrastructure and resilience also find expertise to identify data needs and interpretation of present water resource
- We should be making all the effort to reuse while we find new way to gather store and use the water we get.

- What water contaminant are coming from locations outside Oregon?
- China etc. What are the contaminants? How do local entities deal with these contaminants?
- What is the time of cost of water in my community? Are we charging companies the true cost? How much does it cost to clean and deliver water?
- Develop. Do we improve or not based on current and future water progress water budget
- Need for visions to guide decision making such that we don't lose sight of why we do things a certain way or see when we need to change. "Touchstones" that elevate contentious issues back to shared objectives vs fighting over tactics
- How will all future capital plans for (one water) drinking, storm, wastewater collectively impact single ratepayers
- How operationalize precaution principle? Upstream policy decisions that embody the precautionary principle to minimize the rate of introduction of new and emergent contaminants
- High priority need good asset inventories and management of natural and built water infrastructure so that we can maximize green infrastructure alternatives
- What are the risks to water resources and water systems from a changing climate? (Hotter, drier, wetter, etc.)
- How do large industrial projects like the Jordan cove energy project afford water quality equality
- 5 years-- identifying and preventing HABs cyanobacteria
- What are the future discharge regulations? ... related to facilities plans
- What is the future water quality? for... consumption discharge
- As the director of a public utility investing rate pay or money in clean water infrastructure I need clarity about DEQ regulatory direction
- Indicators for decision makers as in financial reporting and what has been created for salmon recovery in WA state... Assumes data are available and managers/others know what matters
- Need to understand how local decisions interface with regional and larger scale impacts e.g. may have great protective policies or regulations in one county or city but how does that negatively or positively impact adjacent counties... push polluters or certain development next door?
- 20 year facilities plan wastewater treatment and surface water we need certainty around regulatory requirements and ability to partner with nonpoint sources to achieve meaningful benefits to the watershed
- Secured capacity for present and future demands may not necessarily increase, but it must be stable.

- Seismic resiliency of source and source capacity, treatment storage and transmission infrastructure
- Funding and a plan for funding as infrastructure is repaired replaced and added.
- Meeting future regulatory requirements with the existing treatment facilities what must be built?
- How can we reconcile conflicting or siloed regulatory authorities and agency missions to get the one water?
- Do we have primary secondary and tertiary water supply resources? If so are there already demands on all of them?
- Any energy given to using the ocean as a water source? (Israel has done this well)
- Are the rural voices being "heard" as well as the urban voices?
- How do we work with our community stakeholders and regulators on dealing with WQ issues like PFAs mercury lead etc. That crop up and that we have to address right now but might not have the data or treatment capabilities yet.
- How to assess stream channel conditions and functions at a detailed level to guide developments related investments in stream corridors inside and outside UGB
- What communication tools and political leverage can we develop to bring muni interests and development/ag/forest interests into common cause for long term?
- Where do we need to put our R and D efforts? Which processes need more attention ex: stream temp, groundwater
- Understand the key metrics that drive watershed health conditions in urban and rural areas
- Link between water supply reuse program future trends in population growth and climate change and how do we balance/ prioritize decisions around those?
- Understand link between surface water shallow groundwater in rapidly urbanizing water shed to support base flow for fish wildlife riparian veg.
- How can we understand reserve instream water rights such that our investments in stream habitat in stream habitat enhancement structures still have water running by them
- What do we invest limited funding into? Conservation infrastructure environment restoration education increases capacity etc. What's most effective use of funding?
- How effective are green infrastructure facilities in removing sequestering and degrading storm water contaminants including those we don't know about?
- Planning- the hardest part of planning is knowing what planners have to work with. Usable water rights usable source water quality access to resources ability to work within environmental regulations
- How do you decide what communities are a priority of infrastructure funding?
- What crops are we going to grow?

- Realistically how much water is being used and by whom-- to start understanding re: conservation
- Work force capacity to implement/monitor projects in an effective/responsible way
- How much built needed? ASR capacity location basin
- What needs to be prioritized and why?
- Future agricultural intensity due to climate change. How much agricultural use do we need to plan for?
- Where to focus restoration funding in response to climate change but still retain critical resources to support multiuse direction that governs our agency? USFS
- What water treatment systems should we build?
- How to communicate water crisis to public?
- Management compliance within existing regulatory framework for quantity and quality
- Data needed: Quantity and certainty of available water for use and irrigation. Population data and predictions. Impact on watersheds of current voluntary and mandatory practices. What are we doing that is currently working?
- Funding
- Real-time stream gauging quantity/quality modern hydrologic data reflects climate change and new weather patterns. Biological metrics for watershed health use/withdrawal vs demand/projected demand. Balance between watershed health and resource extraction
- How do we plan development around projected comparing value of water? How do we value comparing uses of water? What ate the contributing sources of water quality issues?
- Information for how much water is available in the future for ecosystem and public health. Availability!
- Education is a constant decision struggle. Everyone K-12-cc-uni public needs to be education on reducing their "needs" on how and where they inter connect with water! Food systems retreat purchases communities government. Education!
- Modernization of code policy affecting water reuse, nutrient recovery and wasted food. Code and policy modification!
- Water quantity available for farmers in the Willamette Valley. Quantity? (Availability)
- Water availability for farmers where when how much? Availability!

State Agency Panel: Conditions Memo

Oregon Department of Environmental Quality: Justin Green

- Water quality programs sets standards, established TMDLs, enforcement, and state loan revolving fund. Data for standards, modeling, geographical data, and permitting data – who is discharging what. Rely on modeling – what can we do to develop a comprehensive understanding of water quality. LIDAR – topography related to where water goes.

Oregon Water Resources Department: Racquel Rancier

- IWRS drives what we do. When we think about water and where we need data, we are considering our entire water resources – surface water, groundwater, and natural systems. What are our needs and demands – instream and out of stream? Challenges – climate change, conditions of infrastructure? How do we meet our needs now and in the future? Planning. We have information across the state – stream gages and models – but not on every stream. Groundwater – info, do we have it everywhere? Data needed for planning? Sometimes. We have gages. We have groundwater levels. We have groundwater studies. We need to know water use. We need to know geology. Along with science data, we need information about the status and presence of infrastructure. IWRS is how we might knit these efforts together.

Oregon Department of Fish and Wildlife: Anna Pakenham

- Environmental goal and data needs form IWRS. Native species require habitats, and this relies on water quality and quantity. Flow and quantity – for species, need to understand species specific flow needs. Only 15% of the state has had an instream flow standard set. Critical for planning – if we can't talk about flow needs for species, we can't find a balanced solutions. How often are we meeting our flow targets? Annual? Seasonal? Dry vs wet? ODFW working on this. Water quality – temperature. Species chase streamflow and temp. ODFW doing quite a bit of field based data, but state-wide data set is limited to reach scale – rely on VIC or NorWest models to actually assess whether meeting targets. Disconnect between agencies ability to work together to collect data. Cold water refugia – critical habitats, will be important for climate change resilience. Barriers, riparian wetlands- have location information. Less on condition and species needs of these areas. There will be a shift in the natural hydrographs – unclear how this will impact species needs. Been seeing regional models that produce info – but can they help us make decisions at a scale of a project? Priorities – where is it most important to invest? What are targets today? What will they be in the future? Where can we leverage our work together?

Oregon Watershed Enhancement Board: Renee Davis

- Funding! At least 50 years of underinvestment – will need more coordinated and strategic approach to financing. Can be a whole host of approaches. We know there is a massive need, many funding sources already exist, state, federal, SWCDs, BOR, EPA/DEQ, OWEB, OWRD. Interested in hearing more about gaps. Don't have a great handle on what these needs are. Until we have a better handle on existing conditions and priorities, it is difficult to match up the funding sources with needs. Need to have funding for planning and feasibility as well as implementation. The numbers are massive – don't have the whole host of resources. Will need to be strategic. Develop new revenue streams – what might these look like?

Break Out Groups

Future Trends

Large Group Discussion

- Data to support decision making
- Analyzing data over longer time horizons without stationary assumptions
- How will changing water availability impact different populations?
- Earthquake impacts?
- Increased risk of fire?
- Cost of litigation vs cost of collaboration

Small Group Discussion

- Data indicators of public trust decisions
- Scenario planning data (avail, usable for decisions)
- Ongoing confirmation/refine scenarios
- Data on future extremes and potential impacts
- Storage potential of natural areas/infrastructure
- Safer locations for future development/urbanization
- Data on public understanding of future trends
- Data on effective R- higher education on future trends and resource limitations
- Interactions between different kinds of change
- Data in form usable for major decisions (e.g. land use)
- What other water managers are doing to respond
- Data on how tech upgrades (AMI) can benefit, esp. in rural systems
- Tech upgrades that help bring more data for better management decisions
- Data on pop decline (especially rural communities)
- Population distribution across geography
- How do pop changes negative or positive effect cost/affordability
- How will climate refugees affect decisions -nonlinear and pop change
- Storage /transport/management- re-evaluate based on future inst of historic
- How fire changes hydrology - quality/quantity
- Standard practice for watershed master planning future screening
- Projected changes in plan communities - hydrology spd. yield water quality land suit and ag/forestry
- Water quantity implications for ag use
- Potential sector shifts, market changes
- How to analyze data for longer time horizons without stationarity - data models dynamically adjusting, machine learning AI

- Different temporal and spatial scales
- Better use of data we already have : adaptive management
- How will changing water quality/avail affect different populations differently?
- How do we make more equitable investments across state
- Overview of climate risks and how they may change
- Impact on water resources from major seismic event
- How would a seismic event interact with other changes
- Opportunities to create local resiliency - strategy (eg. island of evc infra)
- Effects of CC on instream flow and species
- Finer spatial scales for climate impacts
- Diner res data on current clime conditions
- Effects of CC on of water demand for timing and quality by region
- What data do we need to have good climate models
- Future water quality likely regulatory longer range planning
- Data from other states with climate impacts
- Eval. of whether current regs/support water conservation
- Demand forecasting for instream species needs - cold water refugia
- Forecasting of future ground/surface water supplies
- Understanding current ground water supplies
- How will land use changes affect watershed function
- Finding the right scale for climate scenarios/models
- Economic Development - Business needs emerging trends commercial industrial residential ag tech industry needs
- Housing demand
- Aggregated water usage by geographic location and demographic
- Spatial analytics of population growth vs food/water supply demand
- Data on redundant water supply and systems
- Micro climate predictive clime change models
- Data around forest practices impacts on native habitats
- Data around forest practices and impacts to source water
- Data bank of successful and unsuccessful management attempts
- Cost benefit analysis management techniques
- Long term needs assessment for state agency staffing
- water vision implementation
- Watershed based climate models as it relates to source water
- Communications tool kit for complex data management
- Data format standardized key performance metrics

- analysis of current baseline data
- Future market analysis for natural resource industries
- Impact analysis for water reuse
- Inventory of successful management stories "communications Network"
- Inventory of conditions of built infrastructure
- Projections of climate impacts on aquatic ecosystems temp, stream flow etc.
- Data around stored water and temp management
- emerging funding trends clock chain "farm to fork"
- Standardized data sharing platform (open)
- Cost benefit analysis of emerging contaminant treatment
- Cost benefit analysis of decentralized water reuse (stacked benefits)
- Population growth models that reflect influx of climate refugees
- Regional economic analyses
- Analysis of potential impacts of climate policies on utilities
- Scenario analyses on impacts and costs of climate change
- Cost of increased risk of wildfire Where? what are the impacts and costs
- Where and when are harmful blooms (HABs)?
- Holistic watershed health assessments
- Data on aquifer vulnerability
- Emerging management and response
- Aquifer restoration after contamination
- Cost of litigation vs cost of collaboration

Availability and Use

Large Group Discussion

- Historic water-how has it moved and how is being used?
  - Re-evaluate the use
- Better stream gaging ad higher resolution
- Models the combined snowpack, rain
- What are allowed water right uses and are people using their rights legally?
- Evaluating potential for conservation
- Better hydrogeology data
  - Statewide and site specific
- Impacts on water supply of forestry impacts
- Link between supply, demand and return source conditions
- How is water temp impacted by geology
- Prior appropriation
- Is there a way we use water now that depletes our ability to use it in the future
- What is the extent of over allocation?

Small Group Discussion

- Aggregation and analysis of existing underground water storage data
- Underground water storage - How much more, where, elevation, quality
- More data on groundwater recharge
- Aquifer testing to collect data on storage coefficient and transmissity
- How surface and groundwater are connected
- Collecting data on education programs related to water
- Assessing public's general knowledge of water science
- Better understanding of water reuse and availability
- Reevaluate storage transport use and how its oved in state
- Historic water availability (how it has moved in state) and use and how it is changing (future planning for next 100 yrs)
- Better stream gauging at higher resolution (more robust network of gauges)
- Models that combine snowpack, rainfall, instream needs to predict availability
- Water rights clarifying around uses are they using their rights appropriate legal use adjudication
- Use water availability modeling to guide water use (ex. crop use in the future)
- Evaluating potential for water conservation
- Data on non-point consumption of water (ex. juniper forest mgmt.)
- Gathering data on the use, accuracy, and effectiveness of using existing models

- Modeling potential capacity of above ground storage of water
- Higher resolution spatial and temporal data on water use by sector watershed
- Data on receptivity of water users form prior appropriation to another model
- Data on other water models within our prior appropriation system
- Data on the productivity of dryland farming practices
- Data necessary for model calibration
- Better hydrology data -- how water moves through system, time, sustainability of resource watershed scale and site specific re...
- Soil moisture data incorporated with other data sets to monitor watershed health
- Showtel data
- Regulation/gov information from federal regulating federal storage projects
- Meteorological stream flow inform water based planning scale process to data, how can find use of data and validation and verification of data and standards
- Water rights data for usability data for solving critical problems including who has legal rights regulation patters ad water right holders updated/digitalized
- Water use needs how changes/shifts across times
- Crop type site specific inform water transactions
- Forest management impacts on water supply changes in hydrologic cycles
- Who is already using water in the basin
- Prior appropriation doctrine -- use it or lose it update in terms of current uses, how does this change in season availability, what education efforts are there to water users
- Climate adaptability what resources/tools avail? USFS
- Municipal water supply and growing population education regarding water conservation water use, what systems (legal or incentive) for establishing rate structures?
- What is the overall supply demand return resource
- Conditions for the entire state of Oregon
- What is our total water source availability?
- How much are we using?
- How much of our extraction goes back to the original source?
- How long will this last based on future time casted demand?
- Efficiency rates of ag, municipality and conservation opportunities, system loses what is diverted vs delivered
- Precipitation monitoring
- Private sector data integration weather data and other
- USGS groundwater studies statewide
- Long term impacts of climate change on snowpack
- Is there a way we use water now that depletes our ability to use water in future?

- Adapting current water management system to CC species needs and water right overlay related to timing
- In season water management what models can be used for efforts?
- Database of interconnectivity between water users and ecosystems
- Population change (up or down) what impact on water availability?
- Hydropower what can/can't be done to explore hydro ground
- Valsetz water storage projects pros and cons of projects, stream flow historical related to retention, positive benefit to cooler water
- Water use, what percent of water is extracted? What amount flows back to system? diversions and consumptive portion
- How our water supply to our neighboring states?
- Measurement and reporting -- understanding water use, real tine, POD/POU water management purposes
- Egnal requirements
- Water temp, how impacted by geology? How does entire system impact temp?
- Water supplies reliable for farming, what are the impacts of winter storage on ecology? scientific analysis
- Extent of over allocation current conditions compared to past allocations
- Stream gauge at PODs how current data relates to future water supplies
- Needs financial and data management and collection
- Illegal use how much being illegally used
- dry vs wet season changes in hydrology of system
- Groundwater limited areas. How do we know who is included? Information to setup?
- Past conditions related to water supply. Information from people who live/have lived in area
- Updates water availability analysis
- Water rights Update/validate information overlap with optimal conditions on the ground
- Prioritize based on need and changing demands
- Instream uses how effective? Education to water users to use system?
- What are instream flow targets for fish (base/peak/ecology)
- State/federal funded trowling on how data may be collected, analyzed, and managed

Environment

Large Group Discussion

- Critical habitat
  - Eel grass and wetlands
- Climate change and land use
- Storage capacity for both build and natural infrastructure
- Impacts of agricultural practices on habitat
- Long-term effects of pesticide application
- Understanding groundwater-surface water connection
- Address instream needs
- Data on ecological and health impacts on emerging contaminants
- Impacts on most vulnerable communities and the environment
- Reduced infrastructure costs with natural systems
- Land use impacts on stream-basin scale
- Where in watersheds is effective water treatment occurring?
  - How do we expand it?

Small Group Discussion

- Species inventory
- Species productivity, resiliency
- Optimum habitat parameters
- Identify critical habitat systems ex. wetlands eel grass
- Existing habitat identify barriers
- Water quality parameters and quantity; seasonality
- Diseases and pests
- Decision support tool
- Near water buffers more than streams
- Prioritized restoration opportunities effectiveness monitoring
- Monitoring for invasive species
- Land use monitoring
- Develop new tools to ID pollutant sources
- Beaver potential habitat
- Macroinvertebrate habitat
- Data collection baseline local with online function central location
- Stream flow
- Impacts from land use, climate change, population growth
- Land use and ecosystem interactions
- Storage capacity built and natural

- Fire resiliency
- Storage capacity condition
- catastrophic impacts to infrastructure
- Species diversity
- Indicator species
- Effectiveness of alternative agriculture practices on habitat
- Fish distribution aquatic species
- Effectiveness of public education and outreach over time
- Information on plant species that will adapt and thrive with climate change
- Effectiveness of restoration strategies ex. juniper removal floodplain connectivity
- Soil moisture and health - long term soil moisture monitoring
- Role of mycorrhizae fungi in ecosystem health
- Timing and sequencing of instream flows- impacts to aquatic species
- Long term effects of pesticide applications
- Understanding groundwater resources
- Connection between ground and surface groundwater (understand the resource, protect instream groundwater mgmt.) Use in resource planning ex. place based
- Include both academic and applied knowledge when looking at ground and surface water
- What fish need and biota in general
- Access statewide to consistent model(s) to plan for future climate change scenarios (CREP Model) (deciding type of infrastructure, location)
- Streamflow monitoring
- Water use measurements and reporting to manage rights inc instream
- Data on ecol. and health impacts of emerging
- Contaminants of concerns
- Understand base flows, peak flows, ecological flows (protect and restore of flow, water use and storage, water management use in place-based planning)
- Cold water sources (ex. springs) at reach scale (decisions about restoration, focus investments)
- Info needed to move through regulatory and policy pathways to implement watershed based solutions that fall outside built infrastructure models (decisions to invest in these approaches)
- Info that provides certainty about specific outcomes and regulatory schemes (decisions around 20 years and planning)
- Support for modeling approaches that inform policies and regulations that govern watershed health (ag water quality)

- Information "translators" to move data conversations to a place it can be utilized
- Demand forecast for instream needs (in climate change)
- Simulate "what if" effects of changing policies like use it or lose it
- Impact of most vulnerable communities and the environment
- Data about what sustainable resource extraction looks like where are we now
- Understanding wildfire risk
- Data relationship with our water neighbors (other states Columbia, Klamath, Ocean, Snake)
- Where will we see changes in human use that impact the environment
- Climate refugees change population trends
- What do students learn about environment
- GIS integrated layers base to visualize what is happening with water and how decisions are made
- Statewide clearing house to get certified into to support needs (develop management) update at real time
- Integrate data across all agencies at a basin level scale useable at scale
- Consolidate agencies so approaches integrated and competition for money is reduced and approaches are coordinated at basin scale silo down
- What reaches (stream) are most important in the future for fish habitat etc.
- Rating system for watershed health based on goals to be achieved very individualized using available data
- How non-point pollutants move through the environment
- Data and modeling about how change in weather patterns changes how we manage water
- Coordination of training and capacity building for those who have or want to collect data (agencies training is siloed and often internal)
- Adopt academic model for data dev and dissemination (peer reviewed consistent dissemination)
- Ensure data is useable for those who use it freely available supplemental data sets
- Expand on examples where agencies share training
- What are we doing to keep substances (ex microplastics, pharmaceuticals) out of our system at the front end (public education corporate changes)
- Capture scientific analysis in a way the public can understand and use
- Data to get simple approaches implemented ex. cattle management beaver use) adopt BMPs
- Watershed research how to make watersheds healthy, reduce infrastructure costs basic biological and ecological data

- Now water resources are impacted by land use and how land use might change in the future land cover and water resource/quality on a stream basin scale
- Changing needs with respect to agriculture (ex if CA central valley moves to or - what happens?)
- Data necessary to enforce water allocations in the field
- Invest in treatment technology and date to determine effectiveness of treatment both natural and built
- Where in watersheds is effective watershed treatment occurring how do we protect and invest in it - identify opportunities to expand
- Data needs to be at small scale and updated for adaptive management
- Regulatory system with feedback that allows adaptability
- What is the real impact of all of the field tiles recently installed?

Funding

Large Group Discussion

- 0 state funding for private water systems – how many do we have in a poor state?
- Federal money unallocated due to lack of ability of federal agencies to transfer money to State of Oregon
- Fire risk to source water areas - recovery of storage following fire
- Tax based approach for funding water infrastructure
- Information gaps to help educate and get buy in from all Oregonians
- One water- where should we send the money
- Where is funding needed the most?
    - Place-based planning efforts

Small Group Discussion

- Zero State funding for private water systems (non-special districts)
- Data: number of systems in this situation
- Data: money estimates for need for each
- Data: nonprofit vs for profit systems
- Zero federal funding for PWS
- Data: what are the relevant CFRs?
- Are existing state funding mechanisms finally utilized?
- What is ROI of the existing systems we use to manage water?
- Differences between rural and urban systems?
- Examine case studies on different subsides
- Equity/at risk pol is human right to water
- Baseline cost and value add
- When allocating funding consider RO1
- Data: willingness to pay survey total potential vs real costs
- Valuation of irrigation water pricing/ag uses (a lot of variability in small geographies)
- Who will inform who gets competitive funding
- What is happening to integrate permitting related to water issues?
- What are the drivers behind water costs?
- And what are the water costs?
- What are the steps to get to drinkable water? (justify investment)
- How water bill cover sewer water etc.?
- Tradeoffs and costs of treatment vs source water protection?
- Centralized vs decentralized systems
- Trends: shifts among industries e.g. BPA/hydro energy costs)

- Planning for no impact development
- Baseline foundation info about what we have/what we know
- Fed money allocated because lack of ability to refer to state partners for priority
- Information what are the limitations for the feds? (e.g. GNA)
- Public/private partnerships inform best practice for these partnerships?
- Data: who is paying for those programs/projects leads to equity balance?
- Risk of fire to source water area reservoirs delivery infrastructure and cost to clean out reservoir rebuild plant etc.; forest health treatment leads to real world scenarios
- Bright spots and stories about how we're accomplishments deserved outcomes leads to water efficiency improvements -metrics, money and best practices -across different sectors ag muni
- Calculate/assess money efficiencies of consolidated services (e.g. one data scientist for 10 orgs instead of individual orgs. each having their own) highly trained services are better fit for this
- Also, assessment of resources available to begin to get efficiencies
- Better understanding the cost of not being able to retain talent for conservation work leads to links to previous efficiency comments
- Is there equitable access to/distribution of benefits to all users who pay?
- Equitable revenue, equitable investment
- Opportunity for cooperative data and info (e.g. Tualatin)
- Money for long term ongoing data
- Statewide "water exports" and capture that value?
- How much money to add to special public wants money
- Sync different timelines for different money
- Public willingness to pay for water examples and local
- Government agencies lead to current debt load current debt capacity and impact of new debt
- State needs to put in money (e.g. WA)
- Better advertising (DEQ SRF)
- What do we need to invest in to be ready for future trends?
- Someone to project water availability to meet food needs?
- Forecasting
- To be able to plan better
- Can we expand current sources for restoration
- Better awareness of moneys sowcest criteria
- Need for grant writers? How much money spent chasing money?
- Using emergency management money

- Info gaps to help educate and get buy in from all Oregonians (tax based approach)
- Info how to best utilize and target existing programs and support for grantees once they are in the door
- Data NRCS money left utilized, because of staffing limitations (IE) including co benefit practice
- Info about how to navigate funding processes and clarity around requirements (e.g. unrealistic expectations?
- Assessment of redundant programs across agencies and how to remedy/streamline
- Coordinated information to present a package of options to do free infrastructure when approaching landowners
- How to translate data into information understanding of impacts, etc. to educate people?
- Cost of building redundancy into water systems

Quality

Large Group Discussion

- Baseline water quality data from all agencies and areas
- Real-time data
- Effectiveness of treatment technologies and strategy
- Can we do things differently relative to regulation
- Who has what data?
  - Sources of pollutants
- Pollution in urban areas
- GIS access to data, networked
- Pesticide use
- Public health analysis

Small Group Discussion

- Risk assessment
- How do you prioritize or determine treatment options?
- Education understanding leads to learning, location level equals trust
- Small/rural community how to support? Capacity building provide resources?
- Where are the small water systems? Source and burden
- Who is responsible?
- Milestones (financials) for community capacity building
- Test contaminants at lower levels what are the impacts, how do we translate this, convey messages for public?
- Planning management future planning for adaptive management
- Toxicology
- Testing methods- what is most accurate?
- Testing affordability
- Public health analysis
- Public values and understanding
- Public support and value/awareness, how does this translate to finding? Equitable solutions- how can we support?
- GLS access data, map it. Collect more network data
- Analysis of current data
- Pesticide use/ag
- Who uses what where/practices
- Expenditures
- Contextual information for users

- Why this data matters?
- List of indicators management decisions/indicators for mission/goals
- How do 3 goals work together to create healthy ecosystems?
- What do data points mean in the watershed? Context of data/data toolbox/grouping parameters
- Who has what data?
- What activities are occurring in the watershed and how does it inform what to monitor for?
- What is working when it comes to water and why
- Stream buffers what works where and why
- Data on sources of pollutants in urban areas
- Meaningful projections of water quality
- Adapting data management and analysis
- How is weather changing
- Population growth data
- How much does public know about WQ?
- How do regulations schemes interact?
- Monitoring new industries tech
- Real time WQ data and informing public
- New testing methods for real time
- Short term prediction methods
- Effectiveness of treatment technologies and strategies/approaches
- Can things be done differently
- Preventative data to prevent reversion
- Unintended consequences ex. R.O. plus residuals cost/benefit
- Triple/bottom line analysis - eco. env. social and cultural
- Quadruple
- Desalinization from treatment where do you discharge hot salty water
- Additional resources for data analysis capability
- Data translation-number to policy
- Fate and transport of pollutants in water cycle
- Provision of data to dischargers
- Be more proactive
- Quality of data
- Education of public on data preventing
- Are we working at right parameters or suite of parameters when developing policy
- Are resources being utilized or expended effective and agile

- What is causing negative impacts
- Baseline data from all agencies and areas
- Should we regulate on watershed scale?
- Look at things holistically
- Better provisions of data to public
- Accumulation of agency data
- State lead real time data similar to air monitoring
- Are enhancements improving water quality?

What asks and offer do you have of those in the room and of the state?

Large Group Discussions

- Promote data rehab with local water master office and BOR – two agencies that run gages
- Expand soil moisture monitoring to support watershed health with BLM
- CWS implemented watershed based permit and water quality trading program – get ahold of them
- CWS has modeling group working water supply and water temperature work – Tualatin area
- ODE have information on where hydro or new hydro might be, and data and funds for hydro/water needs
- Ask that disadvantages groups have an easy way to inform the water vision
- Share case studies of solving problems and how overcome, and examples of existing studies and how integrated work could lead to results
- Beaver Creek streamflow data in Lincoln County
- Evaluation data on the risk of climate change on of wastewater infrastructure
- PHAS contamination
- OHA has an inventory of municipal and non-municipal drinking water systems, in the process of mapping public water systems in the state, and location of private water systems
- OSU Climate Toolbox – web available and great tool to see potential climate impacts
- City of Salem and Clatsop County – available streamflow and other water supply data
- Information to county commissioners on behalf of Water Vision
- Would be nice to be included in future Water Vision meeting – want to see where things go
- Municipal groundwater mitigation program
- State assemble task team about diverting and mobilizing water where we need it in the future – real team
- Oregon Lakes Association – eastern dry land lakes, especially Lake Albert
- Interested in LiDAR and bathymetry data to help map volume
- Harmful Algal blooms – OLA interested in being a part of this information in the future
- Cow Creek Tribes – funds for Winchester Dam Gage, offer Lamprey distribution data for Southern Oregon
- Wastewater providers – quite a bit of expertise related to water quality issues and strategies – relate to One Water strategies, these groups have tons of information, but not money, time, and resources
- Ask that there be funds focused on mining rich dataset of privately collected data

- Ask that state natural resource agencies work together to facilitate out-of-the-box thinking and processes that allow projects that need to happen – funding and regulatory – enable projects to move forward, and state agencies develop internal cultures that support this idea
- Counties – convene group meetings directly with all of the stakeholders
- Ask that data be consolidated and be accessible – don’t make a report and stop
- Ask bill 3182 be passed – on-site potable water reuse
- Ask OWRD to work with USGS to retrieve discontinued gages
- Ask ODFW to carry out more BIRs to understand fish and resource needs now and in the future
- State – please fund more analysis for long-term needs for population and food needs for water
- Ask OWRD- how much is available for storage? When and where?
- How do interested folks connect with education on water conservation? Lane Community College willing to do education in Lane County.
- Recode is developing a water reuse tool statewide – code, policies, incentives
- Ask of state – provide more PR about water crisis or climate change- diffuse misinformation and provide data resources
- Ask of state – build platform for coordinated data access – indexing of available databases at multiple scales with major local, state, federal partners
- Ask of state – more of this conversation with a local habitat conservation plan group – Upper Deschutes water basin, irrigators unwilling to take less water and release more, some public education might help
- Offer – USFS – Joy – lots of data, but needs direction on what kind of data people need, suggest a meeting between USFS and state to outline needs
- Track down university resources at Willamette for people that have projects that involve policy oriented changes

Small Group Discussion

Offers

- We have... climate change impact data and analysis for the Clackamas river water pro...
- Identify water conservation opportunities (my offer)
- Tillamook estuaries partnership has 20 or more years of bacteria levels in Tillamook country's rivers, creeks and bays
- Lower Nehalgy watershed council and salmon super highway have Tillamook country culvert inventory

- Ted Dewitt's group (EPA, Newport) has ocean acidification nutrient load etc. research results
- Oregon water utility council can provide expertise in management and funding challenges
- Offer: Continue to support local monitoring efforts stream WQ, pesticide stewardship partnership, effectiveness monitoring soil moisture monitoring
- Able to provide details on funding problems for private non special district water systems
- Offer: Construction cost information of water infrastructure projects
- Oregon farm bureau: we would like to work with the state to begin to understand the on farm water supply and conservation needs to be able to assess both long term ag water demand and conservation needs
- With appropriate sideboards that address landowner privacy concerns
- After speaking with Finne MacDonald (CWS) it may be possible to collect new data and develop new IDF curves for hydrologic analysis. These new IDF curves would be based on a model developed from the UN. climate protection model. It will take time and money and legwork to develop a group interesting in this update. Need a gauge on the Willamette at Martis confluence
- Offer: Recode is developing a jurisdictional water reuse tool for development. The tool maps pathways with every source, fixture, reuse and disposal mechanisms. The tool will cover the entire state
- Any watershed talks that need water conservation education
- Workforce steps cervantesb@lanece.edu
- Me- Work closely with participants in the LJD place based group to recode water allocation
- Marion SWCD has technical free assistance for grants for water/soil/wetlands riparian invasive projects for land in Manan Co.
- I can offer all the watershed data that city of Salem collects analyses and streams Nathan Josh city of Salem
- Data water temp (continuous) for 30 stream sites in Clatsop CO collected by north coast WS association
- We have a method for simulating the daily flows in the 9000 reaches of the Willamette river basin, under different assumption about future climate out to the end of this century. We are making this model publicly available. The model in NSF-funded and published in the proceedings of the National Academy of science steering committee for the CW3M model Rebecca McCocin chair David Couklin tech support. Rebecca is the director of the N Santiam WC Dave is with Oregon Freshwater Solutions

- We could create a data gap analysis specific to our organization to help focus the data depends focus on infrastructure watershed plans etc.
- I have information on hydrology of terminal lakes in eastern or Ron Larson Rlarson@ccountry.net
- Oregon lakes association has expertise to advise on developing a HABs state wide program oregonlakes.org
- theo.dreher@oregonstate.edu OSU micro has specific information on cyanobacterial HABs genomics in Oregon -- use in monitoring reason understanding
- USFS Joy Archuleta Our agency has lots of data. We would require same direction on what data you are requesting
- Suggest meeting with state to outline the request
- Locate university resources for policy oriented analysis. Willamette University. Susan Smith
- 30-120 days I will continue to stay engaged and provide input
- AVWA we can offer expertise related to water quality issues and strategies
- L. ... distribution data for Southern Oregon Database managed by Teba
- Continued honesty and engagement with process/ framework for collaborative partnership
- ACWA committee meetings are offered as info share opportunities
- Jay MacPherson 541-726-2587 x57 spatial temperature patterns due to impacts of climate change OSU climate toolbox. OHA DWS has inventory of municipal and non-muni drinking water treatment systems location mapping effort underway security concerns. Drinking water source protection plans DEQ for surface OHA for ground water. Location and quality of private water systems (incomplete)
- Evaluation data on impact on wastewater facility assets from seismic event. (Eugene/Springfield water pollution control facility)
- Data results of PFAS analysis wastewater influent effluent bio solids (Eugene/Springfield water pollution control facility)

Asks

- 2020 session: fund the 2 ODFW water positions that didn't get funded in 2019
- 2021 session: fund NR agencies more, fund ODFW's water program, fund WRD's water quality work; water masters science, require measurement and reporting
- Set irrigation efficiency standards, require public interest test of transfers, enforce the law, and don’t issue water rights when you didn’t have science or data to show resource can sustain it.

- I would like to expand the soil moisture monitoring capacity and network in order to inform agencies such as BLM or to support watershed health monitoring --Paul Demaggio JSWCD Meta? NRCS? BLM?
- Promote data rehab local OWRD and BOR
- Passing house bill 3182 "risk based framework for onsite non portable water reuse" will allow acceleration in water conservation and increase public health risk. This is "modernization of Policy and code goal identified today. Pat@recodenow.org recode
- Consolidate data
- OWRD to work with USGS to retrieve the discontinued gauges
- ODRD to carry out more basin investigation studies to understand fish/instream needs now and in future
- To state more technical assistance to small water systems
- We need LIDAR data on lake basins in eastern or and state lands. we need instream flow measurements for the lower Chewaucan River OWRD oregonlakes.org
- Funding for Wincluster Dam Gorge money cubs out at early Nov 2019
- Convene group meetings directly with association of Oregon counties league of cities farm bureau cattlemen and large environ advocacy groups
- State agencies develop a vision and organizational culture that will support out of the box expansion of flexibility to facilitate the type of projects and initiatives that are needed to achieve 100 year vision goals
- Share case studies depicting problems and how the obstacles were overcome
- Ask what existing problems need to be solved and use for an integrated solution among agencies and parties. Problem equals opportunity worksheet
- Water stream data for Beaver Creek. There has been some studies done in past. Are these rewards available? How do we get access to this historic information? Adenlingler@srwd.org 541-563-3599
- Temp mitigation is based on salmon fish
- What about mitigation value for cold water refuges?
- Work a current backlog of permits water rights and other regulated aspects of water
- What effects have past watershed restoration investments had on water quality? How do we know?
- Is there data linking soil health/quality to water quality?
- Would like to see... state investment and commitment in OHA-BWP and WRD via staffing and general funding
- More stream gauges
- Cover more debris with gauges
- More WQ standards

- More meteorological statistics
- Better organized access to data
- Transparent data collection and instrument collaboration
- water availability analysis statewide
- More hydrogeological data
- More state specific data
- State funding and/or other support (technical assistance.. etc.) to conduct data collection
- Reduce complications and risks of accessing funding and grants e.g. easier process, less long-term standings to operations, clearer potential risks to water rights etc.
- Regulatory/mgmt. processes to allow for experimental or trying new/different actions to address potential/actual concerns
- Simplified reporting requirements
- Removing risk or negative consequences to sharing data with potential regulators or the general public
- Continue to invest in existing and add additional stream gauges (staff action)
- Expedite grant revision and contract process
- Could we fly flir with LIDAR to identify refuges?
- Hood river basin study- hydraulic model that factors in climate change model, existing water use, potential water conservation scenarios and stream habitat (IFIM). Could be a good example of what could be replicated across the state at a slightly larger scale.
- Method for the state to share a comprehensive date set for a basin. One place to go to obtain all existing data from all state and federal agencies would provide a big head start in analysis place based planning
- Make spatial data (e.g. infrastructure water quality limited agencies) all available in one place
- In the long run, have/offer funding to public universities in Oregon to support data collection and analysis related to water vision topics
- For publicly available data, provide graphical user interfaces so that the public can query and interpret data more easily
- Support creative solutions for regional complex problems especially with staff and new tools
- Budget line item(s) to fund both national estuary programs (lower Columbia and Tillamook) at some level to support restoration projects
- State managed data repository (single website) for ecological data population growth projections, water needs
- Make aging infrastructure a budgetary priority even in rural areas

- Provide funding
- Follow up through implementation
- Don't create another new fund- use ones that already exist
- Communicate policy changes
- Take this information back to the region for discussion
- More support on state programs and funding resources
- Stop suing each other
- Provide number of private water associations
- Make immediate steps to change state funds to be available to all private water systems
- Temperature load reduction attributed to irrigation causal piping. How much thermal load could be offset?
- Oregon farm bureau: we would like to work with the state to begin to understand the on farm water supply and conservation needs to be able to assess both long term ag water demand and conservation needs
- With appropriate sideboards that address landowner privacy concerns
- Curriculum for water conservation/efficiency
- How to connect with interested folks/agencies to help with education of communities/small systems
- Any watershed talks that need water conservation education
- State- please fund more analysis to interpret data in longer term needs/demand have on population models and food needs
- OWRD you say water is available for storage by how where when and how much can be allocated to farmers?
- Give access to data
- Don't just make a report and stop
- Eliminate or archive historical data that is not contributing to solutions
- Work with Louise John day place based planning group to prioritize watersheds in terms of water needs and identify short term and long term solutions and actions for implementation
- City of Salem be included in core visionary meetings in the future
- Better municipal stormwater mitigation to protect fragile water systems -- Legislatively required maybe comp plans on land use?
- Water conservation efforts and required conservation measures for new development (land use issue)
- I believe the single most important item or priority based on today's efforts is for the state to assemble a task team to create a plan around diverting/mobilizing

water where we need it. That single item could address multiple issues raised today. It all starts there!! Form a team!!

- More focus top down on conservation and water issues, better informed communities of concerns and needs regarding water for the future all topics
- Give report to Clatsop soil and water cons. district on issues brought up here
- Hold work session for county commissioners to convey to them the discussion and ideas brought out in this meeting
- Citizen involvement and engagement make the water goals and issues more public and better education and understanding water master plan data concerns, budgeting
- Citizen involvement opportunities to bring a different perspective to the conversation
- OWRD to adopt CW3M for the Willamette river basin and use CW3M's approach of methods for other parts of the state Dave Coutzliu Oregon Freshwater Simulation
- How will/can the state support local community's organizations, municipalities in their implementation of actions to achieve the vision? Ways to downscale the vision to a county for example? The funding for projects related to the vision? Etc.
- Build complex platform for coordinated data access at multiple scales with major fed, state and local government partners
- Data and analysis re: ecological flow needs from uses QS21 USFWS NOAA ODFW WATERWATCH on watershed basis
- Have more of the conversation with a local habitat conservation plan group- the proposal has a huge impact on upper Deschutes water basin
- Irrigators are not willing to take less and release more
- Can the state provide more P/R about the water crisis and or climate change
- Help diffuse misinformation provide resources for data
- Local government agencies need/ask for stare. NR agencies to work in partnership with local government to create a stream lined pathway (regulatory) to get water and ecosystem projects that achieve or vision goals done

Appendix E: Oregon Water Data Portal - Engagement Summary

November 10, 2022

Dataset Inventory

The draft dataset inventory was completed with the input from participating Oregon state agencies. The inventory was based on existing data inventories that were part of the Oregon Open Data Project. To update the existing inventories, state agencies representatives on the Subject Matter Expert (SME) Team were asked to provide supplementary information and worked in collaboration with the Internet of Water (IoW) staff for assistance where needed. More than 200 datasets were identified and inventoried with updates to dataset categories where necessary (publishable, value, readiness, priority, and open data publishing status).

- Of these, 7 datasets were designated as non-publishable, largely for security or privacy purposes; 161 datasets were classified as ready to publish "as-is;" and 77 datasets were classified as ready to publish, redaction required.
- 180 Level 1 datasets were identified; 32 Level 2 datasets were identified; 39 Level 3 datasets were identified; and 7 datasets were not classified or with multiple classification.
- 41 datasets were classified as high priority; 39 were classified as medium priority; 73 were classified with low priority; and 96 were not assigned a priority.

See Appendix H for draft data inventory.

Data Gaps Identification

In addition to the data inventory exercise, Oregon participating agencies identified datasets that were needed, but not yet collected or ready, for inclusion in the OWDP. These currently unavailable datasets were classified as "data gaps." The IoW team inventoried data gaps from previous efforts, such as Oregon's 100-year Water Vision and the data gaps analysis produced by Oregon's Water Core Team, and further refined the list with input from the SME Team and stakeholder engagements.

In total this assessment identified 26 data gaps. Where available rankings and comments about the data value and readiness were included in the inventory.

- 5 datasets were noted to be of "significant need," 7 were noted as "key data," and 2 were noted as both "significant need" and "key data." The assessment also included 1 dataset that was "important for considering flood protection," 2 that were considered "not key data at this point but could inform subsequent needs assessments and prioritizations," and 10 that did not include comments on their value.
- 7 datasets were of high readiness and 20 were of low readiness. All of the datasets classified as "significant need" or "key data" were of low readiness. There were a variety of tasks needed to bring the low-readiness datasets up to a suitable condition for inclusion in the OWDP including

additional support from stakeholders, survey work with consultants, digitization of hardcopy records, validation for accuracy, and inclusion of additional locations or information.

See Appendix H for complete data gaps inventory.

SME Team Engagements and Prioritization Activities

The IoW team led a set of structured activities to assist SME Team members in developing a method for prioritizing datasets to be incorporated into the OWDP and developing preliminary tasks for individual agencies in preparation of OWDP activities. These structured activities took place in Fall 2022 and included an in-person day-long workshop that followed the IoW Technology Adoption Program (TAP) principles and methods.

About IoW TAP

The goal of IoW TAP is to provide education and training for both management and staff of public agencies to implement technology adoption. TAP training Includes in-person workshops designed to:

1) facilitate agency-wide consensus;

2) identify obstacles and challenges to modernization; and

3) deliver the high-impact behavioral and cultural change necessary to improve data use and management.

More broadly, the adoption of modern water data infrastructure makes it easier for local governments and water users to report their data with minimal effort; enable state governments to manage and integrate those data; and empower water managing entities across sectors and scales to use public data to make informed, evidence-based decisions.

The philosophy that guides the IoW TAP in-person engagement sessions is Open Space Technology (OST), a self-managed, participatory process specifically designed to address organizational change and one that “thrives in situations in which there is a diverse group of people who must deal with complex and potentially conflicting material in innovative and productive ways.” Because of its ability to level the playing field and empower all participants, OST has been identified as an ideal philosophy for IoW TAP.

In OST engagements, participants identify the topics to be addressed, then self-select to work in small groups with the flexibility of moving from one group to another. The purpose of the small working groups is not necessarily to provide solutions, though suggestions for solutions are welcome, but instead to gain a better, nuanced understanding of the topic and suggest a path to a solution. As groups report out it becomes easier to prioritize and identify who should be responsible for taking the topic further.

The information gained during the TAP engagements inform the basis of an implementation strategy for data modernization efforts. This is a critical step to creating strategies that both address the appropriate challenges and do so within the organization’s context and capacity.

Oregon TAP Workshop

The following is a summary of the TAP workshop with the Oregon Water Data Portal SME and Technical Teams. The partners represented were as follows: Oregon Department of Environmental Quality; Oregon Center for Applied Systems and Software; Oregon Institute for Natural Resources; Oregon Watershed Enhancement Board; Oregon Department of State Lands; Oregon Fish and Wildlife; Oregon Department of Forestry; Oregon Water Resources Department; Oregon Department of Agriculture; Oregon Department of Land Conservation and Development; and Oregon Health Authority.

Meeting Objectives

- Promote meaningful dialogue across participating Oregon water agencies related to the Oregon Water Data Portal
- Establish sequencing strategies for each agency's water data
- Apply lessons from the New Mexico pilot program that can be applied to Oregon and other States' modernization initiatives

Attendees

Agency	Name
ODEQ	Mandy Aird
ODA	Marganne Allen
ODFW	Jamie Anthony
ODAS	Erik Brewster
OHA	Curtis Cude
ODEQ	Colin Donald
OWEB	Ken Fetcho
ODEQ	Martina Frey
ODLCD	Tanya Haddad
OWEB	Audrey Hatch
OSU CASS	Carrie Hertel
ODA	Rob Hibbs
DSL	Dana Hicks
WRD	Mellony Hoskinson
WRD	Joel Jeffrey
ODEQ	Melissa Kays
ODF	Rebecca McCoun
ODA	Brittany Mills
OSU INR	Myrica Muir McCune
ODEQ	Travis Pritchard
OSU INR	Marc Rempel
ODEQ	Sarah Rockwell
WRD	Ben Scandella
DSL	Erin Serra
ODEQ	Valerie Thompson
ODEQ	Josh Weber

Meeting Agenda

8:30am – 9:00am	Introductions: *Name, Position, Agency*
9:00am – 9:30am	Introducing a framework for sequencing
	Goal of OWDP: *A single point of access to current, high quality, integrated water data would support important decisions about management, planning and investing in water resources including natural and man-made water infrastructure throughout the state. This is the primary driver of the project. A secondary, but still important project driver is improving availability of Oregon water data to the public*
	Sample criteria: *1. Answers legislative questions* *2. Includes metadata* *3. Is publishable* *4. Meets accuracy threshold* *5. Meets important geographic scope* *6. Meets use case* *7. Provides quick win* *8. Reusable – answers multiple questions* *9. Serves public interest* *10. Supports department goals* *11. Supports external requests* *12. Supports interagency collaboration/requests* *13. Updates frequently*
9:30am – 10:10am	Group work: *Form groups to discuss which of the criteria above are best for sequencing (come up with 3 criteria) and rank these 3 criteria from most to least important*
10:10am – 10:25am	Break: *post criteria on wall (group output)*
10:25am – 11:10am	Development of criteria
	Identify similarities and facilitate integration of group lists into one list of 3 criteria
11:10am – 12:00pm	Introduction to Open Space
12:00pm-1:00pm	Lunch – Sign up for groups
1:00pm-2:00pm	Group work
	Problem/opportunity statement
	Why is it important

	Various perspectives or opinions
	Recommendations or conclusions (be specific, not conceptual)
	People who may take it further (if appropriate)
2:00pm-2:45pm	Report outs
	5 minutes per group
3:00pm-3:15pm	One Word
	Around the room, one word that describes experience so far
4:15pm-4:30pm	Closing
	What to expect next

Prioritization or Sequencing Exercise Group Output

Participants of the workshop were placed into groups, with each group representing a range of agencies present. Groups were asked to discuss criteria for prioritization, and to organize their defined criteria into ranked lists. The following represents the results of each group's output:

Group	Criteria and Ranking		
	1	2	3
G1	Datasets that are publishable	Datasets that meet identified use cases	Datasets that have stakeholder buy-in (Stakeholder represents who the agency serves)
G2	Datasets that are relevant to multiple use cases	Datasets that exist, are not yet accessible, but are ready and publishable.	Datasets that contain continuous data with high update frequency, e.g. data that changes quickly
G3	Datasets that support user requests	Datasets of known quality that are well maintained, stable, and current	Trusted and authoritative datasets, preferencing data that include metadata (provenance, purpose, and use case identification)

G4	Predigested data that tells a story, supports interagency collaboration, and is easy to ingest into the portal	Data that is reusable and answers multiple questions, but are also publishable, include metadata, and inform an identified use case	
G5	Data that meet an identified use case	Data that are of known and high data quality and suitability	Data that are available, meaning already published, and data that are important but are not currently available

Following individual group reports, a broader discussion was facilitated to identify additional questions for further and future consideration. These comments and questions included:

- What does a user case mean in this context of data prioritization? A use case approach makes sense when creating information, but when delivering data what does a use case mean?
- What is distinction between a user request and a use case?
- How should data be prioritized for short-term versus long-term efforts?
- It may help to adopt a mix of easy to put online datasets and datasets not yet online. Usability and relevance are broad categories to capture with use cases.
- Focusing on datasets that inform use cases that address water management in a changing climate may have more funding success
- Qualifying use cases important, such as: the portal offers data at appropriate resolution, frequency, and quality to help answer a question. In other words, it helps someone answer a question and informs decision-making.
- In contrast, user requests are agnostic of how data will be used. A public record request is kind of a use case; however, we don't necessarily know why the data are being requested.
- There should be an important distinction with the OWDP from other data portals in that the OWDP is designed to help users answer questions.

Open Space Topics Proposed

The second phase of the in-person workshop was dedicated to participant-led discussions on topics identified during the Open Space activity. The topics identified by participants that warranted more or deeper discussion were:

- Demystifying use cases
- Organizational readiness
- Data quality

During this portion of the workshop, participants self-selected their group based on their topic of interest. Participants were also able to move around during group discussions, joining concurrent discussions on other topics when desired. Below is a summary of results from these discussions.

Working Groups: Applying the Open Space

1. Demystifying use case scenarios

   The term, "use case" can have a variety of meanings to a variety of people. This group sought to clarify the term by clearly defining the components of a use case. Core elements relevant for use case consideration included an examination of the type of data; the form of the data; the question or decision the data addresses; and the target decision-maker audience. Following this discussion, the group outlined three components for prioritizing a use case. These were, 1) the use case addresses an unmet need as identified by users; 2) the Subject Matter Expert knows where to locate the data; and 3) the data prioritized have multiple uses and can be applied to future use cases.

   In addition to identifying these criteria, group members outlined three pathways for better understanding unmet needs: surveys (administered to the legislature, regulated community, associations, and agencies); web analytics; and agency SMEs. A group discussion followed about the tendency to rely upon stakeholder identified use cases versus agency-initiated use cases. An example was provided by the IoW team that Google Maps was not a specific request of users; however, once developed, users understood the power of such a tool that allowed users to view the world in a different way. In much the same way, agencies may present data in new ways that creates novel products or ways of thinking that were not otherwise anticipated.

   Participants identified that a data portal that combines different types of data from different agencies would generate insights that would not otherwise be possible. For example, data about water quality from domestic wells is housed among several agencies. Allowing for easier integration of this data across agencies would streamline the process of understanding water quality results.

2. Organizational Readiness

   The focus of the organizational readiness group centered on the questions, "Are the appropriate staff engaged to be able to commit to collaborative agreements?" and "How can we plan for succession through changes in agency staffing, management, and leadership?" There was concern over the risk of repeating past failures that occurred due to a lack of agency support; a leadership change that does not prioritize data; or the lack of an IT group that can support a large data modernization effort. Disconnects *between* agencies wherein some agencies lack the needed resources or disconnects *within* agencies when the IT support staff are insufficiently engaged pose potential risks for the successful outcome of a OWDP.

   Recommendations to mitigate the identified risks include:

   - Develop MOUs between participating agencies to gain commitments that last through changes in leadership and administration
   - Subject matter experts should serve as representatives of their agency that report to leaders and IT staff to raise awareness of the project.

- As a group, subject matter experts should create a draft MOU and work with the leadership team, who will appeal to agency directors to gain a commitment. Participating agency staff can continue to point back to the MOU, as needed
- Inform a resources package to support this effort that fills critical staffing gaps to address this mandate, and to provide information services within and across agencies.

Further consideration was given to challenges with IT staffing. Many Oregon natural resources agencies have their own IT staff to maintain their datasets and data processing systems. Are these staff adequately engaged in the discussions regarding the OWDP? While an MOU can hold divisions and programs accountable once agency leadership is supportive; a larger effort to shift the workflow to support the portal is needed. Currently, the needed shift is not well understood in sufficient detail to develop a resource proposal to support implementation. For example, while staff are able to write a metadata standard, time needs to be allocated for staff to do that work.

Finally, discussions included long term ownership and maintenance of the OWDP. Who owns the data portal? In the short-term (e.g. coming fiscal year), ODEQ is the leading agency along with other agencies who are co-leading the project. However, in the longer-term, ODEQ will not serve as the lead. One suggestion was to consider a multi-agency approach to govern and maintain the project. The issue of sustainability and maintenance is another that could be resolved with an MOU.

3. Data Quality

How should the OWDP classify, represent, and filter data to specify an appropriate or acceptable level of data quality? This group discussed the strong tension between the desire to build the portal to be responsive to use cases, and the desire to ensure data quality. It will be critical to ensure the portal is providing data suitable to answer those uses cases. This will require advising and input from SME and IT staff.

Datasets include data with variable quality that are appropriate for different purposes and decisions. Participants discussed example issues and identified the potential challenges of data quality related to these issues:

- Equity and environmental justice: what are the biases in our data collection and quality review? How does that impact users? How do we include traditional ecological knowledge? How do we bring in citizen science?
- Preliminary/provision data versus validated or reviewed data: How do we track the status and timeline of those reviews for quality control?
- Data quality standards that vary by agency: A standardized description of data quality is needed for the portal. How do we translate quality flags from different sources and different data types to match the portal labels?
- Language of data quality: How do we discuss data quality? The word “uncertainty” is challenging; however, the words bias, accuracy, precision, etc are not universally

understood by everyone. How should a consistent vocabulary across agencies be developed?
  - Levels of data quality: What is the appropriate level of quality for a particular dataset for making a particular decision? Can we filter data based on the use case while allowing a data quality filter to be altered as needed?
  - Staff capacity: It will be important to train staff on metadata best practices to achieve cross agency consistency.
  - Qualitative data: How are quantitative measures incorporated and how is uncertainty managed with qualitative data? When is it appropriate to use qualitative versus quantitative data?
  - Licensing: Can data license models be used for licensing certain types of data?

Recommendations for addressing data quality include:

- Conduct a review other solutions and examples
- Interview stakeholders to determine needs for data quality for use cases
- Consult agencies and tribes on their data quality practices
- Include Traditional Ecological Knowledge (TEK) and address environmental justice and equity
- Follow existing guidance on record retention schedules

Workshop Wrap-Up

The workshop concluded with discussions on next steps. It was acknowledged that more discussions were needed to establish a prioritization framework. These discussions and other considerations outlined during the working group report-outs were to be discussed during already scheduled SME Team meetings. Participants were asked to provide one word that described their experience with the workshop. Below is a summary:

Hopeful	Collaborative	Depth	Expansive	Insightful
Effective	Curious	Interoperable	Engaged	Anticipation
Insightful	Casual	Optimistic	Dynamic	Understanding
Standards	Enlightened	Broadening	Eye-Opening	Informative
Clarifying	Connections	Above the line	Flannel	

Prioritization

Following the in-person workshop, the IoW team continued discussions on the prioritization framework in subsequent SME team meetings. During these discussions, it was noted the prioritization criteria for the pilot are different than the prioritization criteria for the long term. In the short term or pilot period, the focus is on data that has a high degree of readiness because there is insufficient time to make data ready. In the longer term, prioritization will include the incorporation of data gaps.

The recommendation is that this set of prioritization criteria are based on short term, pilot period needs:

- Meets high priority use case
  - Notes: data that feed multiple use cases; without regional specificity; and low to no seasonality are recommended criteria for "high priority."
- Data is of known quality and well maintained
  - Notes: Data that already has IT support should be a key component
- Degree of readiness and/or accessibility
  - Notes: in the short term, all data is considered "ready," however, in the long term, priority can be made for data gaps (data not collected or collected by not in digital format).
- Increased effectiveness
  - Note: data that make staff jobs more effective and efficient; data that facilitate cross-agency collaboration

It was suggested to prioritize in the short term, pilot period, at least one dataset with high demand from stakeholders but with low readiness, as a demonstration of need and impact.

Post-Workshop Survey

A post-workshop survey was distributed to participants to evaluate participant experience and effectiveness of the workshop format. All participants reported satisfaction with the workshop, indicating the workshop was a good use of time and participants could talk openly and honestly about the issues raised in the workshop. Participants also reported they felt that due to their participation in the workshop, they could positively contribute to the OWDP initiative, and they plan to use what they learned in the workshop to better inform planning and activities in their agencies.

Participants suggested that in future workshops, the Oregon Department of Transportation, representatives from local governments, IT partners, and representatives from tribal governments should be included. Also, for future workshops, it was suggested that preparatory materials be included that give more details about the OWDP. There was also the suggestion that the workshop be replicated at other, appropriate future stages of the project.

Appendix F: Oregon Water Data Portal Legislative Update Report

The text below is the main report that was delivered to the Oregon Legislature in February 2023. The full report with cover, table of contents and appendices may be provided upon request or via https://bit.ly/2023_OWDP_Full_Report.

EXECUTIVE SUMMARY

The 2021 Oregon Legislature directed the Department of Environmental Quality (DEQ) and state water agencies to "begin initial scoping and design" and "develop a funding request for further development" of a water database framework. In response, the DEQ, in collaboration with other state water agencies, initiated the Oregon Water Data Portal (OWDP) Project.

The OWDP envisions a modernized, single point of access for public data about water and water infrastructure. This could include data and information relevant to or about water quality and quantity, habitat and ecosystems, and natural and built infrastructure used to store, deliver or treat water. The portal will help state and local governments use and share data more effectively, saving state and local resources. State agencies, Tribes, stakeholders, and people living in Oregon will have better and more efficient access to water data. This access will allow decision-makers to better prioritize water investments, help more people understand or identify issues of water availability and quality in communities across the state, and improve access to information needed to make short- and long-term water management decisions. The portal will also include modernized security systems to protect sensitive data when appropriate.

During 2021-2023 (Stage 1), the OWDP began its scoping and design by engaging 68 participants representing more than 40 state, local, and Tribal agencies, community organizations and other interested groups. The OWDP Project Team inventoried currently existing water data sets held by the 17 state agencies with water-related missions or functions, assessed their readiness for inclusion in the OWDP, and identified additional critical data needs. Based on meetings with representatives from states who have initiated similar water data modernization projects and meetings with private sector representatives, the OWDP Project team evaluated the technical aspects of the portal platform that will be needed.

Based on the work completed for Stage 1, the OWDP Project Team developed a set of recommendations and associated tasks for work to be performed in OWDP Stage 2 (2023-2025):

Recommendation 1: Develop a governance structure for the OWDP.

Recommendation 2: Develop Standard Operating Procedures for submission, curation, and integration of data in the OWDP.

Recommendation 3: Develop a pilot OWDP based on an iterative process.

Recommendation 4: Based on agency- and stakeholder-identified needs, determine short- and long-term priorities for data readiness and integration.

Recommendation 5: Where appropriate and possible, use existing software systems to build on staff knowledge and expertise.

To pursue these recommendations for Stage 2 of the data portal initiative, the OWDP Project Team has estimated necessary resources, including costs to support technical staffing and contract services, for project development and implementation during the 2023-2025 biennium at approximately $2.5M.

LEGISLATIVE REPORT

THE OREGON WATER DATA PORTAL PROJECT

INTRODUCTION

The Oregon Water Data Portal (OWDP) will be a modernized, single point of access for public water and infrastructure data to inform water resource decision-making in Oregon. The portal framework will make it easier for water decision makers and the public to find, integrate, and analyze data. The OWDP will be responsive to the recommendations of the 2017 Integrated Water Resources Strategy (IWRS), the 2020 100-Year Water Vision, and the Secretary of State's 2023 Water Security Advisory Report by aggregating data currently fragmented across many different agencies and processing those data into answers to key water questions.

Improved coordination of inter-agency data management, sharing, and processing are the foundation of the OWDP and will enable public, private, and non-governmental organizations to make better informed decisions about water management, use, conservation, and investment. Moreover, by leveraging consistent and modern data management practices and technologies, the OWDP will increase the accessibility and utility of required data reported from regulated entities and agencies and improve the security of public water data managed by state agencies. The OWDP will enable agencies to address ongoing water management challenges identified by multiple stakeholders, including, but not limited to:

- Tracking the capacity and condition of dams, canals, and other critical public water infrastructure.
- Developing a standardized portal to support the interoperability and accessibility of reported data between agencies.
- Integrating existing and new groundwater data to characterize aquifers to support aquifer-specific groundwater budgets.

- Forecasting water availability and demand under climate and population change scenarios.
- Developing a statewide assessment of Publicly Owned Treatment Works infrastructure improvement needs to ensure compliance with the Clean Water Act and address future water quality and climate challenges.
- Documenting outcomes of water planning efforts, such as instream flow conservation programs.

BACKGROUND

The state of Oregon has undertaken several efforts focused on improving cross-agency water planning and management. These efforts included initiatives around water planning and collaboration, such as the Oregon Water Core Team (WCT), the 2017 IWRS, and the 2020 100-Year Water Vision, among others. A consistent and growing theme across these initiatives has been the need for better data access and integration across agencies.

In 2021, the Oregon Legislature directed the Oregon Department of Environmental Quality (DEQ) and the state water agencies to “begin initial scoping and design” and “develop a funding request for further development” of a water database framework.[8] This authorized work is also responsive to Recommendations A and B[9] of the 2022 Report of the Work Group on State-Supported Regional Water Planning & Management.

To implement this work, the partnering agencies developed a Project Concept Document that introduced the OWDP and outlined three stages of work: Stage 1 from 2021-2023, Stage 2 from 2023-2025, and Stage 3 beyond 2025 (see Appendix A). The OWDP project, led by DEQ, established three working groups, known collectively as the **OWDP Project Team** (see Appendix B):

[8] HB 5006 SECTION 112: “In addition to and not in lieu of any other appropriation, there is appropriated to the Department of Environmental Quality, for the biennium beginning July 1, 2021, out of the General Fund, the amount of $350,000, to begin initial scoping and design of a database framework of water and infrastructure data.”

[9] HB 5006 Report of the Work Group on State-Supported Regional Water Planning & Management, Recommendation A: “The Legislature should allocate increased funding to support state agency capacity and resources for collecting, processing, interpreting, and distributing the water data needed for more effective water planning and management of instream and out-of-stream needs.” Recommendation B: “The Legislature should fund, and the Governor should direct, the appropriate level of agency capacity needed for interagency data collection and analysis, technical support, and coordinated work-planning and budgeting to ensure robust engagement by and between agencies in support of water planning in alignment with each agency’s mission and authorities.”

- **Subject Matter Expert (SME) Team** represents each of the 17 Oregon water agencies with knowledge of each water agency's processes, data, and supporting business systems.
- **Technical Team** provides expertise for the platform and technologies to be considered for the OWDP. Team members include several water agencies, Oregon Department of Administrative Services, and three external organizations (see below).
- **Steering Committee** consists of water data agency and IT executives to guide the project and serve as its change control board.

In addition to these agency-based teams, DEQ commissioned three external organizations to assist with the OWDP Project: Oregon State University's Center for Applied Systems and Software (CASS); Oregon State University's Institute for Natural Resources (INR); and the Internet of Water team at Duke University (IoW). CASS has special expertise in planning, managing, and executing data and information technology projects with Oregon state agencies; INR has special expertise in geospatial server applications and great familiarity with a wide variety of public data types in Oregon; and the IoW has assisted several US states in their water data modernization efforts (e.g., NM, TX, CA, NC), and developed a set of standard water data integration templates and best practices suitable for national use.

STAGE 1: 2021 – 2023

STAGE 1 ACCOMPLISHMENTS TO DATE

As of January 2023, the OWDP Project Team has completed or is nearing completion of many of the stated goals of Stage 1, including:

- **Engagement and Listening Sessions:** Members of the SME Team conducted a series of Tribal Government and stakeholder engagement and listening sessions. The goals of these sessions were to hear from users, Tribes, and stakeholders about water data issues including: data needs and gaps; challenges in accessing existing data; concerns about portal development and data management; and prioritization of data use case themes (e.g., plausible data use and decision scenarios) to inform development of a pilot portal. Following these sessions, the SME team distributed a survey to gather additional information to inform the design and development of the OWDP to best fit data and user needs. These engagements included 68 participants representing more than 40 state and local agencies, Tribes, community organizations, industry groups, and non-governmental organizations (See Appendix E).
- **Data Inventory:** The OWDP Project Team compiled an initial draft data inventory of currently existing water data sets held by the 17 state agencies with water-related missions or functions. The inventory includes available information on the managing agency, data type, and current need and condition. The inventory does not include or address federal or local water agency data (unless those data are reported to state

agencies). Over 200 distinct data sets were identified and preliminarily assessed for level of readiness, level of need by user groups, and priority for inclusion in the OWDP (See Appendix H). Further development of the content of the data inventory will continue as part of Stage 2 recommended tasks.

- **Data Needs Assessment:** The OWDP Project Team began a Data Needs Assessment to identify data sets that are essential for responding to consistent water data-related questions, but either do not exist or have low "readiness" (e.g., not readily available in digital or interoperable formats, only available across fragmented spreadsheets). The OWDP Project Team identified a baseline of data sets that are needed but not yet collected or available for inclusion in the OWDP; several of these data sets were further identified as a significant need, key data, or both (See Appendix L). Data Needs Assessment work will continue as part of Stage 2 recommended tasks.
- **Data Prioritization Framework:** The SME Team and Technical Team collaborated with IoW to develop a preliminary framework to prioritize data for incorporation into the OWDP. This framework was informed by stakeholder, user, and Tribal Government engagement (see above).
- **Technical Team Engagements and Report:** The OWDP Project Team engaged with peers from Texas, New Mexico, and California, who have initiated and managed similar water data modernization projects. Additionally, the Technical Team solicited presentations from data management vendors (e.g., Foundry Spatial, Google, True Elements) to better understand the technical options available, and how those interacted with currently adopted technology and expertise in the various water agencies. The Technical Team produced a report that analyzes the options available to Oregon to establish the OWDP and includes recommendations for technical aspects of the portal platform (described below) to be implemented in 2024 (See Appendix I).

STAGE 1: WORK REMAINING THROUGH JUNE 2023

For the remaining period of Stage 1 (to conclude in June 2023) the OWDP Project Team will continue improving the draft data inventory and planning the portal and its technical components. The team will also focus on developing use cases and identifying options to deliver useful water information and data visualization tools for decision-making. Scoping during Stage 1 has found that across state agencies, there are data that are not ready for use in a portal because they are collected only on paper; located in outdated spreadsheets or isolated databases; or not currently collected by state agencies. In some cases, the remedies for these situations will be substantive projects for agencies to pursue during subsequent stages of the OWDP Project. In June 2023, an OWDP Project Stage 1 Final Report will be issued that will include detailed summaries of the activities and analysis conducted and may identify that additional resources are needed to optimize the pilot OWDP. Further evaluation of data readiness and supporting information will continue as part of the recommended tasks of Stage 2.

RECOMMENDATIONS AND TASKS FOR STAGE 2: (2023-2025)

Recommendation 1: Develop a governance structure for the OWDP.

Task 1.1: In collaboration with participating agencies, develop a governance structure and process that includes the designation of a lead agency, articulation of portal-related decision-making processes, procedures for incorporation of feedback, and development of a detailed plan for the ongoing maintenance and governance of the OWDP.

Task 1.2: Develop resources to support the implementation of the OWDP, including, but not limited to, writing position descriptions, identifying recruitment opportunities, creating contract language, and identifying applicable grant funding.

Recommendation 2: Develop Standard Operating Procedures for submission, curation, and integration of data in the OWDP.

Task 2.1: In collaboration with participating Oregon state agencies, develop and draft a library of standard operating procedures, data privacy and quality guidelines, and standards for data to be included in the OWDP.

Task 2.2: Determine, define, and draft criteria for data readiness.

Recommendation 3: Develop a pilot OWDP based on an iterative process.

Task 3.1: Build a pilot OWDP based on guidance and recommendations from the OWDP Technical Team. This product will have enough data sets and features to attract early users and validate technology assumptions and processes for data integration.

Task 3.2: Engage in an iterative design process that incorporates feedback throughout the development process by testing pilot versions of the interface for usability and functionality with potential user groups.

Task 3.3: In partnership with the IoW, secure Federal grant funds, such as Water Smart grants from the Bureau of Reclamation, to engage special service districts and local and Tribal governments in the development and testing of a pilot OWDP.

Recommendation 4: Based on agency- and stakeholder-identified needs, determine short- and long-term priorities for data readiness and integration.

Task 4.1: Add, refine, and prioritize use cases that will be supported by the OWDP, to ensure that critical water management decisions can be made using appropriate data.

Task 4.2: Continue to assess and analyze data sets in the OWDP Draft Data Inventory and Draft Data Needs Assessment, to determine the requirements to meet the standards for inclusion in the OWDP.

Task 4.3: Employing the standards and guidance developed in Recommendation 2, evaluate and catalog the status of and requirements for data and organizational readiness.

Task 4.4: Formally assess necessary long-term projects for both data with high priority and low readiness and data with high readiness.

Task 4.5: Draft project evaluation plans and Policy Option Package suggestions for agencies to address water data and information technology gaps.

Task 4.6: Work with state water agencies to communicate the implications of projects and resulting data at the regional and state level.

Recommendation 5: Where appropriate and possible, use existing software systems to build on staff knowledge and expertise.

Task 5.1: Where appropriate, deploy tools and software products included in existing state software systems to build on staff knowledge and create efficiencies in developing the pilot OWDP infrastructure and interface. Where state-licensed technologies are insufficient, analyze additional software options.

Task 5.2: Determine the appropriate platform(s) for data storage, data reporting, and data analysis based on OWDP Technical Team recommendations.

At the conclusion of Stage 2, a final report and legislative request will be drafted in collaboration with the SME Team, Technical Team, and Steering Committee.

ESTIMATED RESOURCE NEEDS FOR STAGE 2: (2023-2025)

This report, the current concept of the portal, and the resource estimates below are well supported by our work to date as part of the "initial scoping and design" process commissioned by the legislature. However, project work and learning will continue until the end of the 2021-2023 biennium and these estimates will be further refined.

As of January 2023, resources needed for the Oregon Water Data Portal project:

	CATEGORY	DESCRIPTION	AMOUNT
1.	LIMITATION	"Limitation" is permission from the Oregon Legislature to spend funds acquired via Federal grants, including the Bureau of Reclamation Water Smart grant.	$250,000
2.	CONTRACTORS SERVICES	IoW, CASS, INR, DAS rotation project Quality Assurance contractor, additional contracting TBD	$1,000,000
3.	SOFTWARE SYSTEMS AND HOSTING	ESRI, FME software licenses, other software licensing fees TBD, hosting and central data storage	$125,000
4.	STAFFING	3.56 FTE Two half-time Data Specialists (ISS-4) One Geographical Information Specialist (ISS-5) One Business Analyst/Developer (ISS-6) One System Architect/Lead Developer (ISS-7)	$1,136,846
	TOTAL		$2,511,846

LIMITATION

$250,000 of limitation for an anticipated Federal Bureau of Reclamation Water Smart data grant, expected to begin in September of 2023. This grant will be used to fund engagement with state and local Oregon community agencies, discover and process useful data sets to offer on the OWDP, communicate how to use the portal in decision-making, and get feedback on the state's portal plan.

CONTRACTOR SERVICES

Contractor cost estimates are based on 2021-2023 project contractor spending. OWDP used contractors for approximately 12 months of the 2021-2023 biennium and spent approximately $300,000 of the allocated project money on the three main project contractors. Those three contractors, doing similar work for 24 months should be approximately $600,000. An additional contractor is added to perform an ongoing project Quality Analysis, per the state Chief Information Officer's recommendations, for an additional $200,000.

The project team anticipates several substantive but currently unassigned contractor tasks to be necessary during the development of the pilot portal. These are likely to be for software system setup, data transformation and setup of data flows, especially for data toolset providers. These tasks will be assigned to the $200,000 allocation titled "Additional Contracting".

CONTRACTOR	DESCRIPTION	AMOUNT
IoW	IoW will format water data families, engage local governments, draft plans for missing-but-needed data, analyze water data sets, move water data sets to the prototype portal via standard data communication protocols, consult on national water policy and its applicability to the OWDP	$250,000
CASS	CASS will be responsible for Project Management assistance, administrative work, assistance with project planning paperwork and project reporting, meeting facilitation, and other miscellaneous duties. CASS is an experiential learning program and will include internships.	$250,000
INR	INR will supply technical leadership, project component execution, perform INR stakeholder engagement, and other miscellaneous duties.	$100,000
QA CONTRACTOR	DAS rotational project QA contractor	$200,000
ADDITIONAL CONTRACTING	Consulting, development, application development, and other subject matter expert tasks as discovered during the course of the project.	$200,000
TOTAL		$1,000,000

SOFTWARE SYSTEMS AND HOSTING

DESCRIPTION	DURATION	AMOUNT
ESRI ACCESS LICENSES	1 year	$15,000
DATA INTEGRATION TOOL LICENSES	1 year	$15,000
OTHER SOFTWARE LICENSING FEES	1 year	$20,000
HOSTING AND CENTRAL DATA STORAGE	2 years	$75,000
TOTAL		$125,000

STAFFING

This staffing request is largely based on the OWDP Technical Team's recommendation. (The Technical Team report is included in Appendix I.) The staffing outlined below assumes that the project lead and some ancillary project management roles will be performed by existing agency staff.

POSITION	PT/FT	START DATE	COMMENT	AMOUNT
ISS-4	PT (.5)	9/1/23	Data Analyst	$149,185
ISS-4	PT (.5)	1/1/24	Data Analyst	$117,018
ISS-5	FT	9/1/23	GIS Specialist to participate in data analysis and portal development	$278,005
ISS-6	FT	10/1/23	Business Analyst/Developer for agency backlogs and long-term projects, general Portal developer for Portal Tech Stack	$277,507
ISS-7	FT	9/1/23	Architect, lead developer and data analyst, data communication standards	$315,131
TOTAL				$1,136,846

ISS-7: This position is the operational technical lead and will serve as the SME team technical advisor. They will be primarily responsible for the success of the project's overall technology setup and secondarily responsible for the data acquisition, analysis, and transformation portions of the project. This position could eventually develop into the OWDP system operator.

ISS-6: This position is the application lead and will actively participate the project's Technical Team. They will be primarily responsible for leading and executing the building of the pilot portal and secondarily responsible for developing OWDP Standard Operating Procedures (SOP).

ISS-5: This position will be primarily responsible for developing the OWDP's mapping display and managing geospatial components of the data sets and secondarily responsible for defining and maintaining geospatial data standards. They will participate in the development of SOP and provide subject matter expertise on geospatial topics. They will be a member of the Technical Team, responsible for acquiring and setting up various geospatial contract data sets.

ISS-4: These two positions will be graduate-level student data analysts. They will be primarily responsible for analyzing available data sets to determine transformations needed for integration with similar data sets from other agencies intended to be offered on the OWDP and secondarily responsible for assisting in technical tasks as necessary and requested by the project management and senior technical staff.

These two ISS-4 positions will be half time. They will be expected to accomplish data analysis work for the OWDP project while gaining valuable experiential learning. This will include occasional state agency field work with the intention of conceptually connecting the data they are working on to real world operations Oregon agencies perform.

In all cases, during the project stages, technical staff will work with the contracting organizations to produce project outputs as planned and be responsible for meeting the stated goals and expectations of project governance bodies.

Funds allocated to project staffing will be used to meet the fund matching requirements of Federal grants, including the 2023 Bureau of Reclamation grant which is a 1-1 matching grant.

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Making a Water Data System Responsive to Information Needs of Decision Makers

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Evidence-based environmental management requires data that are sufficient, accessible, useful and used. A mismatch between data, data systems, and data needs for decision making can result in inefficient and inequitable capital investments, resource allocations, environmental protection, hazard mitigation, and quality of life. In this paper, we examine the relationship between data and decision making in environmental management, with a focus on water management. We focus on the concept of *decision-driven data systems*—data systems that incorporate an assessment of decision-makers' data needs into their design. The aim of the research was to examine the process of translating data into effective decision making by engaging stakeholders in the development of a water data system. Using California's legislative mandate for state agencies to integrate existing water and other environmental data as a case study, we developed and applied a participatory approach to inform data-system design and identify unmet data needs. Using workshops and focused stakeholder meetings, we developed 20 diverse use cases to assess data sources, availability, characteristics, gaps, and other attributes of data used for representative decisions. Federal and state agencies made up about 90% of the data sources, and could readily adapt to a federated data system, our recommended model for the state. The remaining 10% of more-specialized data, central to important decisions across multiple use cases, would require additional investment or incentives to achieve data consistency, interoperability, and compatibility with a federated system. Based on this assessment, we propose a typology of different types of data limitations and gaps described by stakeholders. We also propose technical, governance, and stakeholder engagement evaluation criteria to guide planning and building environmental data systems. Data-system governance involving both producers and users of data was seen as essential to achieving workable standards, stable funding, convenient data availability, resilience to institutional change, and long-term buy-in by stakeholders. Our work provides a replicable lesson for using decision-maker and stakeholder engagement to shape the design of an environmental data system, and inform a technical design that addresses both user and producer needs.

Keywords: water management, data systems, stakeholder engagement, environmental decision making, California

INTRODUCTION

Evidence-based environmental management requires data that are sufficient, accessible, useful and used (California Department of Water Resources, 2020). If data systems are to effectively inform environmental decision making, then development of such systems can be improved through assessment and incorporation of decision-makers' data needs. The concept of *data-driven decision making* describes the practice of making decisions based on analysis of data (Provost and Fawcett, 2013). In this paper, we develop a related and equally important concept of *decision-driven data systems*: data systems that are designed based on an understanding of decision-makers' data needs. Development of such systems can be improved through first assessing these needs and then incorporating this assessment into system design and content prioritization.

We define "data systems" broadly as the assemblage of hardware, software, people, and institutions that collect, organize, archive, distribute, integrate, process, analyze, and synthesize data and information. There are a growing number of efforts that seek to advance earth and environmental data systems through integration and collaboration in order to maximize applicability to both research and decision making. For example, National Science Foundation (NSF) has supported Hydroshare, a collaborative environment for sharing hydrologic and critical-zone data and models geared toward research users. In the European Union, the INSPIRE Directive seeks to create a spatial-data infrastructure to inform E.U. environmental policies, and the Copernicus project focuses on meeting earth-science data-user needs. Copernicus developers have created a use case library demonstrating how data are applied to real-world problem solving.

Water management presents an important case for strengthening the relationship between environmental data and decision making. Provisioning and use of adequate information are central to effectively making investments in water infrastructure, confirming environmental regulatory compliance, managing risks and uncertainties, guiding operations, evaluating and encouraging innovation, and making rapid and effective decisions during droughts, floods, or crisis events (Kiparsky et al., 2013; Escriva-Bou et al., 2016; Larsen et al., 2016; Green Nylen et al., 2018a,b). Researchers have worked to strengthen connections between data and decision making related to water. For example, researchers have assessed decision-makers' demand for and use of forecasting data for water resources management (Viel et al., 2016; Neumann et al., 2018). Researchers and computational/data scientists are advancing new approaches to quantify watershed behavior to inform management decisions. Recent examples highlight the promise of machine learning for advancing tractable watershed-data processing, parameter estimation, sensor optimization, early warning, groundwater-level prediction, and process understanding (e.g., Ahmad et al., 2010; Oroza et al., 2016; Pau et al., 2016; Mosavi et al., 2018; Schmidt et al., 2018; Müller et al., 2019). Researchers are also developing watershed-centric data tools that seek to improve integration of data management, analysis, modeling and interpretation of diverse watershed datasets (Varadharajan et al., 2019; Hubbard et al., 2020). These examples indicate significant potential for new tools to aid in the tractable translation of water data into information for decision making.

The complexity of water systems means that managers must integrate and analyze multiple types of data and information (Kallis et al., 2006; Bakker, 2012; Vogel et al., 2015). Modern information technology promises, in concept, to make such multi-faceted integration possible, but providing data does not in and of itself ensure that data can or will be used for more effective and sustainable water management. Here, *water data* refers to a broad suite of data and information used to inform water-related research and decision making. Water data includes both measured data and model-output data, and can be used both to characterize systems and to monitor conditions over time. Our definition of water data goes beyond hydrologic data such as streamflow, precipitation, and groundwater-level measurements to include many related and relevant areas, such as land use, ecological, and agricultural data. We primarily address public data sources in this paper.

As a case study, we focus on California water, which is one of the most complex and politically contentious environmental management challenges in the world. California's water challenges require a wide range of data to solve problems including managing drought and climate change, balancing environmental and agricultural water demands, and meeting water needs of endangered species and cities alike (Hanak, 2011). Yet despite California's prominence in the technology sphere, the state's water data have not proven up for these challenges (California Council on Science and Technology, 2014; Escriva-Bou et al., 2016). California water data are diverse and fragmented, and are produced, housed, and maintained by multiple entities from disparate sectors. Recent legislation has attempted to address this issue. California's Open and Transparent Water Data Act (Assembly Bill, or AB 1755), passed in 2016 (Cal. Water Code §12,400 et seq.), requires California state agencies to integrate existing water and other environmental data from local, state, and federal agencies for the purpose of creating and maintaining a statewide integrated water data platform. In this research, we developed a process to systematically explore data needs for decision making to inform the design of data systems, focusing on California.

The aim of this paper is to contribute a better understanding of the practice of translating data into effective decision making by engaging stakeholders in data system development. The research has three main contributions. First, we develop the concept of a decision-driven data system, and assess how it might support improvements in informing management across a wide range of environmental sectors. Second, we examine and illustrate the concept's application in the California case study by defining attributes of a user-centered data and information system through stakeholder engagement. Third, we identify and characterize types of data limitations, and evaluate how a decision-driven, user-defined data system can address the data limitations experienced by users.

We first describe our methods, which involved working with stakeholders in California water management to develop and analyze a set of "use cases," short descriptions of decision making and the data needed to inform those decisions. We then develop a typology of different types of data limitations and gaps described by stakeholders, including gaps in data availability, accessibility, interoperability, and resolution. We propose technical, governance, and stakeholder engagement evaluation criteria to guide planning and building environmental data systems that account for these needs. By developing and describing a method for engaging stakeholders in the development of data systems, this article contributes to a better understanding of a crucial but understudied aspect of the practice of translating data into effective decision making, and offers recommendations applicable to a broad range of environmental and climate data and information systems.

METHODS

Leaders from the California Department of Water Resources (DWR), the California Council on Science and Technology (CCST) and researchers from University of California collaborated on a process of engaging stakeholders and evaluating data needs with the goal of ensuring that California's Open and Transparent Water Data Act results in an effective data system that improves water management in practice[1]. Our stakeholder engagement was centered around identification and analysis of "use cases"—brief descriptions of decision making associated with a specific outcome (such as balancing a basin water budget or responding to a harmful algal bloom) and the data needed to inform those decisions (fully described in Cantor et al., 2018). The idea of use cases was initially articulated in the field of computer sciences, based on the concept of developing data systems by starting with the end users' goals in mind in order to increase efficiency and efficacy (Alexander and Maiden, 2005; Kulak and Guiney, 2012). We adapted the use case approach from computer sciences to first systematically assess the data needs of California's water decision makers and other data users, then evaluate whether existing data and data systems met these needs, and finally to communicate these needs with technical developers of data systems and applications.

Use Case Development

We developed our application of the use case concept in collaboration with technical data system developers as well as data users. To begin, we asked the interrelated questions of *who* needs *what data* in *what form* to make *what decisions* (Kiparsky and Bales, 2017). We created a template (**Table 1**) to guide stakeholders in answering these questions in a systematic way, centered around a particular decision or goal.

Using the template in **Table 1**, we identified and developed 20 use cases (see Cantor et al., 2018). The use cases were compiled during three full-day-long facilitated workshops as well as additional meetings with stakeholders. We defined "stakeholder" broadly as including data producers and consumers with an interest in the outcomes of California's progress on

TABLE 1 | Use case template: Elements and definitions of a use case (adapted from Cantor et al., 2018).

Use case element	Definition
Objective	The decision, goal or desired action. The objective describes what the user is trying to accomplish. The objective is the goal or desired action on the part of the system user. Decisions could be investment and policy decisions (longer-term); programmatic implementation (medium-term); regulatory compliance; or operational decisions (short term).
Description	The description provides important context and background information that might help a reader understand the objective.
Participants	The participants include the main actor(s) or decision maker(s). Participants may also include other parties involved or affected by the decision or objective (in this case, note the main decision-maker).
Regulatory context	Regulatory context deriving from specific statutes or regulations and activities; legal operational constraints; specific government-agency programs or those under development; reporting requirements; and other regulated activities. It also includes physical and fiscal boundaries, frequency of reporting requirements and constraints.
Workflow	The workflow describes a progression of steps and specific actions taken by the participants in order to accomplish the objective.
Data sources	Data sources include existing data sources as well as gaps. This section describes the data already in use, along with additional sources that data users would like to see developed.
Data characteristics	Data characteristics includes notes about the type, form, and format of data that would be most useful for making decisions, and anything peculiar about the data.

[1]In this article, we build on and extend a 2018 report published by the Center for Law, Energy & the Environment at Berkeley Law, available at: https://doi.org/10.15779/J28H01. The initial report was published as a white paper intended largely for a California-based water policy and decision-maker audience. In this article, we strive to speak to a broader scholarly audience by expanding the theoretical framing, putting key ideas from the 2018 report into a more in-depth conversation with scholarly literature, extending the generalizable observations, and more fully developing and discussing the typology of data limitations.

water data, including academics, state and local agency representatives, non-governmental-organization representatives, community members, the private sector, and other water management practitioners. Workshop participants were selected through purposive sampling (Aarons et al., 2012; Ritchie et al., 2013) based on their relevant experience with data use or production related to the selected use cases.

The first two workshops, which produced eight use cases in total, each included 60–80 attendees. The majority of attendees worked with one of the state agencies named in California's Open and Transparent Water Data Act (AB 1755), so they attended in the capacity of their agencies, which had a direct stake in the process. Other attendees included academics, non-profit organization representatives, and others who saw themselves as having an interest in participating in water data system design and development. Lunch and opportunities for networking were provided as part of the workshops. Workshops began with an overview of the concept of data for decision making and the specific task of informing development of a data system. Participants then formed smaller breakout groups of 10–20

TABLE 2 | Example of completed use case: Groundwater recharge project planning.

Use case element	Use case: Planning a groundwater recharge project
Source	Data for Water Decision Making Workshop 1, February 9, 2017
Objective	To determine when, where, and how to recharge groundwater, with what water, in order to avoid declining groundwater levels through the recharge of groundwater.
Description	Under California's Sustainable Groundwater Management Act (SGMA), Groundwater Sustainability Agencies (GSAs) must avoid undesirable results including chronic lowering of groundwater levels. Managed Aquifer Recharge (MAR) is the use of, e.g., infiltration basins, green infrastructure, aquifer storage, and recovery wells to actively increase the amount of water that enters an aquifer. MAR can offset reductions in groundwater levels by increasing storage of water.
Participants	• GSA • Consultants • Local land use planners • State Water Resources Control Board and CA Department of Water Resources (interested in results of groundwater sustainability plan) • GSA constituents
Regulatory context	• Sustainable Groundwater Management Act • Other regulatory contexts: for example, CEQA, NEPA, water rights issues, water quality issues • Possible permits from SWRCB
Workflow	Identify potential source(s), quantity, timing, and cost of water available for recharge. Examine options for recharge areas based on geology, basin capacity, available land and land values, and water quality implications. Take into account basin characteristics such as subsurface characteristics, soil types, topography, current and planned land use, and basin capacity.
Data sources	• Water availability data: Water rights information, precipitation data, projected flows, projections/forecasts of water availability. ○ DWR California Data Exchange Center datasets: "California Statewide Water Conditions" (includes precipitation, snowpack, runoff forecasts, river runoff, and reservoir storage) ○ Executive Update on Hydrologic Conditions in CA (03/31/2017; updated monthly) ○ Annual Water Year Precipitation Summary ○ Reservoir Water Storage, by hydrologic region ○ USGS Current Water Data for California: Daily Streamflow Conditions ○ NOAA Precipitation Frequency Data Server (PFDS) ○ CA Water Board Electronic Water Rights Information Management System • Basin characteristics data: Soil types, basin capacity, subsurface characteristics, assimilative capacity, models of basin characteristics, evidence for natural recharge. ○ DWR Groundwater Basin Maps and Descriptions (Bulletin 118) ○ USGS Groundwater Modeling: California Groundwater Model Archive ○ UC Davis California Soil Research Lab Soil Agricultural Groundwater Banking Index (SAGBI) suitability index for groundwater recharge • Land use data: Available land, water quality concerns from past land use history, historical data on land use (requires both temporal and spatial dimensions). ○ DWR Land Use Survey data (available at county scale; available years vary) ○ USDA National Agricultural Statistics Service "Cropscape" Cropland Data Layer ○ USGS Global Land Cover Characteristics Data Base, Version 2.0 ○ CA Department of Conservation Farmland Mapping and Monitoring Program • Data gaps: ○ Water rights data may be incomplete or unavailable. ○ Groundwater pumping data may not be readily available. ○ Data on water demands for managed habitat, including state, federal and private wildlife refuges, hunting clubs, and incidental habitat areas
Data characteristics & further notes	To capture potential impacts of previous land uses (including contamination), land use data must include both historical and spatial dimensions. Spatial analysis can help find areas of overlap between various characteristics. Groundwater models may be required to make decisions in some cases, but not all. Existing groundwater models may be useful in some cases, but in other cases existing models may be insufficient. Not all required data is digitized, which presents problems for those seeking to access and use data. Uncertainties in this case include land use impacts on groundwater, as well as climate change and other uncertainties.

participants to develop use cases on pre-identified topics. Each group was given the use case template (**Table 1**) and had an assigned facilitator and note taker from the project team. We next identified and developed four additional use cases through a series of more-targeted, facilitated meetings with smaller groups of water data users and data producers with specific subject area expertise (for example, employees at the California State Water Resources Control Board involved in water rights), and worked directly with a range of non-governmental organizations and state agencies to identify and develop the remaining eight use cases using the template. Finally, a third, larger workshop was held toward the end of the use case process to present the initial use cases and findings to ∼100 attendees, and to solicit their feedback. The process thus evolved over time—from medium-sized workshops with a variety of water data users, to targeted meetings and one-on-one work to generate specific use cases, to a more general forum to present initial results.

The use cases encompassed a diversity of topics relevant to California water management, including groundwater management, environmental restoration, wetland monitoring, fishery management, urban and agricultural water management, water rights and water availability, capital investment, and drought contingency planning[2]. For example, some of the specific use case topics included "Management of environmental flows to protect salmon habitat," "Groundwater basin water budgets," "Water shortage contingency planning vulnerability assessment," and "Decision support system for harmful algal bloom response, communication, and mitigation." To provide a more detailed example, **Table 2** shows a completed use case on the topic of groundwater recharge project planning, and **Table 3** summarizes the specific data sources listed by stakeholders for this example use case.

While the sample of use cases does not comprehensively represent the entire landscape of California water management (for example, the cases covered many themes related to water quality, habitat, and water allocation, but water treatment utilities were largely unaddressed in the overall use case portfolio), the cases represent the complexity and breadth of water-management topics, and the selection of use cases was deliberately aligned with broader goals for California water (California Natural Resources Agency, 2016).

TABLE 3 | Specific data sources for groundwater recharge use case.

Topic	Description	Data source description
Water	Precipitation	DWR CDEC 2017 WY Precipitation Summary
Water	Hydrologic conditions	DWR CDEC Executive Update on Hydrologic Conditions in CA (03/31/2017; updated monthly)
Water	Reservoir storage	DWR CDEC reservoir storage by hydrologic region
Water	Statewide water conditions	DWR CDEC information on precipitation; snowpack; runoff forecasts; river runoff; and reservoir storage
Water	Precipitation	NOAA Precipitation Frequency Data Server (PFDS)
Agriculture, mapping	Farmland maps	California Department of Conservation Farmland Mapping and Monitoring Program (county-level data)
Water, mapping	Groundwater basin maps	DWR Bulletin 118 basin boundaries
Land use	Land use surveys	DWR Land Use Survey data (available at county scale; years vary)
Water	Water rights	SWRCB Electronic Water Rights Information Management System (eWRIMs)
Water	Groundwater models	USGS Groundwater Modeling: California Groundwater Model Archive
Water	Groundwater recharge suitability	SAGBI (Soil Ag Groundwater Banking Index) suitability index
Land use, mapping	Land cover maps	USGS Global Land Cover Characteristics Data Base Version 2.0
Agriculture	Agricultural land use	USDA National Agricultural Statistics Service Cropscape Cropland Data Layer
Water	Streamflow	USGS California streamflow data
Data gaps		
Water	Water rights	Incomplete or inaccessible; not digitized
Water	Groundwater pumping	Incomplete or unavailable records
Water	Water demands for habitat	Data not readily available

Analysis of Use Cases

We analyzed the collected use cases to identify patterns. We compiled the data sources listed for each use case and coded them according to thematic categories, including data topic and data provider. At least two members of the research team coded each data source and cross-checked their categorizations to enhance reliability. An emergent coding scheme (Holton, 2007) was used in order to capture the wide range of stakeholder-generated themes that were included in the use cases. Use case information was then cross checked and verified to remove errors and redundancy. We then identified data gaps, which we defined as data that were unavailable, inconsistently available, available only in formats that did not allow for interoperability, or that contained gaps in measurement or analysis. Data gaps were also coded and checked by multiple researchers for reliability. Finally, qualitative comments and feedback were coded using an emergent coding scheme, and were grouped according to themes to better understand stakeholder perspectives (see Cantor et al., 2018 for more detail). These classifications allowed us to systematically examine the availability of data sources, origin of data sources, the thematic topics covered, and gaps in data.

RESULTS

Data Types and Sources

Stakeholders used (or saw potential to use) water-related data for a wide variety of decisions. Some use cases were oriented toward directly answering a question, while other use cases involved collecting and integrating data into models or

[2] A full, detailed compilation of all 20 use cases and the specific data sources associated with each is available online at: https://doi.org/10.15779/J28H01.

decision support tools that in turn could be used to inform a number of different decisions. Some use cases focused on high-level investment and policy decisions, some on mid-level programmatic implementation, and others on day-to-day operational decisions, and regulatory compliance. Some cases represented concrete, already-existing decision processes, while others were more aspirational in describing desired goals.

Analysis of the use cases confirmed that water decision makers require a wide diversity of data types. While this may be no surprise to those versed in environmental management, it is important to consider the implications for data-system design. Water decision making requires a variety of data related to various natural, built, and socioeconomic systems in addition to data more traditionally associated with the hydrologic cycle (including precipitation and streamflow, water demand, groundwater, water quality, and water storage data) (**Table 4**). As illustrated in **Table 4**, the heterogeneity of data included in the use cases underscores the point that water data systems need to incorporate not only data obviously related to water (e.g., precipitation, streamflow), but also a wide range of related data—from agricultural land use to population data to climate-change projections—to fully support water-related decisions. The diversity of data and their associated spatial and temporal resolutions presents a challenge to data-system designers seeking to prioritize accessibility and interoperability for water decision making.

A relatively small number of state and federal public agencies provided the bulk of the data: just six federal and state agencies (including, at the federal level, the U.S. Geological Survey, the U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration, and at the California state level, the Department of Water Resources, the State Water Resource Control Board, and the Department of Fish and Wildlife) provided ∼two-thirds of the data sources mentioned by decision makers. Federal and state agencies made up about 90% of the data sources, while a variety of university, private, and non-governmental sources together made up the remaining 10%. Data systems seeking to integrate public data from the full range of federal and state data providers contributing to water management will need to rely upon common data standards between public agencies to ensure interoperability—a large task currently underway in California. At the same time, there was a long list of more specialized data that were cited for specific use in a single case. Water data users drew not only from public data from state and federal agencies, but also from a wide range of less-frequently-used other sources that were still highly important in certain decisions.

TABLE 4 | Broad range of data needs and topics represented within data needed for water decision making (adapted from Cantor et al., 2018).

Topic	Examples of data needed
Water-related data needs & topics	
Water demand & use	Water demand for different uses, water rights, water transfers, water usage, conservation, conjunctive use, urban water use, water deliveries, imports and diversions, pump locations, per capita water use, consumptive use, environmental use, domestic well data
Water supply	Precipitation, hydrologic conditions, streamflow, hydrographs, full natural flow, flow projections, snowpack, return flows, river stages, annual or seasonal volume, water year type
Water storage	Reservoir capacity, reservoir levels, reservoir surveys, snowpack storage, flood storage capacity, groundwater storage capacity
Water quality	Water quality, temperature, Total Maximum Daily Loads (TMDLs), water chemistry, sediments, contaminants, bacteria, algal blooms, biological indicators
Groundwater	Groundwater basin maps, elevation, models, pumping, quality, recharge suitability, storage, groundwater-dependent ecosystems, groundwater-surface water connectivity, Groundwater Sustainability Agency boundaries, well locations, well logs, aquifer storage capacity
Further data needs & topics beyond water-specific data	
Agriculture	Land use, crop types, evapotranspiration, pesticide use
Ecology	Species counts, habitat attributes, biodiversity, invasive species, wildlife population estimates, forest type, vegetation classification, aquatic resources, wetland boundaries
Geology & soils	Soil types, subsidence, geologic and hydrogeologic attributes
Infrastructure	Service area boundaries, water utility boundaries, pumping records, roads, water and energy use
Land use	Aerial imagery, city and county land use, land cover, land-use surveys, remote sensing data
Mapping & modeling	Watershed boundaries, surface waterways, terrain models, topographic surveys, elevation, county boundaries
Socioeconomic	Population, demographics, cost-benefit analyses, water pricing data, economic impact assessments, policy analyses
Weather and climate	Temperature, seasonal forecasts, climate projections, drought scenarios

Data Limitations

Stakeholder input and use cases revealed significant limitations in data and information availability (**Figure 1**). Some critical data were not available at all (limitation type 1). For example, data about groundwater extraction by individual water users was not systematically collected. As another example, data related to water demand by different interests such as recreation, or socioeconomic data such as valuation by different interests, pricing, or willingness to pay, was not readily available.

Other data were inaccessible or hard to use (limitation type 2). For example, some datasets were only published as PDF files or were not machine readable, and other data were password protected, required a fee to access, or were otherwise inaccessible. Other data had been transformed into maps or visualization tools, but the underlying data were not readily available. In one notable example, most information on California water rights only existed in paper form in a vault in the state capitol, rather than in an accessible digital database (although there have since been efforts to digitize this information).

Other data had low interoperability (limitation type 3). For example, stakeholders described datasets that were collected for specific purposes and were therefore not intended for interoperability. Multiple data producers had their own processes

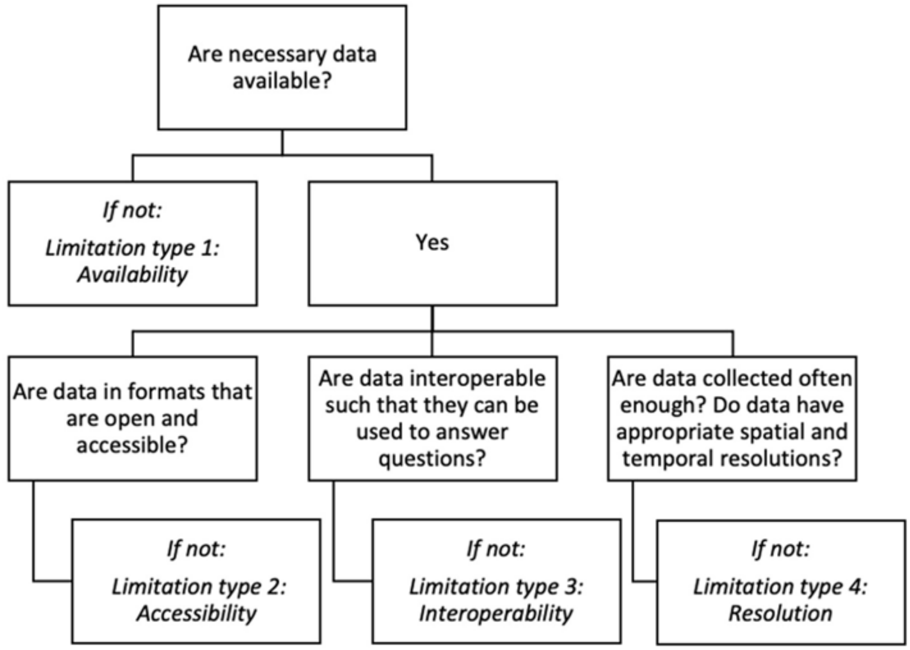

FIGURE 1 | Types of data limitations.

for data collection, storage, and documentation. The result was that data and IT systems could not exchange information with each other in standard ways allowing for comparison, aggregation, and analysis.

Finally, some data were not gathered using standardized approaches, or were not collected at useful time intervals or consistent spatial resolutions (limitation type 4). For example, data can be collected seasonally, monthly, or daily but this may not line up with decision-making needs. As another specific example, the California Department of Water Resources divides California into different hydrologic regions, but these boundaries did not exactly match USGS hydrologic boundaries, making it difficult to integrate multiple data sets.

Limitations in accessibility, interoperability, and resolution (types 2, 3, and 4) mean that some data sources can effectively constitute data gaps even if data technically exist.

DISCUSSION

Scholarship from environmental science and management has outlined guiding principles for how data can ideally guide decision making (Cortner, 2000; Cash et al., 2003; Holmes and Clark, 2008; Lemos and Rood, 2010). Data and information, beyond providing a snapshot of the state of the environment, should be *useful*, which refers to functionality and desirability for decision makers, as well as *usable*, which refers to how well data inform decision making processes in practice (Lemos and Rood, 2010). Data and information must also be *salient* (relevant to decision makers), *credible* (accurate from a scientific perspective), and *legitimate* (produced in a way that is perceived as respectful, unbiased, and fair) (Cash et al., 2003).

In this paper, we apply these principles to the mechanisms through which data are stored, published, accessed, and used. Drawing from our stakeholder engagement and analysis, we identified three categories of considerations for developing useful and usable water data systems that are salient, credible, and legitimate: (1) technical elements, including data interoperability, spatiotemporal resolution, documentation and quality; (2) governance, including funding and operating of systems across institutions; and (3) stakeholder engagement. Here we discuss each of these categories, then use them to inform criteria to evaluate a water data system.

Technical Considerations

Most of the use cases in our analysis integrated multiple data sources spanning a variety of thematic categories and sourced from a range of different data providers. The extraordinary heterogeneity of water data (**Table 4**) reflects how water decisions must often consider hydrologic, ecological, climate and other natural-system phenomena (e.g., streamflow, groundwater levels, species abundance, temperature, etc.) as well as characteristics associated with human and built systems (e.g., land use, crop types, built infrastructure, etc.). It also reflects institutional realities: water data are produced, housed, and maintained by multiple entities from disparate sectors.

Our analysis showed that there are significant limitations in data availability (**Figure 1**), including non-existent data and available but difficult-to-access data. Interoperability (limitation type 3) presented a particularly significant problem, and based on our analysis, it became evident that interoperability of multiple data sources from different providers is key to the success of an environmental data system (**Figure 1**). The current lack of uniform, accessible, interoperable, and ultimately usable data hampers evidence-based water management in California (Escriva-Bou et al., 2016). Datasets are produced for a variety of primary purposes, and thus do not always share metadata or data-quality standards. Given our finding that a relatively small number of state and federal agencies provided a large fraction of needed data, there is significant potential for interoperability to improve by focusing on those agencies. Stakeholders also noted challenges related to spatial and temporal resolution of data collection (limitation type 4), which are related to interoperability (Gibson et al., 2000).

To address the interoperability challenge, participants in our project discussed the relative benefits of centralized vs. federated data systems. A centralized system such as those used by multiple federal agencies can readily implement uniform data standards and respond to diverse user needs. Yet federated data systems were preferred by many participants. Federated data systems connect multiple independent data systems through common standards, conventions, and protocols, while keeping those independent systems autonomous (Busse et al., 1999; Blodgett et al., 2016). Our research showed that data users relied upon a wide range of data produced and distributed by a variety of state and federal agencies and other data producers. Given the reliance on a range of distributed data sources from independent organizations, a federated data system may have advantages. A successful interoperable federated system requires *clear* standards for data quality, metadata, and technical requirements. Standards do not have to be created from scratch: for example, projects such as Hydroshare and the Environmental Systems Science Data Infrastructure for a Virtual Ecosystem (ESS-DIVE), a cyberinfrastructure system to integrate diverse environmental datasets, have laid significant groundwork for methods to define and store metadata (Peckham and Goodall, 2013; Agarwal et al., 2017; Varadharajan et al., 2019). Here, it is worth highlighting the importance of clear standards, as data managers across different agencies and organizations may believe their standards are aligned but in practice, they may not be aligned sufficiently to support an effective federated system.

Workshop participants emphasized the importance of traceability, clear identification of sources, and documentation of uncertainties, all of which contribute to an assessment of data limitations (**Figure 1**). A data system drawing from multiple sources requires clear protocols for data quality assurance and documentation throughout all stages of the data life cycle. Structuring data according to set standards can facilitate integration between multiple data providers (Blodgett et al., 2016). Georeferencing of data is also critical for many water-related analyses. Archiving practices also require thought, as they are important to prevent data losses. One solution is the use of unique digital object identifiers (DOIs) for data sets (Paskin, 2010; Wilkinson et al., 2016), which can address traceability concerns by ensuring that data sets persist even if websites are reorganized and can assist with versioning, quality assistance/quality control, and referencing. For continually updated datasets, making versioned DOI sets of data would be a helpful best practice across agencies.

The range of use cases identified in this research also showed that different data users need data in different formats. In some cases, stakeholders and researchers preferred raw data which they could analyze and translate themselves into information. In other cases, stakeholders required quality-controlled data with transformed formats that could be readily input into decision-support systems, hydrologic models, workflows, visualization software, water-budget calculation, or other analytical tools.

Governance Considerations

Open data are important for sustainable and inclusive environmental management and water governance in particular (De Stefano et al., 2012; Chini and Stillwell, 2020), and can help make environmental governance more transparent, accountable, and efficient (Blodgett et al., 2016; Mayton and Story, 2018). Stakeholders in our research emphasized that developing and maintaining an open and transparent water data system requires not just making existing data more readily available, but also requires thoughtful governance and sustainable funding. Strategies for generating a sustainable funding source and governance model for a water data system have been proposed and adopted by the state of California. These involve a consortium of state, NGO, and private-sector actors working collaboratively (Huttner et al., 2018).

Participants in our stakeholder engagement noted that resources are needed throughout the information pipeline: this includes data system design, quality control, decision support and analysis tools, archiving, user support and continued system innovation. Building and maintaining a sustainable data system will therefore require investment in addressing limitations in data availability, accessibility, interoperability and resolution (**Figure 1**). To maximize usability over time, long-term funding models must be carefully thought out, with special consideration given to openness of data systems. Again, a federated system has benefits in this area: while a federated system with multiple funding streams may be vulnerable to losing one or more data streams, it also provides resilience by being distributed. It can also incorporate incremental additions from legislative actions that introduce new data sources or systems that meet new or emerging needs.

In addition to funding, an effective data system relies upon robust institutions to coordinate decision making and actions around how the data system is structured and used (Huttner et al., 2018). A framework that does not address institutional concerns increases the risk of data system failure from lack of coordination, underinvestment, or lack of trust and buy-in. Stakeholders noted the importance of trust, confidence, and credibility within and between institutions, which are widely recognized as important in water resources management generally, but can be forgotten when the focus is on the technical aspects of data systems (Jackson, 2006).

Data systems benefit from participation of data providers because their adherence to standards is important for interoperability and their involvement in those standards is a way to facilitate that adherence. Governance mechanisms such as mandates for incorporating standard metadata and data-quality procedures could help ensure that agencies participate in a federated system. The bulk of the data used by stakeholders in our analysis came from public agencies. Legislative and regulatory mandates could be a way to encourage participation of these agencies. Still, a large handful of data sources identified as useful or necessary came from a wide variety of non-governmental stakeholders. Such smaller data providers may require incentives to fully participate in a system if adhering to protocols involves costs. For example, "intervener funding" (financial support that helps stakeholders to effectively participate in agency proceedings) could help support engagement of non-governmental data producers (Kiparsky et al., 2016). Another mechanism to encourage participation could involve requiring that state-funded projects make data interoperable and publicly available (similar to current National Science Foundation requirements for data management plans and data publication).

This raises a particular conundrum for environmental data systems design: the distinction between public and non-public data. While it may be possible (although far from straightforward) to require openness and transparency of data from federal, state, and local agencies, there remains a large category of non-public data. Other sources of data include nonprofit data sources, but also private data sources that present additional complications with regards to openness and transparency. It also may be more difficult to enact requirements or incentives for interoperability with these non-public data sources, meaning that they are likely to be more difficult to integrate, even though they may provide valuable information.

Stakeholder Engagement

Ensuring that an environmental data system is sufficient, accessible, useful and used (California Department of Water Resources, 2020) hinges on meaningful, ongoing relationships with data users. Successful stakeholder engagement requires many things: recognition of common goals, time to develop functional relationships, common vocabulary, careful facilitation and ongoing maintenance of relationships, and resources. Developing environmental data systems that are sufficient, accessible, useful, and used requires both usable technical cyberinfrastructure, good governance, and funding sufficient to support both technical infrastructure and governance.

We found that engaging knowledgeable stakeholders with detailed understanding of data needs and workflows involved in different aspects of water-related decision making is essential to identifying key aspects of data system usability. We also note the importance of engaging those who hold a stake in water decisions but do not have in-depth technical knowledge. To support communication, we used professional facilitation in larger meetings to ensure that project goals were articulated clearly and concisely. We also found it useful to engage stakeholders through different formats to serve different project goals. Larger workshops were helpful in communicating overall aims to a broader audience, including those with influence over policy decisions. Smaller meetings enabled focused conversations with specific groups of people with targeted technical knowledge. Working directly with organizations to identify use cases was an effective way to engage additional stakeholders.

User-focused data-system development can thus be framed as an adaptive management cycle (Pahl-Wostl, 2007) that includes multiple iterations of planning, implementation, and evaluation. Stakeholder engagement should be formally integrated into this cycle from an early stage to increase usability of the data system (Welp et al., 2006; Reed, 2008). Because decision-maker needs and technological capacities change over time, a data system must be adaptable (McNie, 2007; Hanseth and Lyytinen, 2016), and as new decision-maker needs and new technologies arise, a data system must evolve to remain useful. The process of identifying stakeholder objectives, translating these objectives into functional and technical requirements, and using these objectives to inform the development of data systems, can be built into the life cycle of data system design.

Evaluating Decision-Driven Data Systems

To integrate the technical, governance, and stakeholder-engagement considerations identified during our research and outlined here, we propose a set of questions to guide evaluating the success of an environmental data system (**Table 5**). This set of evaluation criteria incorporates the multiple types of data limitations identified in this paper (see **Figure 1**) and includes technical considerations, governance considerations, and stakeholder engagement considerations.

TABLE 5 | Proposed criteria for evaluating success of an environmental data system (adapted from Cantor et al., 2018).

	Evaluation criteria
Addressing data limitations (see **Figure 1**)	Are appropriate data readily available? Are data accessible in open, transparent, and usable formats? Are data from multiple sources interoperable? Are data available at appropriate spatial and temporal resolution?
Technical considerations	Is documentation adequate? Are standards for metadata, data quality, and technical requirements clear to data managers? Does the data system effectively support synthesis and analysis? Are systems regularly updated?
Governance considerations	Is there institutional commitment by key organizations to use and maintain the system? Do incentives exist to ensure participation by data providers and users? Are data providers participating, in practice? Are sufficient resources allocated to long-term maintenance? Is there a plan to ensure financial stability over time?
Stakeholder engagement considerations	Are data users engaged meaningfully at key points in data system development? Is involvement of stakeholders an ongoing process? Is the system based on an understanding of decision-making contexts and user needs? Do users believe the system is useful and usable? Is the system used in practice to inform decision making?

These evaluation questions are in line with those developed by others, such as the "FAIR" (Findable, Accessible, Interoperable, Reusable) Guiding Principles (Wilkinson et al., 2016), but also add to these guiding principles through inclusion of governance and stakeholder engagement criteria, which we argue are crucial to data system success and should therefore be included alongside the more technical considerations. These questions are targeted at data providers, although many of the evaluation questions require the input of data users. The questions do not provide quantitative measurements or metrics, which would need to be specific to an individual data system; instead, these questions provide a guide for data providers to consider how well their system is serving users. Our evaluation criteria include the very important question of whether the data system is ultimately used in practice to inform decision making—perhaps the key indicator of success.

A crucial indicator of the success of our process can be found in the formal uptake of the concepts of decision-driven water data systems into state processes required by statute (California Department of Water Resources, 2020). Based on the results of our workshops and analysis, our recommendation of a federated, use case-driven water data platform that connects independent databases while prioritizing and managing data based on how data will be used has been adopted by California's AB 1755 Partner Agency Team. Another indicator of success is in the influence of other subsequent processes. For example, organizers of a recent workshop on water data in Texas used a use case approach based on our template and model (Rosen and Roberts, 2018). Drawing from our approach, the Texas workshop organizers also started from the basic principle that water data systems must be responsive to stakeholder needs in order to support decision making in practice (Rosen and Roberts, 2018).

Challenges and Limitations

In the course of our study, we experienced inevitable obstacles related to the challenges of working with stakeholders. We found that (as might be expected) engaging with stakeholders meaningfully is time consuming and takes resources, and it is important not to underestimate the capacity needed to conduct effective stakeholder engagement. We also learned that developing a sufficiently clear articulation of an objective or decision around which to anchor a use case was not a simple task. In practice, it proved difficult for larger groups with greater diversity in their topical expertise to agree upon objectives. At the same time, engaging participants in groups helped ensure that different stakeholders with various types of expertise could provide different types of knowledge.

The work presented in this paper has several limitations. First, many problems in the water sector are highly complex. They may involve multiple levels or stages of decisions: in this project we mainly tested the use case approach on single-stage decisions and the concept would need to be adapted or used iteratively to account for multi-stage decisions. Second, the use case framework is helpful for identifying data gaps, but does not necessarily provide a mechanism for evaluating the relevance or significance of such gaps. That is, some limitations represent a critical bottleneck to decision processes, while other limitations do not actively constrain decisions from going forward but still impact the quality of those decisions. Future efforts to implement use cases and identify data limitations could ask participants about the relative impact of a particular data limitation. Third, we developed this methodology with the creation of a new data system in mind; we did not test the applicability of the methodology to existing data systems that already have established formats and tools. Future work could test our proposed evaluation criteria by applying it to an existing system. Finally, given growing interest in water data from global organizations (for example, the World Water Data Initiative, led by the World Meteorological Organization) there may be opportunity for future research to examine how these concepts apply to different scales.

We also acknowledge that conflicts in water management go beyond data. Water issues and proposed solutions frequently evoke controversy and can be hotly contested. In this project we did not directly address the complex politics and disagreements between different stakeholder groups that frequently emerge in environmental governance and problem-solving. While data can, ideally, help inform and evaluate solutions to difficult and controversial issues, we recognize that lack of data is not the only issue preventing good water governance, and that conflict will not be resolved solely through data availability.

CONCLUSIONS

Applying the concept of decision-driven data systems to environmental management is an important contribution to the overarching goal of enhancing data-informed environmental decision making. Our case study of water data in California identified specific ways in which less-than-adequate data sources and systems are currently constraining decision making, resulting in data gaps, ineffective delivery of overlapping data needs across sectors, and limiting secondary uses of data. Based on this research, we argue that to effectively inform water management, data systems must begin with a strong understanding of decision makers' data needs, and should engage decision makers to identify and address different types of data gaps and limitations. Otherwise, data systems risk being of limited utility, an inefficient use of resources, and a source of frustration for users.

Our work shows that useful and usable environmental data systems must consider not only technical elements, but also data system governance and stakeholder engagement. In the case we examined, given the distributed nature of data required by stakeholders, the independence of disparate agencies, and the need for interoperability, federated data systems have the potential to address technical and governance issues. In terms of stakeholder engagement, a responsive data system requires ongoing analysis of stakeholder objectives and translation of those objectives into functional and technical requirements. Resources for engagement should be considered part of infrastructure investment, because they ultimately can help inform usability of a data system and prevent wasting future resources.

Supporting environmental decision making through decision-driven data systems is a long-term project involving ongoing attention to meaningful engagement with decision makers and other data stakeholders. As is true of other forms of infrastructure, the full value of investments in environmental data may only become apparent when it is sorely needed: for example, the value of water data becomes apparent during droughts, floods, or other crisis events. In such events, access to information may be a crucial factor in determining whether or not rapid and effective decisions can be reached. This prospect alone justifies the forward-looking efforts described in this article, and, more generally, greater attention to the role of data in environmental management and sustainability.

DATA AVAILABILITY STATEMENT

A full, detailed compilation of all 20 use cases developed for this project and the specific data sources associated with each is available online at: https://doi.org/10.15779/J28H01. Further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

AC: conceptualization, methodology, investigation, data curation, analysis, and writing—original draft. MK: conceptualization, methodology, investigation, analysis, writing—original draft, supervision, project administration, and funding acquisition. SH and RK: conceptualization and writing—review and editing. LP: analysis, data curation, and writing—review and editing. KG: project administration, investigation, and writing—review and editing. GD and CM: resources, investigation, and writing—review and editing. RB: conceptualization, supervision, project administration, funding acquisition, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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Appendix H: Oregon Water Data Portal Draft Data Inventory

This data inventory was a compilation between the Internet of Water and the various state agencies with water data. This table includes both data sets and data needs as identified from the Water Core Team and others. The datasets and data needs represented here is a living document and is a sample of the information collected. There are no guarantees all data are included in this document.

Inventory ID	Agency Name	Department/Division	Dataset Name	Brief Description of Data	Geographic Boundaries	Geographic Granularity	Frequency of Data Change	Existing Publication	Type of Existing Publication	Data Classification	Data Contains PII/PHI	Data Restrictions or Regulations	Data is/is not Publishable	Data Value	Data Readiness for Publication	Overall Priority	Open Data Publishing Status	Dataset ID	Dataset Link	Format	Conforms To	Category	Database Name	Database Technology	Data Value Comments	Data Readiness Comments	Overall Priority Comments
Data Need	DEQ		**NPDES Outfalls**	Outfall locations of all NPDES permit facilities point sources											Low							Water Quality			Significant Need	Relatively complete data set on the locations of facilities holding individual NPDES permits. 2008 collected data on the locations of all the outfalls from individual NPDES permits. Information is out of date.	Recommendation from WCT
Data Need	DEQ		**Wastewater Systems**	Municipal and nonmunicipal wastewater system locations and conditions											Low							Infrastructure; Water Quality			Significant Need	we have good idea on the location of facilities covered under individual NPDES permits. We do not have as reliable a data set for general permits; any existing data would need to be validated for accuracy. Overall, this data set could be considered non-existent.	Recommendation from WCT
Data Need	DEQ		**Storm Water Systems**	Municipal and nonmunicipal storm water system locations and conditions											Low							Infrastructure; Water Quality			Significant Need	we have an idea on the location of facilities covered under individual NPDES stormwater permits, which would include the current MS4	Recommendation from WCT

																										Phase I and Phase II permits (i.e., municipal permits). Some of this information may be available in hardcopy reports. This would be a very small subset of municipal stormwater systems. This data set is essentially non-existent.	
DEQ - 20220302-00012	DEQ	Land Quality / Emergency Response	**Ballast Water Database**	list of vessel arrivals, port moves, discharges in OR waters, and how/where that water was managed prior to discharge. Database includes local agent contact info, global port salinities, a record of program inspections, list of violations, enforcement actions, and payment records.	earth	most typically, hundredths of decimal degrees	Daily	Yes	?monthly compliance report to local parties	Level 1	No	not that i am aware of. only concern would be vessel/agent contact info.	As-is	Low	Low	Low	Not Published										
DEQ - 20220302-00016	DEQ	Land Quality /UST Compliance	**Underground Storage Tanks**	Location, ownership, ficial responsibility and UST equipment information for all regulated underground storage tank facilities in Oregon, active and decommissioned.	Statewide	Street address	As needed, between daily and weekly	Yes	?Published in report format here: https://www.deq.state.or.us/Reports/Default.aspx?Report=%2fUST%2frptUstFacilitySummaryPostTCR	Level 1	No	none	As-is	High	Medium	High	Not Published										
	DEQ	LEAD/RATS	**Drinking Water Source Monitoring**	DEQ and the Oregon Health Authority are working together on this project to monitor source waters upstream of surface water intakes and at groundwater extraction wells in conjunction with public water systems. Laboratory analysis may include chemical compounds that are not addressed in the Safe Drinking Water Act requirements for post-treatment public supplies. Data generated from the monitoring will provide state agencies and drinking water providers with the information needed to identify likely sources of pollution and prioritize resources for preventing the contamination of the source waters used for public systems.	Statewide	lat/long	Weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Drinking Water, Surface Water, Groundwater and Wells	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Biomonitoring**	This SQL database houses raw habitat data from 2015 to 2019. It doesn't house the raw bug data. The main function of this database is to house the taxon data. It is likely to become the reference condition database.	Statewide	lat/long	Annually	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	Medium	Low	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Ecosystems & Wildlife (Habitat Data), Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**EMAP/REMAP/CEMAP Monitoring**	The Environmental Monitoring and Assessment Program (EMAP) was a research program administered by EPA to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP collected field data from 1990 to 2006. EMAP's goal was to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of current ecological condition and forecasts of future risks to our natural resources.	Statewide	lat/long	Program is retired. Data is static.	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	Medium	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.sta		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			

				The Regional Environmental Monitoring and Assessment Program (REMAP) uses the statistical design and indicator concepts developed by EPA's EMAP. REMAP conducts projects at smaller geographic scales and shorter periods than the national EMAP program. Between 1999 and 2006, DEQ's Laboratory collaborated with EPA to monitor for a range of toxic pollutants, including mercury, in Oregon's coastal and estuary waters. This Coastal Environmental Monitoring and Assessment Program (CEMAP) work involved the collection of sediment, fish tissue and water column samples in various locations. Monitoring of the nation's aquatic resources is now being routinely conducted by the National Aquatic Resource Surveys.													te.or.us/Login.aspx											
	DEQ	LEAD/RATS	**Groundwater Management Areas Monitoring**	The Groundwater Quality Protection Act is a critical component in Oregon's overall water quality protection and management strategy. The Act ensures that Oregon's groundwater is protected as a resource for all present and future beneficial uses through a strategy that uses monitoring and assessment to identify groundwater quality problems. Where problems are identified, local groundwater management committees are formed to develop local groundwater management plans, in collaboration with local and state government agencies. The Southern Willamette Valley, Northern Malheur County, and Lower Umatilla Basin are all designated by DEQ as Groundwater Management Areas primarily due to the severity and extent of groundwater contamination.	Statewide	lat/long	Dependent on program needs.	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Groundwater + Wells, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Harmful Algal Bloom Monitoring**	The DEQ Laboratory and Environmental Assessment Program provides staff and resources to the agency and sister agencies for water quality investigations. These investigations include harmful algal bloom samplings. Harmful algal blooms are algal blooms composed of phytoplankton which may produce toxins that may harm the environment, wildlife and humans.	Statewide	lat/long	Dependent on HABS blooms: updated into AWQMS weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Water Quality, Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Landfill Monitoring**	DEQ conducts split sampling events with permitted landfills. The number and type of sampling locations selected for splits varies from facility to facility. Field and laboratory analytical parameters are also specific for each facility. Samples are analyzed by the DEQ Laboratory and often include several non-target analytes which are not required by the facility's permit.	Statewide	lat/long	Dependent on program: loaded to AWQMS weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Groundwater + Wells, Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Volunteer Monitoring Program**	The DEQ's Volunteer Monitoring Program's goal is to involve Oregonians in identifying and solving the State's water quality problems. The program provides support including technical assistance in monitoring design, equipment use, data management and analysis. Community Based Organizations (hereafter CBO's) participating in the program are eligible to receive high quality monitoring equipment on loan. The purpose of the program is to improve the quality and quantity of data collected by groups around	Statewide	lat/long	Dependent on program: Daily	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.sta		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			

				Oregon such that the data may be used locally by the CBO's and by the DEQ.													te.or.us/Login.aspx										
	DEQ	LEAD/RATS	**Oregon Plan Monitoring**	The Oregon Plan for Salmon and Watersheds is Oregon's response to the Endangered Species Act listing or proposed listing of a dozen salmon populations in the state. The stream monitoring program involves the Oregon Department of Fish and Wildlife, DEQ, and other state agencies. The focus of DEQ's Oregon Plan monitoring is to describe the biological condition (fish, amphibians and macroinvertebrates), chemical water quality and physical habitat condition of salmon spawning and rearing streams. The monitoring sites are a randomly selected sub-sample of the larger stream network.	Statewide	lat/long	Program is retired. Data is static.	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	Medium	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Pesticide Stewardship Partnerships Monitoring**	The purpose of Pesticide Stewardship Partnerships is to collect data for evaluating the occurrence and concentration of current use pesticides in local surface water during agricultural pesticide application periods. The data will be used to encourage voluntary improvements in pesticide application and management practices that are designed to reduce concentrations of pesticides in surface waters.	Statewide	lat/long	Weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Senate Bill 737 Monitoring**	The 2007 Oregon Legislature directed the Oregon Department of Environmental Quality to compile a prioritized list of persistent pollutants (the P3 List) to guide Oregon's pollution prevention efforts. Senate Bill 737 contains specific requirements for DEQ that included submitting a priority list of persistent pollutants to the Legislature by June 1, 2009, and reporting on the sources and pathways of these pollutants in June 2010. The legislation also requires Oregon's 52 large municipal wastewater treatment plants to develop plans to reduce the presence of those persistent pollutants detected in their effluent above levels set by the Oregon Environmental Quality Commission. Municipalities must submit Persistent Pollutant Reduction Plans to DEQ by July 1, 2011.	Statewide	lat/long	Program is retired. Data is static.	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Drinking Water, Surface Water, Groundwater and Wells	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Statewide Groundwater Monitoring**	The Groundwater Quality Protection Act is a critical component in Oregon's overall water quality protection and management strategy. The Act ensures that Oregon's groundwater is protected as a resource for all present and future beneficial uses through a strategy that uses monitoring and assessment to identify groundwater quality problems. Where problems are identified, local groundwater management committees are formed to develop local groundwater management plans, in collaboration with local and state government agencies. The purpose of this program is primarily to identify contamination and potential sources of contamination in groundwaters within the state of Oregon but outside the current Groundwater Management Areas.	Statewide	lat/long	Dependent on program: AWQMS updated weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Groundwater + Wells, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Statewide Toxics Monitoring**	The scope of this program is to collect reliable, long-term, multi-media information regarding the status and trends of toxic pollutants in the State. DEQ targeted multi-media monitoring for selected environmental contaminants in all of the State's basins on a rotating schedule. Factors such as human health concerns, ecological considerations, hydrologic or land use features are taken into account during the selection of monitoring locations in each basin. This program measures and tracks the following chemical classes: semi volatile organic chemicals (SVOCs), poly-	Statewide	lat/long	Dependent on program: AWQMS is updated weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.sta		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			

				chlorinated biphenyls (PCBs), poly-brominated diphenyl ethers (PBDEs), dioxins and furans, heavy metals, current-use and legacy pesticides, contaminants of emerging concern (i.e., pharmaceuticals, personal care products, and plasticizers).													te.or.us/Login.aspx										
	DEQ	LEAD/RATS	**Ambient Water Quality Monitoring**	A statewide effort to monitor major rivers of concern. A network of roughly 160 sites is sampled on a regular schedule to provide conventional pollutant data that is used to determine: baseline water quality; general problem areas needing further investigation; management effectiveness; water quality limited stream segments and segments where TMDLs need to be established; and long-term trending. The network sites were selected to represent all major rivers in the state and provide statewide geographical representation. The locations of those sites reflect the integrated water quality impacts from point and non-point source activities, as well as the natural geological, hydrological, and biological impacts on water quality for the watershed they represent.	Statewide	lat/long	Weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Total Maximum Daily Load Monitoring**	The purpose of this program is to collect data for development of Total Maximum Daily Loads (TMDL). TMDL is a regulatory term from the Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.	Statewide	lat/long	Dependent on program; AWQMS is updated weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Water Quality Response Monitoring**	The DEQ Laboratory and Environmental Assessment Program provides staff and resources to the agency and sister agencies for water quality investigations. These investigations may include fish kill sampling, enforcement cases, legal samplings, harmful algal bloom samplings, and other activities. Requests for assistance may come from internal staff conducting work under the Clean Water Act delegation, sister agencies such as the Oregon Health Authority (OHA), Oregon Department of Agriculture (ODA) or the Oregon Department of Fish and Wildlife (ODFW), federal agencies such as the Environmental Protection Agency (EPA), or local, state, or federal law enforcement.	Statewide	lat/long	Dependent on program; AWQMS is update weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Water Quality, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Beach Monitoring**	The Oregon Health Authority (OHA) and DEQ are responsible for monitoring recreational water quality and issuing contact advisories along beaches in Oregon. The collaborative program is a US Environmental Protection Agency (EPA) funded program. This program tests the marine waters at select Oregon beaches for the fecal indicator bacterium enterococcus, which has shown to be a useful indicator organism that has greater correlation in marine waters with gastrointestinal illnesses than other bacterial organisms (USEPA, 2013). Samples are collected in the months of May through September.	Statewide	lat/long	Annually	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**NPDES Surface Water Data**	Ambient surface water data collected by permittees submitted to Oregon DEQ as required for Reasonable Potential Analysis (RPA) and Copper Biotic Ligand Modeling (BLM) under the NPDES program.		lat/long	Weekly	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.sta		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water, Monitoring	AWQMS	COTS Goldsystems			

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	DEQ	LEAD/RATS	**Call for Data (Integrated Report)**	Third Party data submitted to Oregon DEQ as part of a Call For Data.		lat/long	Every two years	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Surface Water	AWQMS	COTS Goldsystems			
	DEQ	LEAD/RATS	**Historic Water Quality Data**	This contains general historical data generated before and up to 2003. Projects are not ongoing, data is static.		lat/long	Static	Yes	https://orwater.deq.state.or.us/	Level 1	No		As-is	High	High	No Priority	This data is already published but not on data.oregon.gov...it is published here https://orwater.deq.state.or.us/Login.aspx		https://orwater.deq.state.or.us/	COTS Web-based		Water Quality, Surface Water, Monitoring, Groundwater + Well	AWQMS	COTS Goldsystems			
	DEQ	Water Quality/Permitting	401 Dredge and Fill	Access Database Use to keep track of 401 projects. Data includes application information, project location and description. The data are now managed in YDO.	State of Oregon	lat/long	Access database contains historical data. Data in YDO is updated as-entered.	Yes	Access Database	Level 3	PII		As-is	High	High	No Priority							401 Access		Valued low because the data migrated to YDO.		
	DEQ	Water Quality/Compliance Policy and Data Management	PPA Reporting	Jim Billings uses the following ACES reports to communicate Compliance and Enforcement actions to EPA. OCE FEA List, OCE Penalties by Violation Report, OCE Final Penalty Report, OCE Resolved Compliance Orders, and OCE Formal Enforcement Action List.	State of Oregon		Annual Report	Yes	Document	Level 3	PII		?	?	High	?							ACES				
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-ICIS Reporting	NPDES Informal Enforcment Actions	Informal enforcement actions from ACES to ICIS. DEQ sets up and manages data.	State of Oregon	lat/long	Monthly																ACES/ICIS				
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-NetDMR	Discharge Monitoring Reports	Discharge monitoring reports submitted through EPA's Net-DRM system.	State of Oregon	lat/long	Dependent on Schedule																NetDMR/ICIS				
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-ICIS Reporting	NPDES Compliance Monitoring	Compliance events from ACES to ICIS. DEQ sets up and manages data.	State of Oregon	lat/long	Monthly																ICIS				
	DEQ	Water Quality/Com	NPDES Limit Sets	NPDES, monitoring required by water quality permits	State of Oregon	lat/long	As needed																ICIS				

		pliance Policy and Data Management/EPA-ICIS Reporting																									
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-ICIS Reporting	NPDES Parameter Limits	NPDES, numeric effluent limits set by water quality permits.	State of Oregon	lat/long	As needed																ICIS				
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-ICIS Reporting	NPDES Basic Permit	NPDES, certified copies of record containing discharge monitoring data required by water quality permits.	State of Oregon	lat/long	Monthly																ICIS				
	DEQ	Water Quality/Operator Certification	Wastewater System Operator Certifications	This database is used to keep track of Wastewater System Operator license and certifications. This includes contact information such as name and address, employer, license types, issue and renewal dates.	State of Oregon	lat/long	as-entered	Yes		Level 3	PII		As-is	Medium	High	Medium							Licensing				
	DEQ	Water Quality/Permitting	Underground Injection Control	Access Database used to keep track of Facilities and their corresponding UIC wells. The data are now managed in YDO.	State of Oregon	lat/long	Access database contains historical data. Data in YDO is updated as-entered.	Yes		Level 3	PII		As-is	High	High	No Priority							UIC Access		Valued low because the data migrated to YDO.		
	DEQ	Water Quality	Outfall Location Data	Static list of Outfalls associated with water quality permits. List was last updated in 2008.	State of Oregon	lat/long	Only changed if notified.			Level 2			As-is	Low	High	No Priority							WQREPORTS.dbo.OutfallsMay272009SISandDWSAs WQREPORTS.dbo.OLD_Export_031309				
	DEQ	Water Quality/Compliance Policy and Data Management/EPA-ICIS Reporting	NPDES, General Permit	NPDES, General permits for ICIS. DEQ sets up and manages data.	State of Oregon	lat/long	Quarterly																				
	DEQ	Water Quality/Permitting	Historical 600MAO Permit Data	Inactive permit data for WPCF General Permit - Industrial wastewater discharges, Mutual Agreement and Order - Offstream mining	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical 700MAO Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Mutual Agreement and Order - Instream Mining	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical G12COLS	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water discharging to Columbia Slough	State of Oregon	lat/long	Historical data, will			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review	

			Permit Data				not change.																			and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical G12COLSB Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water discharging to Columbia Slough	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN07 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Suction dredges	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN07PM Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Suction dredges	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN08 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Confined animal feeding operations (CAFOs)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN08(ODA) Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Confined animal feeding operations (CAFOs)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN11 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Sewers & Pump Stations	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12A Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Storm Water: Sand, gravel, and other non-metallic mining	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12C Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Storm Water: Construction activities - 1 acre or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12C(AGENT) Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Storm Water: Construction activities - 1 acre or more - local agent	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12CA Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Storm Water: Construction activities performed by public agencies - 1 acre or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12D Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Textile, apparel, and printing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium								WQSIS			Data includes PII and will need review and redaction	

																										prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12F Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Food processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12G Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Landfills	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12H Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Heavy industry	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12L Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Light manufacturing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12M Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Minerals and metals mining	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12P Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Pulp and paper	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12R Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Scrap yards and auto wreckers	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12S Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - STP sites	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12T Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Transportation	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12U Permit Data	Inactive permit data for WPCF General Permit - Industrial wastewater discharges, Underground Injection Control (UIC) General Permit intended to cover facilities and municipalities that do not qualify for Rule Authorization or the WPCF UIC Individual Permit.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12W Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water - Wood products	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical GEN12Z Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial storm water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN12ZN Permit Data	Inactive permit data for NPDES General Permit - Industrial storm water discharges, Industrial Storm water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN14 Permit Data	Inactive permit data for WPCF General Permit - Industrial wastewater discharges, Food processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN15 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Petroleum Hydrocarbon cleanup	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN16 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Small froth-flotation min. extr.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN17 Permit Data	Inactive permit data for NPDES General Permit - Industrial wastewater discharges, Wash Water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN18 Permit Data	Inactive permit data for WPCF General Permit - Industrial wastewater discharges, Kennels with wastewater	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN19B Permit Data	Inactive permit data for WPCF General Permit - Industrial wastewater discharges, General geothermal exploration permit, as part of evaluation of geothermal resources.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN21 Permit Data	Inactive permit data for NPDES General Permit - Domestic wastewater discharges, Discharge of treated domestic wastewater from existing floating residences located in the Lower Columbia-Youngs Subbasin of Clapsop County	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN44 Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Waste disposal well	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN51a Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Sand filter less than 2,500 gpd (1,500 gpd or more)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical GEN51b Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Sand filter less than 2,500 gpd (Less than 1,500 gpd)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN52A Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Recirculating gravel filter on-site system, 1,500 GPD or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN52Ab Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Recirculating gravel filter on-site system, less than 1,500 GPD	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN54 Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Holding tank	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN55 Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, On-site sewage lagoon less than 1,500 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN56 Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Standard/Alternative system less than 20,000 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical GEN56B Permit Data	Inactive permit data for WPCF General Permit - Domestic on-site sewage system, Standard/Alternative system less than 5,000 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical MAOIRR Permit Data	Inactive permit data for MINOR, NPDES General Permit - Industrial wastewater discharges, Mutual Agreement and Order - Irrigation system	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-DOM Permit Data	Inactive permit data for MINOR, Individual NPDES - Domestic wastewater treatment facilities, NPDES Domestic Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-DOM-C Permit Data	Inactive permit data for MINOR, Individual NPDES - Domestic wastewater treatment facilities, Sewage Disposal - 1 MGD or more but less than 5 MGD	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-DOM-D Permit Data	Inactive permit data for MINOR, Individual NPDES - Domestic wastewater treatment facilities, Sewage Disposal - less than 1 MGD	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS		Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical NPDES-DOM-E Permit Data	Inactive permit data for MINOR, Individual NPDES - Domestic wastewater treatment facilities, Sewage Disposal - Lagoon	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IND Permit Data	Inactive permit data for MINOR, Individual NPDES - Industrial wastewater discharges, NPDES Industrial Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-A Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Major pulp, paper, paperboard, hardboard, and other fiber pulping industry	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-B Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Major sugar beet, potato and other vegetable processing, and fruit processing industry	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Ci Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Seafood Processing - Bottom fish, crab and/or oyster processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Cii Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Seafood Processing - Shrimp processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Ciii Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Seafood Processing - Salmon and/or tuna processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Civ Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Seafood Processing - Surimi processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Di Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Electroplating industry (excludes facilities which do anodizing only) - Rectifier output capacity of 15,000 Amps or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Dii Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Electroplating industry (excludes facilities which do anodizing only) - Rectifier output capacity of less than 15,000 Amps but more than 5,000 Amps	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-E Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Primary aluminum smelting	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical NPDES-IW-F Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Primary smelting and/or refining of non-ferrous metals using sand chlorination separation facilities	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-G Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Primary smelting and/or refining of ferrous and non-ferrous metals not elsewhere classified above	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-H Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Alkalies, chlorine, pesticide or fertilizer manufacturing with discharge of process waste waters	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-I Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Petroleum refineries with a capacity in excess of 15,000 barrels per day discharging process waste water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-J Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Cooling water discharges in excess of 20,000 BTU/sec.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-K Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Milk products processing industry which processes in excess of 250,000 pounds of milk per day	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-L Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Major mining operators (over 500,000 cubic yards per year)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Mi Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining and/or processing operations - Medium (100,000 to 500,000 cubic yards per year) mechanical processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Mii Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining operation with froth flotation	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Miii Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining and/or processing operations - Medium using chemical leaching	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Miv Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining and/or processing operations - Small (less than 100,000 cubic yards per year) mechanical processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical NPDES-IW-Mv Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining and/or processing operations - Small using froth flotation	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Mvi Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Medium mining and/or processing operations - Small using chemical leaching	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-N Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, All facilities not elsewhere classified with dispose of process waste water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-O Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of non-process waste waters (small cooling water discharges, boiler blowdown, filter backwash, log ponds, etc.)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-P Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, Dairies and other confined feeding operations and fish hatching/rearing on individual permits	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-Q Permit Data	Inactive permit data for Individual NPDES - Industrial wastewater discharges, All facilities which dispose of wastewaters only by evaporation from watertight ponds or basins	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IW-S Permit Data	Inactive permit data for MINOR, Individual NPDES - Industrial storm water Discharges, Municipal Storm water Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical NPDES-IWS03 Permit Data	Inactive permit data for MINOR, Individual NPDES - Industrial wastewater discharges, State fish hatcheries located in the Clackamas River subbasin, the McKenzie River subbasin above Hayden Bridge, and the North Santiam River subbasin	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-DOM Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic wastewater treatment facilities, WPCF Domestic Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-DOM-A1 Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - 50 MGD or more.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-DOM-A2 Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - At least 25 MGD but less than 50 MGD.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical WPCF-DOM-A3 Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - At least 10 MGD but less than 25 MGD.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-DOM-C Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic wastewater treatment facilities, Sewage Disposal - 1 MGD or more but less than 5 MGD	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-DOM-UIC Permit Data	Inactive permit data for Individual WPCF - Industrial storm water Discharges, Municipal Stormwater Permits - Underground Injection Control (UIC) Program	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IND Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, WPCF Industrial Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-A Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Major pulp, paper, paperboard, hardboard, and other fiber pulping industry	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-B Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Major sugar beet, potato and other vegetable processing, and fruit processing industry	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Ci Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Seafood Processing - Bottom fish, crab and/or oyster processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Cii Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Seafood Processing - Shrimp processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Ciii Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Seafood Processing - Salmon and/or tuna processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Civ Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Seafood Processing - Surimi processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Di Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Electroplating industry (excludes facilities which do anodizing only) - Rectifier output capacity of 15,000 Amps or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical WPCF-IW-Dii Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Electroplating industry (excludes facilities which do anodizing only) - Rectifier output capacity of less than 15,000 Amps but more than 5,000 Amps	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-E Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Primary aluminum smelting	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-F Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Primary smelting and/or refining of non-ferrous metals using sand chlorination separation facilities	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-G Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Primary smelting and/or refining of ferrous and non-ferrous metals not elsewhere classified above	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-H Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Alkalies, chlorine, pesticide or fertilizer manufacturing with discharge of process waste waters	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-I Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Petroleum refineries with a capacity in excess of 15,000 barrels per day discharging process waste water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-J Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Cooling water discharges in excess of 20,000 BTU/sec.	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-K Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Milk products processing industry which processes in excess of 250,000 pounds of milk per day	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-L Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Major mining operators (over 500,000 cubic yards per year)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Mi Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Medium (100,000 to 500,000 cubic yards per year) mechanical processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Mii Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Medium using froth flotation	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical WPCF-IW-Miii Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Medium using chemical leaching	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Miv Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Small (less than 100,000 cubic yards per year) mechanical processing	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Mv Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Small using froth flotation	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Mvi Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Medium mining and/or processing operations - Small using chemical leaching	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-N Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, All facilities not elsewhere classified with dispose of process waste water	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-O Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of non-process waste waters (small cooling water discharges, boiler blowdown, filter backwash, log ponds, etc.)	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-P Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, Dairies and other confined feeding operations and fish hatching/rearing on individual permits	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-IW-Q Permit Data	Inactive permit data for MINOR, Individual WPCF - Industrial wastewater discharges, All facilities which dispose of wastewaters only by evaporation from watertight ponds or basins	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCF-OS Permit Data	Inactive permit data for MINOR, Individual WPCF - Domestic on-site sewage system, WPCF On-Site Permit	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCFOS-Biii Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Aerobic systems, 1500 gpd or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCFOS-Biv Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Aerobic systems, less than 1500 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Historical WPCFOS-Bv Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Recirculating Gravel Filter, 1,500 gpd or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCFOS-Bvi Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Recirculating Gravel Filter, less than 1,500 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCFOS-Bvii Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Sand Filter, 1,500 gpd or more	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Historical WPCFOS-Bviii Permit Data	Inactive permit data for Individual WPCF - Domestic on-site sewage system, Sand Filter, less than 1,500 gpd	State of Oregon	lat/long	Historical data, will not change.			Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Wastewater Permitted Facilities Contact Information	This report uses a series of databases to compile facility location and contact information for active Wastewater Permitted Facilities.	State of Oregon	Street Address	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Community and Program Assistance	Water Quality Invoicing	Data from Invoices generated from WQ Invoice. For each permit there will be an invoice history, amounts invoiced and the payment status. This database also includes active and inactive water quality fee codes as defined by OAR 340-045-0075.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN01 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Cooling water/heat pumps	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN02 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Filter backwash	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN03 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Fish hatcheries	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN04 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Log ponds	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN05 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Boiler blowdown	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active GEN06 Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, Offstream placer mining	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN07PM-GS Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Gravity/Siphon suction dredges	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN07PM-M Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Motorized suction dredges	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN09 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Seafood processing	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN10 Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, Gravel mining	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN13 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Oily storm water runoff, oil/water separators	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN14A Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, Wineries and seasonal fresh pack operations whose wastewater flow does not exceed 25,000 gpd and is only disposed of by land irrigation.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN14B Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, Wineries and small food processors not otherwise eligible for a 1400A general permit	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN15A Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, NPDES Petroleum Hydrocarbons Cleanup	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN15B Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, WPCF Petroleum Hydrocarbons Cleanup	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN17A Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, NPDES-Vehicle & equipment wash water	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active GEN17B Permit Data	Active permit data for WPCF General Permit - Industrial wastewater discharges, WPCF-Vehicle & equipment wash water	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN19 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Non-contact geothermal heat exchange	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN20 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Irrigation System General Permit coverage for pesticide applications within irrigation system boundaries for pesticide applications into, over, and near water for pest control.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN22 Permit Data	Active permit data for NPDES General Permit - Domestic wastewater discharges, Discharge of treated domestic wastewater from existing floating residences located in the Lower Columbia-Youngs Subbasin of Clatsop County.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN23 Permit Data	Active permit data for NPDES General Permit - Industrial wastewater discharges, Pesticide General Permit coverage for pesticide application into, over or near water for pest control: mosquito and other flying insects, weed and algae control, nuisance animal control, forest canopy pest control and area-wide pest control.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN2401 Permit Data	Active permit data for Tier1, WPCF General Permit - Domestic on-site sewage system, Tier 1 graywater reuse and disposal system for residential systems not exceeding 300 gallons per day, or equivalent specific geographic area graywater reuse and disposal area permit.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN2402 Permit Data	Active permit data for Tier2, WPCF General Permit - Domestic on-site sewage system, Tier 2 graywater reuse and disposal system for systems not exceeding 1,200 gallons per day, or equivalent specific geographic area graywater reuse and disposal area permit.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN2501 Permit Data	Active permit data for Tier2, WPCF General Permit - Industrial wastewater discharges, WPCF permit for seasonal irrigation of high-quality process wastewater from industrial sources not covered under another general permit.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active GEN40 Permit Data	Active permit data for NPDES General Permit - Industrial storm water discharges, General Permit for stormwater discharge from MS4 conveyance system to waters of the state.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-A1 Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - 50 MGD or more.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-A2 Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 25 MGD but less than 50 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active NPDES-DOM-A3 Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 10 MGD but less than 25 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-Ba Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 5 but less than 10 MGD	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-Bb Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 5 MGD but less than 10 MGD (Systems where treatment occurs in lagoons that discharge to surface waters).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-C1a Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 2 MGD but less than 5 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-C1b Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 2 MGD but less than 5 MGD (Systems where treatment occurs in lagoons that discharge to surface waters).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-C2a Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 1 MGD but less than 2 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-C2b Permit Data	Active permit data for Tier1, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - At least 1 MGD but less than 2 MGD (Systems where treatment occurs in lagoons that discharge to surface waters).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-Da Permit Data	Active permit data for Tier2, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - less than 1 MGD, and not otherwise categorized under Category E.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-Db Permit Data	Active permit data for Tier2, Individual NPDES - Domestic wastewater treatment facilities, Sewage disposal - less than 1 MGD, and not otherwise categorized under Category E (Systems where treatment occurs in lagoons that discharge to surface waters).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-MS4-1 Permit Data	Active permit data for Individual NPDES - Industrial storm water Discharges, Municipal Separate Storm Sewer System - Phase I; Separate storm sewer system, as defined in 40 CFR § 122.26	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-DOM-MS4-2 Permit Data	Active permit data for Individual NPDES - Industrial storm water Discharges, Municipal Separate Storm Sewer System- Phase II; Separate storm sewer system, as defined in 40 CFR § 122.26	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active NPDES-IW-B01 Permit Data	Active permit data for Tier1, Individual NPDES - Industrial wastewater discharges, Pulp, paper, or other fiber pulping industry.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B02 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Washing/Packing only	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B03 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Small. Flow less than or equal to 0.1 MGD or flow less than 1.0 MGD for less than 180 days per year.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B04 Permit Data	Inactive permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Food/beverage processing - Medium. 0.1 MGD < Flow < 1 MGD for 180 or more days per year, or flow >= 1 MGD for less than 180 days per year.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B05 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Large and complex . Flow greater than or equal to 1 MGD for 180 days/year or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B06 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Primary smelting and/or refining - Aluminum	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B07 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Primary smelting and/or refining - Non-ferrous metals utilizing sand chlorination separation facilities	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B08 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Primary smelting and/or refining - Ferrous and non-ferrous metals not elsewhere classified	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B09 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Chemical manufacturing with discharge of process wastewater	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B10 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Cooling water discharges in excess of 20,000 BTU/sec	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B11 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Major (over 500,000 cubic yards per year and/or involving chemical leaching)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active NPDES-IW-B12 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Medium (100,000 to 500,000 cubic yards per year)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B13 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Small (less than 100,000 cubic yards per year)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B14 Permit Data	Active permit data for Tier1, Individual NPDES - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 1 sources	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B15 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 2 sources	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B16 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of non-process wastewaters (i.e., small cooling water discharges, boiler blowdown, filter backwash, etc).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B17 Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, Dairies, fish hatcheries and other confined feeding operations on individual permits	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B17ODA Permit Data	Active permit data for Tier2, Individual NPDES - Industrial wastewater discharges, ODA Administered: Dairies, fish hatcheries and other confined feeding operations on individual permits	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B19 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Timber and Wood Products - Sawmills, log storage, instream log storage.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B20 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Timber and Wood Products - Hardboard, veneer, plywood, particle board, pressboard manufacturing, wood products.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active NPDES-IW-B21 Permit Data	Active permit data for Individual NPDES - Industrial wastewater discharges, Timber and Wood Products - Wood preserving	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-DOM-Ba Permit Data	Active permit data for Tier1, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - At least 5 but less than 10 MGD	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active WPCF-DOM-C1a Permit Data	Active permit data for Tier1, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - At least 2 MGD but less than 5 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-DOM-C2a Permit Data	Active permit data for Tier1, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - At least 1 MGD but less than 2 MGD.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-DOM-Da Permit Data	Active permit data for Tier2, Individual WPCF - Domestic wastewater treatment facilities, Sewage disposal - less than 1 MGD, and not otherwise categorized under Category E.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-DOM-E Permit Data	Active permit data for Tier2, Individual WPCF - Domestic wastewater treatment facilities, Sewage Disposal - Systems where treatment is limited to lagoons which do not discharge to surface water.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-DOM-F Permit Data	Active permit data for Tier2, Individual WPCF - Domestic wastewater treatment facilities, Septage alkaline stabilization facilities	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B01 Permit Data	Active permit data for Tier1, Individual WPCF - Industrial wastewater discharges, Pulp, paper, or other fiber pulping industry.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B02 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Washing/Packing only	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B03 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Small. Flow less than or equal to 0.1 MGD or flow less than 1.0 MGD for less than 180 days per year.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B04 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Food/beverage processing - Medium. 0.1 MGD < Flow < 1 MGD for 180 or more days per year, or flow >= 1 MGD for less than 180 days per year.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B05 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Food/Beverage Processing - includes produce, meat, poultry, seafood, dairy for human/pet/livestock consumption - Large and complex . Flow greater than or equal to 1 MGD for 180 days/year or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B06 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Primary smelting and/or refining - Aluminum	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active WPCF-IW-B07 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Primary smelting and/or refining - Non-ferrous metals utilizing sand chlorination separation facilities	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B08 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Primary smelting and/or refining - Ferrous and non-ferrous metals not elsewhere classified	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B09 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Chemical manufacturing with discharge of process wastewater	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B10 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Cooling water discharges in excess of 20,000 BTU/sec	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B11 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Major (over 500,000 cubic yards per year and/or involving chemical leaching)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B12 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Medium (100,000 to 500,000 cubic yards per year)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B13 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Mining operations(includes aggregate/ore processing) - Small (less than 100,000 cubic yards per year)	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B14 Permit Data	Active permit data for Tier1, Individual WPCF - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 1 sources	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B15 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of process wastewater (includes remediated groundwater) - Tier 2 sources	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B16 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, All facilities not elsewhere classified which dispose of non-process wastewaters (i.e., small cooling water discharges, boiler blowdown, filter backwash, etc).	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B17 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, Dairies, fish hatcheries and other confined feeding operations on individual permits	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active WPCF-IW-B18 Permit Data	Active permit data for Tier2, Individual WPCF - Industrial wastewater discharges, All facilities which dispose of wastewaters only by evaporation from watertight ponds or basins	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B19 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Timber and Wood Products - Sawmills, log storage, instream log storage.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B20 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Timber and Wood Products - Hardboard, veneer, plywood, particle board, pressboard manufacturing, wood products.	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCF-IW-B21 Permit Data	Active permit data for Individual WPCF - Industrial wastewater discharges, Timber and Wood Products - Wood preserving	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-A Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, On-Site sewage lagoon with no discharge	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-Bi Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Standard or alternative subsurface system not listed with design flow of 20,000 gpd or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-Bii Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Standard or alternative subsurface system not listed with design flow less than 20,000 gpd	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-BiiiAS> Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Aerobic systems, 2,500 gpd or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-BiiiRGF> Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Recirculating Gravel Filter, 2,500 gpd or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-BiiiSF> Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Sand Filter, 2,500 gpd or more	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-BivAS< Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Aerobic systems, less than 2,500 gpd	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium							WQSIS			Data includes PII and will need review and redaction prior to publishing.	

	DEQ	Water Quality/Permitting	Active WPCFOS-BivRGF< Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Recirculating Gravel Filter, less than 2,500 gpd	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium						WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-BivSF< Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Sand Filter, less than 2,500 gpd	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium						WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/Permitting	Active WPCFOS-Bix Permit Data	Active permit data for Individual WPCF - Domestic on-site sewage system, Holding tanks	State of Oregon	lat/long	as-entered	Yes	https://www.deq.state.or.us/wq/sisdata/ContactsCriteria.asp	Level 2	PII		As-is	High	Medium	Medium						WQSIS			Data includes PII and will need review and redaction prior to publishing.	
	DEQ	Water Quality/TMDL	Satellite estimates of cyanobacteria abundance	Satellite estimates for 49 large waterbodies in Oregon based on methods from the US EPA CyAN project https://www.epa.gov/water-research/cyanobacteria-assessment-network-cyan	State of Oregon	lat/long	as-entered																			
	DEQ	Water Quality/TMDL	TMDL final models	Final TMDL calibrated and scenario models	State of Oregon	lat/long	as-entered	Yes		Level 2			As-is	High	High	High						On DEQ servers		DEQ gets data requests and provides the data	High	
	DEQ	Water Quality and LEAD	Photographs of waterbodies at the time of water quality sampling	Photographs of site conditions at the time of water quality sampling can provide great insight on how to interpret water quality monitoring results	State of Oregon	lat/long	as-entered																			
	DEQ	Water Quality/Drinking Water Protection	Public water system surface water intakes	State-wide surface water intakes for public water systems (Level 3 Restricted distribution)	State of Oregon	lat/long	as needed			Level 3		This dataset is confidential and should not distributed outside of State agency use. See dataset distribution constraints in metadata.	is not publishable (Level 3)	High												
	DEQ	Water Quality/Drinking Water Protection	Public Water System groundwater wells	State-wide groundwater wells and springs serving public water systems (Level 3 restricted distribution)	State of Oregon	lat/long	as needed			Level 3		This dataset is confidential and should not distributed outside of State agency use. See dataset distribution constraints in metadata.	is not publishable (Level 3)	High												
	DEQ	Water Quality/Drinking Water Protection	Public Water System surface water drinking water source areas	State-wide drinking water source area for public water systems using surface water sources	State of Oregon	lat/long	as needed	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer (https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)	Level 1			is	High												

	DEQ	Water Quality/Drinking Water Protection	Public Water System Surface water drinking water source area, 8-hr Time of Travel	Estimated 8-hr time-of-travel upstream from a public water supply surface water intake based on using mean annual stream velocity flow estimate in NHD Plus tables (field V0001E). For surface watersheds greater than 100 square miles, 8-hr TOT defaults to 16 miles upstream.	State of Oregon	lat/long	as needed			Level 1			is														
	DEQ	Water Quality/Drinking Water Protection	Public water system groundwater drinking water source areas	State-wide drinking water source area for public water systems using groundwater sources. Typical extent is 10- or 15-year time of travel to wellhead	State of Oregon	lat/long	as needed	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer (https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)	Level 1			is	High													
	DEQ	Water Quality/Drinking Water Protection	Public water system groundwater drinking water source area 2-year time-of-travel	State-wide 2-year time-of-travel to wellhead for public water systems using groundwater source	State of Oregon	lat/long	as needed	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer (https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)	Level 1																	
	DEQ	Water Quality/Drinking Water Protection	Soil Erosion Potential - for areas with 50% - 75% ground disturbance (NRCS Off-road/Off-trail analysis)	Drinking water protection program analysis based on NRCS Erosion Hazard off-road/off-trail hazard rating from NRCS Soil Data Viewer. Used for management activities such as silviculture, grazing, mining, urban development, fire, firebreaks, etc. with < 75% soil surface disturbance. Data uses the attribute EROHZDORT = "Slight", "Moderate", "Severe", or Very Severe".	State of Oregon	lat/long	No updates planned			Level 1																	
	DEQ	Water Quality/Drinking Water Protection	Soil Erosion Potential - for areas with intensive (>75%) ground disturbance (NRCS RUSLE2/ODA-EVI)	Drinking water protection program analysis based on NRCS Revised Universal Soil Loss Equation-2 (RUSLE2) and OR Dept of Agriculture Erosion Vulnerability Index (EVI). For areas with > 75% soil disturbance (such as tilled or bare soils) AND lower slopes (generally ≤30%, i.e. valleys and agricultural lands).	State of Oregon	lat/long	No updates planned			Level 1																	
	DEQ	Water Quality/Drinking Water Protection	Soil Erosion Potential - for USFS lands (based on SRI data)	Drinking water protection program analysis using Soil Resource Inventory (SRI) information from the US Forest Service. Erosion potential for soils represented in the SRI data is based on available representative data attributes such as sedimentation yield potential, sediment, or surface soil erosion potential. Specific information on the factors used for each National Forest to evaluate sensitivity is available from DEQ upon request.	State of Oregon	lat/long	No updates planned			Level 1																	
	DEQ	Water Quality/Drinking Water Protection	Land Use/Ownership	The dataset is a combination of multiple datasets and was developed by DEQ in 2015 and updated 2017. These datasets include: OWNERSHIP_POLY.shp from the USDA Bureau of Land Management (BLM); Private_Industrial_2006_ORLambert.shp from the Oregon Dept. of Forestry (ODF); National Agricultural	State of Oregon	lat/long	as needed	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer	Level 1																	

				Statistics Service (NASS) data from Natural Resource Conservation Service and county tax lot data. The dataset has been modified by grouping land owner categories in order to simplify data display.					(https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)																		
	DEQ	Water Quality/Drinking Water Protection	Source Water Assessment Potential Contaminant Sources	Used to identify potential contaminant sources within drinking water source areas for source water assessment work. From original Source Water Assessment work collected 2000-2005. Data is from databases, windshield surveys, satellite imagery, and permits.	State of Oregon	lat/long	Historical data as of 2005	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer (https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)	Level 1																	
	DEQ	Water Quality/Drinking Water Protection	Updated Source Water Assessment Potential Contaminant Sources	Used to identify potential contaminant sources within drinking water source areas for source water assessment work. From Updated Source Water Assessment work collected 2005 to present. Data is primarily from satellite imagery and personal communication with water system operators.	State of Oregon	lat/long	as needed	Yes	Shapefiles available via Drinking Water Protection Maps and Data page and on interactive map viewer (https://www.oregon.gov/deq/wq/programs/Pages/DWP-Maps.aspx)	Level 1																	
	DEQ	Water Quality/TMDL	TIR Thermal Infrared Radiometry	TIR data used to characterize the thermal regime of the streams and habitat quality.	State of Oregon	lat/long	as-entered	Yes - there are reports for each acquisition	Level 2			As-is	High - very costly to collect	High	High							On DEQ servers		DEQ gets data requests and provides the data	High		
	DEQ	Water Quality / Assessments	Integrated Report	Assessment conclusions from the integrated report. Includes IR status, assessment data, monitoring locations and WQ standards. Data is assessed every two years, and a new dataset is created.	State of Oregon	Assessment Unit/waterbody/monitoring location	Evcery 2 years , but a new dtaset is created	Yes	Shinyapp database/web map/geodatabase/ArcOnline web service / Arconline storymap	level 1	No	None	As is														
Data Need	DEQ OHA BusOr	DEQ OHA BusOr	**Water Supply Systems**	Municipal and nonmunicipal water supply system locations and conditions											Low							Infrastructure; Drinking Water & Public Water Supply			Significant Need	Requires a consultant to conduct individual surveys. LATER - Build on ongoing process to obtain this information	Recommendation from WCT
Data Need	DEQ OHA BusOr ODF	DEQ OHA BusOr ODF	**Drinking Water Source Protection**	Drinking water source protection locations and conditions for municipal and nonmunicipal systems											Low							Drinking Water & Public Water Supply			Significant Need	Requires a consultant to conduct individual surveys. LATER - Build on ongoing process to obtain this information . May also be able to request info from USFS, DEQ and Ecotrust about statewide SW protection	Recommendation from WCT

DLCD-20220302-00006	DLCD	Oregon Coastal Services Division	**Federal Consistency Dataset**	Federal consistency is a review process that coastal states with federally approved coastal programs undertake, every time a federal activity is proposed in that state's Coastal Zone. The review process is usually triggered under three circumstances; when the federal activity is proposed by a federal agency, when a federal permit is needed for a proposed project, or when a project receives federal assistance (e.g. funding). The federal consistency dataset collects information about projects that are reviewed by the Oregon Coastal Management Program to determine if it is consistent with local and state policies. The dataset includes key dates for the review process, permit numbers, project information, and the final determiniation.	Curry, Coos, Lake, Douglas, Lincoln, Tillamook, and Clatsop counties	Project boundaries at varying sizes and scales.	daily	No		Level 2	PII	project dependent - in very limited circumstances, non-disclosure agreements may be in place limiteing data release. Jordan Cove is the only one I know of that has an active NDA and only limited info was directly uploaded to the databse due to the expanse of that project folder so I don't believe this would be an issue for this row. We should check with Patty on this to confirm.	Redaction required	High	High	Low	Not Published										
DLCD-20220302-00008	DLCD	Oregon Coastal Services Division	**Coastal Zone Public Access Points**	GIS datasets for coastal zone public access points (1990, 2000, 2010)	coastal zone	coastal watersheds	every 10 years	yes	GIS data provided on DLCD web site and on the Oregon Coastal Atlas; https://www.coastalatlas.net	Level 2	No	Data is covered by an Oregon Framework Stewardship document	As-is	High	High	No Priority	Not Published										
DLCD-20220302-00009	DLCD	Oregon Coastal Services Division	**Enforceable Policies of the Oregon Coastal Management Program**	Local and state entities have documents that govern how they operate and guide the administration of land use in their jurisdiction. The policies within these documents are legally binding and are the policies that provide the criteria used to determine if a federal activity is consistent with the Oregon Coastal Management Program. DLCD provides the list of enforceable policies that are used for federal consistency review. The data includes state statutes, statewide planning goals, and city and county policies selected from local comprehensive plans and land use regulations.	All boundaries of Coastal counties and coastal cities, Marine Renewable GLD, CMECS Nearshore Beaches Map, Cape Arago, Estuaries, ShorelandsNHD Waterbodies, Territorial Sea, National Wetlands Inventory, Rocky Shores. All geographies are clipped to the coastal	City UGBs	monthly-annually (based on updates with NOAA)	Yes	excel files are provided on DLCD's web site; https://www.oregon.gov/lcd/OCMP/Pages/Enforceable-Policies.aspx	Level 1	No	None	As-is	High	High	No Priority	Not Published										

					zone boundary.																						
DLCD-20220302-00010	DLCD	Oregon Coastal Services Division	**Goal 18 Eligibility Inventory**	GIS dataset of oceanfront parcels, with information regarding development status as of January 1, 1977. Related to Statewide Planning Goal 18: Beaches and Dunes.	ocean shore	tax parcels	Annual maintece only	yes	GIS data provided on DLCD web site and on the Oregon Coastal Atlas; https://www.coastalatlas.net	Level 1	No		As-is	High	High	No Priority	Not Published										
DLCD-20220302-00019	DLCD	Oregon Coastal Services Division	**Oregon Coastal Marine Ecological Classification**	GIS dataset of coastal & marine habitats, classified using the federal CMECS standard	Head of tide out tofederal waters	individual habitat units	In progress	yes	GIS data provided on DLCD web site and on the Oregon Coastal Atlas; https://www.coastalatlas.net	Level 1	No	Oregon Framework Data Standard is under development	As-is	High	Medium	No Priority	Not Published										
DLCD-20220302-00020	DLCD	Oregon Coastal Services Division	**Oregon Coastal Zone**	Extent of the jurisdiction of the Oregon Coastal Management Program	Crest of the coast range out to 3 nautical miles, with exception of the Columbia, Rogue an Umpqua river basins which are truncated a specific locations.		As needed	yes	GIS data provided on DLCD web site and on the Oregon Coastal Atlas; https://www.coastalatlas.net	Level 1	No		As-is	High	High	No Priority	Not Published										
DLCD-20220302-00022	DLCD	Oregon Coastal Services Division	**Oregon Territorial Sea**	State jurisdiction extending 3 nautical miles from shore	State jurisdiction extending 3 nautical miles from shore		As needed	yes	GIS data provided on DLCD web site and on the Oregon Coastal Atlas; https://www.coastalatlas.net	Level 1	No		As-is	High	High	No Priority	Not Published										
Data Need	DLCD DOGAMI	DLCD DOGAMI	**Dikes and Levees**	Location and condition of dikes and levees											Low							Infrastructure			Important for considering flood protection	DOGAMI layer may have location information (not sure if complete), but likely doesn't have condition information.	Recommendation from WCT
DSL-20220308-00001	DSL	Aquatic Resource Management / Common School Fund & Property	**Land Administration System (LAS)**	DSL's permitting and information system, used to track waterway and land permits and authorizations, registrations, leases, compensatory mitigation, enforcement actions, jurisdictional determinations, wetland delineations, wetland land use notices and other related data	Oregon	Point references based on TRS or site survey	Daily	Yes	https://lands.dsl.state.or.us, basic permit status & contact information, portal for public comments & downloading of permit & authorization	Level 2	No	Some redaction of permittee contact information & address may be warranted	Redaction required	High	Medium	Medium	Not Published			Microsoft SQL	NA	Natural, Land, Monitoring	LAS-Land Administration System	Microsoft SQL			
DSL-20220308-00009	DSL	IT/GIS	**ENVIR**	GIS layers related to the Regulatory program (Removal/Fill & Wetlands)	Oregon	Varied	Daily	Yes	Various maps on https://maps.dsl.state.or.us/Portal	Level 1	No	None	As-is	Medium	Medium	Medium	Not Published										
DSL-202203	DSL	IT/GIS	**FILLEDLANDS**	DSL Waterway ownership and filled lands on those waterways	Oregon	Varied	Daily	Yes	Various maps on https://maps.dsl.state.or.us/Portal	Level 1	No	None	As-is	Medium	Medium	Medium	Not Published										

08-00010																											
DSL-20220308-00011	DSL	IT/GIS	**FORESTRY**	GIS Layers related to management of our forest	Oregon	Varied	Daily	Yes	Various maps on https://maps.dsl.state.or.us/Portal	Level 1	No	None	As-is	Medium	Medium	Medium	Not Published										
DSL-20220308-00013	DSL	IT/GIS	**OWN.SLIS (State Lands Inventory System)**	The State Land Inventory System (SLIS) contains information about real property currently owned by the State of Oregon and administered by its various agencies. The system is maintained by the Oregon Department of State Lands (DSL) in cooperation with the Department of Administrative Services (DAS) and the land-owning agencies.	Oregon	Varied	Weekly	Yes	Maps & reports: https://www.oregon.gov/dsl/Land/Pages/SLI.aspx	Level 1	No	None	As-is	High	High	High	Not Published										
DSL-20220308-00017	DSL	IT/GIS	**SLOUGH**	South Slough Esturine Reserve programs	Oregon	Varied	Daily	Yes	Various maps on https://maps.dsl.state.or.us/Portal	Level 1	No	None	As-is	Medium	Medium	Medium	Not Published										
DSL-20220308-00018	DSL	IT/GIS	**Statewide Wetlands Inventory (SWI)**	The SWI is a screening tool to help identify approximate locations of wetlands and waterways. The SWI consists of wetland inventories and other natural resource mapping that identify approximate locations of wetlands and waters (streams, ponds, etc.). LWI boundries is DSL created data, the rest are from other entities	Oregon	Varied	Daily	Yes	Maps & reports: https://www.oregon.gov/dsl/ww/Pages/Inventories.aspx	Level 1	No	None	As-is	High	High	Medium	Not Published										
DSL-20220308-00019	DSL	IT/GIS	**Local Wetlands Inventories (LWI)**	DSL approved local wetlands inentories, done by consultants & local governments. Currently file-based, will be moved either under ENVIR or a new Geodatabase	Oregon	Varied	Daily	Yes	Maps & reports: https://www.oregon.gov/dsl/ww/Pages/Inventories.aspx	Level 1	No	None	As-is	High	High	Medium	Not Published			GIS ESRI file Geodatabase	DSL LWI Standard,https://www.oregon.gov/dsl/WW/Documents/LWI_GIS_Data_Description.pdf	Natural, Land, Monitoring	Individual LWIs for each municipality	ESRI File Geodatabase			
	DSL	IT/GIS	**Wetland Mitigation Mapping**	The mitigation mapping project is providing a complete compensatory mitigation (CM) polygon dataset for Department of State Lands staff and the public to reference																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
	DSL	IT/GIS	**Waterway Ownership**	The Department of State Lands is responsible for management of publicly owned submerged and submersible land. This dataset tracks DSL ownership of these waterways.																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
	DSL	IT/GIS	**Essential Salmonid Habitat**	Determination of whether the fish habitat meets criteria for designation as Oregon Essential Indigenous Anadromous Salmonid Habitat.																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
	DSL	IT/GIS	**Head of Tide**	Head of Tide Dataset was originally generated by R Sounheim (2000) from the Heads of Tide for Coastal Streams in Oregon study conducted by by DSL in the late 1980s and reviewed by G Willnow. The digitization of the report's tidal data was conducted against 1:24,000 USGS Quads and 1:24,000 Digital Ortho Quads dating from 1995 and reviewed and QA/QCed by the original DSL staff (Greg Willnow and Perry Lumley) that generated the original report and also																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			

				verified in the field by R. Sounhein and G. Willnow during the Waterway Inventory Project of 1997-2000.																							
	DSL	IT/GIS	**Wetland Mitigation Bank Locations**	Wetland mitigation banks in Oregon. A compilation of geodata from state agencies with mitigation bank management or oversight responsibilities. Currently, the agencies are Oregon Dept of State Lands and Oregon Dept of Transportation. Not to be used for planning offsets or calculating credits for development. Please contact Oregon Dept of State Lands for such information.																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
	DSL	IT/GIS	**Wetland Mitigation Bank Service Areas**	Online map allows user to click on a location for a list of mitigation providers. For areas with more than one provider available, use the arrow button to display information on each bank in that area. Select which bank or ILF matches the HGM and Cowardin classes of your proposed impact. Contact the banker(s) for availability.																Microsoft SQL	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
	DSL	IT/GIS	**Advanced Aquatic Resource Planning Areas**	The features in these layers are derived from a variety of sources, including County Assessor Tax Lot Data. According to a description from DSL's Aquatic Resource Management Program's Annual Report, "Advance Aquatic Resource Plan (AARP) rules were developed from a long process involving multiple state, federal, local government and other stakeholder participation. AARPs are similar in many ways to Wetland Conservation Plans (WCPs). Wetland and waters are identified, functional assessments completed, and decisions are made regarding best use of each wetland; then the plan is approved by final order of the Director. AARPs differ from WCPs because the plan is not a land use decision; the plan area is determined by participants, and both the landowners and future developers voluntarily agree, or not, to the conditions of the plan. If the participant chooses to comply with the terms of the AARP, there is streamlining of the removal-fill permitting process."																shapefile	NA	Natural, Land, Monitoring		ESRI Enterprise Geodatabase			
Federal	NOAA Tides and Currents		**National Water Level Observation Network**	tide and water level reference datums used for nautical charting, coastal engineering, International treaty regulation, and boundary determination. The NWLON provides historical as well as present-day water level information.											High							Monitoring					Recommendation from WCT
Data Need	OCCRI	OCCRI	**Climate Projections**	reach scale estimates flow, temperature; sea-level rise; air temp; precip; drought; fire											Low							Climate			Not key data at this point, but can inform subsequent needs assessments and prioritizations		Recommendation from WCT
ODA-20220606-00001	ODA	Administrative Services/Licensing	**L2K data**	Data entered through the Licensing Search Module (LSM) and stored in L2K. L2K database is for licenses, permits, and registrations for contact information, addresses, license status, and payment history.	Oregon	Street Address	Daily	Yes	website - http://oda.state.or.us/dbs/search.lasso	Level 3	PII	PII - Redactions required	Redaction required	High	Medium	High	NO			excel		Agriculture	L2K	LSM			
ODA-20220606-00026	ODA	Food Safety Division	**Shellfish Notice List**	Shellfish grower information that is associated with specific growing area so they are contacted when that bay is opened or closed	Oregon	Street Address	Annually	No	NA	Level 2	PII	Some redaction would need to happen.	Redaction required	Low	Medium	Medium	NO			excel		Education/ Outreach	Filemaker	Filemaker			

ODA-20220606-00027	ODA	Food Safety Division	**Shellfish Tracker**	Used to collect percipitation and river levels in growing areas to open and close harvesting	Oregon	Coast Bay Area	Daily	No	NA	level 1	No	Some redaction would need to happen.	Redaction required	Medium	Medium	Low	NO			excel		Water Quantity	Filemaker	Filemaker			
ODA-20220606-00028	ODA	Food Safety Division	**Shellfish Plat Leasing-Production Quarterly (Excel)**	Quarterly billing for plat leases, annual report for production, who leases what area	Oregon	Street Address	Bi-weekly	No	NA	Level 2	PII	Some redaction would need to happen.	Redaction required	Low	Medium	Medium	NO			excel		Funding	Filemaker	Microsoft Office			
ODA-20220606-00029	ODA	Food Safety Division	**Shellfish Plat Leasing-Production Annual (Word)**	Annual production from the quarterly billing for each year	Oregon	Plat Leases	Bi-weekly	Yes	ODA website- https://www.oregon.gov/oda/programs/FoodSafety/Shellfish/Pages/ShellfishPlat.aspx	level 1	No	Some redaction would need to happen.	Redaction required	High	Medium	Medium	NO			word		Funding	Filemaker	Microsoft Office			
ODA-20220606-00044	ODA	Natural Resources Division, Confined Animal Feeding Operations	**CAFO NPDES and WPCF General and Individual Permit Registration data - Operator Info Page**	Dataset containing: Contact information - Operator name, Physical Locations (Animals or Physical location of facility, Animal types and numbers, Status of Animal Waste Mangement Plans, Identification numbers, facility Designations, Permit activity, date required paperwork was received, NAIC Codes. Data housed in Operator Page that resides on FM5.	Oregon by Area - Facility County	Street Address	Weekly/Daily	No	N/A	Level 1	No	Redaction of Fur Farms Personally Identifiable Information	Redaction required	High	Medium	High	NO			excel		Facilities	CAFO database	Filemaker			
ODA-20220606-00045	ODA	Natural Resources Division, Confined Animal Feeding Operations	**Logbook Page - CAFO Inspection and Compliance Data Permitted and Non-Permitted Facilities**	Dataset containing: Inspection Report #s, Dates of Inspection, Types of Inspection, Results of Inspection, Due Date for Required Actions, Date Verified for Required Actions and Violation Citations. Check box for samples taken and Discharge to Surface water (no data provided) Data housed on Logbook housed on FM5.	Oregon by Area - Facility County	Street Address	Weekly/Daily	No	N/A	Level 1	No	Redaction of Fur Farms Personally Identifiable Information	Redaction required	High	Medium	High	NO			excel		Regulatory & Enforcement/Compliance	CAFO database	Filemaker			
ODA-20220606-00046	ODA	Natural Resources Division, Confined Animal Feeding Operations	**Chronology - Inspection, Correspondence, Items Received detail.**	Dateset containing: Notes on Inspections, Dates of Items Received, Dates of Action Taken, Dates of Correspondence sent each with brief description. Data housed in Chronology that resides on FM5.	Oregon by Area - Facility County	Street Address	Weekly/Daily	No	N/A	Level 1	No	Redaction of Fur Farms Personally Identifiable Information	Redaction required	Medium	Medium	High	NO			excel		Regulatory & Enforcement/Compliance	CAFO database	Filemaker			
ODA-20220606-00047	ODA	Natural Resources Division, Confined Animal Feeding Operations	**Compliant Tracking**	Dataset containing: Operator Information tab Permitted or Non-Permitted (Name/Business Name, address, city , state, zip and county). Description of complaint tab. Complait Information (Name, address, city , state, zip , phone and email) Toggle yes/no if confidential and if it was from an OERS Report. Outcome tab Assigned to, outcome, Inspection Report number, date and Outcome Description. Data housed in Layout tab that resides on FM5.	Oregon by Area	Street Address	Weekly/Monthly	No	N/A	Level 1	PII	Redaction of Fur Farms Personally Identifiable Information	Redaction required	Medium	Low	Medium	NO			excel		Regulatory & Enforcement/Compliance	CAFO database	Filemaker			
ODA-20220606-00048	ODA	Natural Resources Division, Confined Animal Feeding Operations	**Annual Report Entry**	Dataset containing: Master Address Number, Business Name Contact Names, County and Area. Report year, Date Received, Acres Reported, Date Reviewed, Reviewed by, Amendment needed , Date of Amendment and Date of Original Signature Received. Data housed in Layout tab that resides on FM5.	Oregon by Area	Street Address	January - May Daily	No	N/A	Level 1	No	Redaction of Fur Farms Personally Identifiable Information	Redaction required	Medium	Low	High	NO			excel		Facilities	CAFO database	Filemaker			

ODA-20220606-00055	ODA	Natural Resources Division, Water Quality Program	**Water Quality - Area Plan Boundaries**	GIS feature layer showing the different Water Quality Management Areas	Oregon	Sub-basin	Rare	Yes	"Web map - https://geo.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=e48e9d32e854458a8079b10852c3100b PDF - https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/AgWQManagementAreas.pdf"	Level 1	No	None	As-is	High	Medium	High	NO			shapefile		Water Quality	WQ Management Areas	ArcGIS Online			
ODA-20220606-00056	ODA	Natural Resources Division, Water Quality Program	**Water Quality - SIA Boundaries**	GIS feature layer showing the different Strategic Implementation Area boundaries	Oregon	Watershed	Weekly	Yes	https://geo.maps.arcgis.com/apps/View/index.html?appid=5cde20dff13b4183a42d5a65570f7b69	Level 1	No	yes	As-is	High	Medium	High	NO			shapefile		Water Quality	SIA Boundaries	ArcGIS Online			
ODA-20220606-00057	ODA	Natural Resources Division, Water Quality Program	**Water Quality - Focus Area Boundaries**	GIS feature layer showing the different Focus Area Boundaries	Oregon	Watershed	Bi-annually	Yes	PDF - https://www.oregon.gov/ODA/shared/Documents/Publications/NaturalResources/WaterFocus4.pdf	Level 1	No	None	As-is	High	Medium	HIgh	NO			shapefile		Water Quality	Focus Area Boundaries	ArcGIS Online			
ODA-20220606-00058	ODA	Natural Resources Division, Water Quality Program	**Water Quality - Agriculture Land**	GIS feature layer showing the results of an anaylsis to define Agriculture Land in Oregon	Oregon	eco-region	3 years	Yes	GIS feature layer	Level 1	No	None	As-is	Medium	Medium	High	NO			shapefile		Agriculture	Oregon Ag Land	ArcGIS Online			
ODA-20220606-00059	ODA	Natural Resources Division, Water Quality Program	**Soil and Water Conservation Districts Boundaries and Zones**	GIS feature layers showing the SWCD Boundaries and the zones within each district. SWCD contact information, Zone Director's names are included	Oregon	sub-county	Yearly or as requested by the SWCD	Yes	Web Map - https://geo.maps.arcgis.com/apps/Viewer/index.html?appid=9cee1a8b865140d5b71253975fb7fe6d	Level 1	No	None	As-is	High	Medium	High	NO			shapefile		Boundaries	SWCD Boundaries	ArcGIS Online			
ODA-20220606-00060	ODA	Natural Resources Division, Confined Animal Feeding Operations	**Confined Animal Feeding Operations - Livestock Water Quality Specialist Boundaries**	GIS feature layers show the boundaries of the Livestock Water Quality Specialist.	Oregon	County	As requested by the CAFO program Manager	Yes	Web Map - https://geo.maps.arcgis.com/apps/PanelsLegend/index.html?appid=881f2ae8cb7b40949fa735aa22f74415	Level 1	No	None	As-is	Medium	Medium	High	NO			shapefile		Boundaries	WQ Specialist Boundaries	ArcGIS Online			
ODA-20220606-00061	ODA	Natural Resources Division, Water Quality Program	**SIA Dashboards**	The data accumulates the status and results of SIAs around the state. Data includes stage of SIA phase, evaluation and compliance results, stream miles and acres evaluated, landowners contacted, and OWEB dollars invested.	Oregon	Tax lot	Monthly	No	NA	Level 1	No	None	As-is	Medium	Medium	Low	NO			excel		Monitoring	SIA Dashboard	Microsoft Office			
ODA-20220606-00062	ODA	Natural Resources Division, Water Quality Program	**Agricultural Water Quality Program compliance database**	The data tracks all compliance cases of potential violations of Agricultural Water Quality rules.	Oregon	Tax lot	Daily	Yes	Annual report summary.	Level 2	PII	None	As-is	Medium	Medium	Medium	NO			excel		Regulatory & Enforcement/Compliance	WQ Compliance Investigations	Filemaker			
ODF-20220302-	ODF	Protection - Fires	**Fire incident data**	Data associated with reports of fire, fire incident responses, fire causes and associated expenses related to fire incident responses.	ODF protected land and Federal partners	Acres	Daily	No		Level 3	No	Data is used for sensitive fire investigations.	Not publishable	Medium	Low	No Priority	Not Published										

00006																											
ODF-20220302-00007	ODF	Protection - Fires	**Fire incident data**	Spatial data associated with reports of fire.	ODF protected land and Federal partners	Acres	Daily	Yes	https://oregon-department-of-forestry-geo.hub.arcgis.com/search?tags=fire	Level 1	No		As-is	High	High	High	Not Published										
ODF-20220302-00008	ODF	ODF - GIS Data	**Non Restricted GIS data**	ODF Steward GIS data are those for which ODF is the primary steward or originator. The data could be completely an ODF source or could be derived from external data sources.	State of Oregon	Varies	Daily	Yes	https://oregon-department-of-forestry-geo.hub.arcgis.com/	Level 1	No	None	As-is	High	High	Medium	Not Published										
ODF-20220302-00009	ODF	ODF - GIS Data	**Restricted GIS data**	ODF Steward GIS data are those for which ODF is the primary steward or originator. The data could be completely an ODF source or could be derived from external data sources. Datasets with restricted information including threatened and endangered, shared agreement data, and ownership information must be redacted.	State of Oregon	Varies	Daily	No		Level 3	No	Restricted by law	Not publishable	High	High	No Priority	Not Published										
ODF-20220302-00016	ODF	Protection - Significant Fire Potential	**Weather data**	Data set contains combined weather data pulled from various public weather sites.	Oregon	State wide	Daily	Yes	https://apps.odf.oregon.gov/SignificantFirePotential/#/ https://nap.nwcg.gov/NAP/#	Level 1	No	ODF is not the custodian of this data.	As-is	Low	Low	No Priority	Not Published										
ODF-20220302-00017	ODF	State Forests - WALT	**Timber Sales**	Data set includes timber sale information including bids, inspection reports, sale contracts, tracking of log load tickets and management of payments.	Oregon State Forests managed lands, federal lands	Acre	Daily, maybe more	No		Level 3	No	Some business partner information is considered sensitive industry information.	Redaction required	Medium	Low	Medium	Not Published										
ODF-20220302-00018	ODF	State Forests - WALT	**Recreation Usage and fees**	Data set includes campsite information including dates used, number of campers and fees collected.	Oregon state managed lands	Campground	Daily	No		Level 1	No		As-is	Medium	Medium	Medium	Not Published										
Data Need	ODFW	ODFW	**Fish and Wildlife Species Presence/ Distribution**	e.g., ESA, sensitive, strategy species. Stream / river line and waterbody polygon habitat distribution GIS data.											Low							Ecosystems & Wildlife			Key Data	Stream / river line and waterbody polygon habitat distribution GIS data are managed separately by species. Would need to be compiled specifically into a specific species layer.	Recommendation from WCT
Data Need	ODFW	ODFW	**Species Temperature and Flow**	Species Specific Vulnerability Assessments & Flow from BiOp, ISWRs, other methods											Low							Ecosystems & Wildlife; Water Quality; Water Quantity			Key Data	ODFW POP 123 & 110	Recommendation from WCT
Data Need	ODFW	ODFW	**Critical Habitats**	Location and Persistence of e.g., estuaries, wetlands, riparian. locational polygon data (GIS) & analysis of											Low							Ecosystems & Wildlife			Key Data	ODFW POP 123 & 110	Recommendation from WCT

				persistence, number of days wetted seasonally, variation of lake levels and quality																							
Data Need	ODFW	ODFW	**Cold Water Resources**	Identification and Mapping Reach-scale (NHD) temperature estimates based on empirical temperature data obtained from instream thermistors or model estimates.											Low							Ecosystems & Wildlife; Water Quality; Water Quantity			Key Data	ODFW POP 123 & 110	Recommendation from WCT
Data Need	ODFW	ODFW	**ODFW Fish passage barriers**	locational point data (GIS & excel), both natural and artificial barriers to fish passage - current, removed / replaced, priority); INR tidegate inventory											Low							Ecosystems & Wildlife			Key Data		Recommendation from WCT
Data Need	ODFW	ODFW	**Distribution Projections for Native and Non-Native Fish**	Probability of presence for different future scenarios; Spatial GIS layers											Low							Ecosystems & Wildlife				needs identification of proper scenario approach	Recommendation from WCT
Data Need	*ODFW*	*ODFW*	***HABs Monitoring***	*Harmful algal bloom response to decreased water flows; impacts on seafood/public health*											*Low*							*Water Quality; Ecosystems & Wildlife*				*Data related to HABs monitoring are available from DEQ and OHA*	*Recommendation from WCT*
	ODFW		**ODFW Water Temperature Datasets - multiple projects/datasets**	Continuous water temperature monitoring at multiple locations through multiple ODFW monitoring programs (Klamath Anadromous Reintroduction Program, Salmonid Life Cycle Monitoring and John Day basin trapping locations, 25 locations throughout the Siletz watershed, multiple locations in the Middle Fork John Day Intensively Monitored Watershed. Additional monitoring projects and locations are in development.	Statewide	Specific watersheds, thermistor deployment locations	Annual	No		Level 1	Some site locations may contain personally identifiable data (property owners, etc.)	May require some redaction to protect anonymity of landowners, etc.	No	High	Low	Low									Depending on specific dataset, data have high external interest and are used by multiple partners	Low; ODFW is currently compiling existing internally-collected water temperature data and designing an overarching water temperature research and monitoring program. ODFW is piloting use of AWQMS as a means of data sharing. Near term, it may be possible to develop a layer of Level 1 location data where monitoring is currently conducted	
	ODFW		**Natural Origin Salmon and Steelhead Abundance and Productivity (ODFW Salmon & Steelhead Recovery Tracker) - Many**	The Recovery Tracker provides information on the health of Oregon's anadromous salmon and steelhead populations. Website users can explore and download information related to salmon conservation and recovery in Oregon.	Statewide, not comprehensive	ESU/SMU; Management Strata (aggregates of populations, Population, sub-population (varies by dataset)	Annually (varies by dataset)	Yes	http://odfwrecoverytracker.org/	Level 1	None	None	As is	Medium	High	Medium									Moderate external interest in data; relied upon by multiple parties	Well developed metadata. Data already in a suitable, machine readable format for publication, however data will be migrated into a new system in the future; well	

			component datasets																							developed metadata; Provided on an external (public-facing) web application for fish species throughout Oregon. Additional resources will be necessary to more comprehensively serve metrics from contributing monitoring projects	
	ODFW		**Fish Monitoring Index, Census and Estimate (Trend) Data (StreamNet Data Exchange Standard) - Many component datasets**	StreamNet is a cooperative information management and data dissemination project focused on fisheries and aquatic data and data-related services in the Pacific Northwest, with a focus on the Columbia River Basin. Data are provided in tabular format and as maps and GIS layers. ODFW is a partner and serves as a design and data contributor to the StreamNet project. Fish monitoring data, formerly called the StreamNet "trends," consist of numerous data categories for resident and anadromous fishes, including fish abundance estimates, redd counts, dam counts, and other abundance indices. These data categories have data sets spanning many years. These data are collected, standardized, and shared by cooperating states, tribes, and federal agencies in the Pacific Northwest. Data sets are generally updated annually.	Statewide, not comprehensive	ESU/SMU; Management Strata, Population (varies by dataset)	Annually (varies by dataset)	Yes	https://www.streamnet.org/data/trends/?index=1&perpage=10&species=All&datacategory=All&compiledby=All&run=All&populationname=All&endyear=All	Level 1	None	None	As is	High	High	High									High external interest; relied upon by multiple parties	Data already in a suitable, machine readable format for publication; well developed metadata; Provided on an external (public-facing) web application for fish species throughout Oregon	
	ODFW		**Natural Origin Salmon and Steelhead Abundance and Productivity (Coordinated Assessments Data Exchange Standard) - Many component datasets**	StreamNet is a cooperative information management and data dissemination project focused on fisheries and aquatic data and data-related services in the Pacific Northwest, with a focus on the Columbia River Basin. Data are provided in tabular format and as maps and GIS layers. ODFW is a partner and serves as a design and data contributor to the StreamNet project. The Coordinated Assessments Partnership (CAP) fish high-level indicators (HLIs) query systems provide access to standardized data for fish population HLIs housed in the Coordinated Assessments Data Exchange (CAX; https://cax.streamnet.org/). These population-level HLI data are developed by CAP and shared here via map based and tabular query systems. CAP currently provides 6 HLIs of the health of naturally spawning salmonid populations (Natural-Origin Spawner Abundance/Escapement for Salmon and Steelhead; Presmolt Abundance for Natural-Origin Salmon and Steelhead; Smolt to Adult Return Rate (SAR) for Natural-Origin Salmon and Steelhead; Recruits per Spawner (R/S) Adults and Juveniles for Natural-Origin Salmon and Steelhead; Proportionate Natural Influence (PNI). The current 5-year plan for the CAP identifies the following HLI categories to be developed, pending funding and staff resources to support the work: Bull Trout, Carrying Capacity, White Sturgeon, Other Fish, and Hatchery Fish (being developed through the HCAX 2020-23 process	Statewide, not comprehensive	ESU/SMU; Management Strata, Population (varies by dataset)	Annually (varies by dataset)	Yes	https://cax.streamnet.org/	Level 1	None	None	As is	High	High	High									High external interest; relied upon by multiple parties	Data already in a suitable, machine readable format for publication; ; well developed metadata; Provided on an external (public-facing) web application for PNW salmon & steelhead fisheries data.	

	ODFW		**Western Oregon stream habitat restoration monitoring**	Monitoring effectiveness and habitat change of stream restoration	Central Point (Rogue Watershed District), Clackamas (North Willamette Watershed District), Corvallis (South Willamette Watershed District), Tillamook (North Coast Watershed District), Roseburg (Umpqua Watershed District); Western Oregon: Oregon Coast ESU, Lower Columbia ESU, Southern Oregon Northern California Coast ESU	Project-specific	Data are static; Project discontinued after 2014			At site level may contain PII; would need evaluation to release L1 data	Some site locations may contain personally identifiable data (property owners, etc.)	May require some redaction to protect anonymity of landowners, etc.	As is	Low	Medium	Low									Low External Interest		
	ODFW		**Oregon Plan Stream Habitat Monitoring**	Long-term monitoring of status and trend of Western Oregon stream habitat; Survey sites are selected using a generalized random tesselation stratified design.	Central Point (Rogue Watershed District), Clackamas (North Willamette Watershed District), Corvallis (South Willamette Watershed District), Tillamook (North Coast Watershed District), Roseburg (Umpqua Watershed District); Western Oregon: Oregon Coast	Metrics are calculated at each site; status and trend assessed at ESU/SMU and stratum (aggregate of populations) scale. Population-scale estimates of high quality habitat for juvenile coho salmon	Survey data is updated annually; status and trend assessments generally occur at 5-year intervals			At site level may contain PII; would need evaluation to release L1 data	Some site locations may contain personally identifiable data (property owners, etc.)	May require some redaction to protect anonymity of landowners, etc.		High	Medium	Medium									Relied upon by multiple parties		

					ESU, Lower Columbia ESU, Southern Oregon Northern California Coast ESU																					
	ODFW		**Basin Stream Habitat Monitoring**	Monitoring habitat quality and quantity across Oregon. Basin surveys are conducted by a pair of surveyors, starting at a designated point along the river/stream and walking upstream to the designated ending point. Broad scale information that describes distinct stream reaches characterized by land use, topology, or vegetation are identified. Within these reaches, habitat units such as pools, riffles and glides are documented. Information that is collected includes substrate, gradient, channel exposure, woody debris, bank stability and riparian vegetation content.	Statewide, not comprehensive		Dataset updated annually where basin surveys occur			At site level may contain PII; would need evaluation to release L1 data	Some site locations may contain personally identifiable data (property owners, etc.)	May require some redaction to protect anonymity of landowners, etc.		Medium	Medium	Medium								High External Interest; relied upon by multiple parties		
	ODFW		**Oregon Conservation Strategy Habitats**	This dataset represents the extent and distribution of the habitats prioritized within the Oregon Conservation Strategy. Strategy Habitats are identified by ecoregion, and as such are only mapped within their associated Strategy Ecoregions (see http://oregonconservationstrategy.org/strategy-habitats/ for more information on all Strategy Habitats). The list of Strategy Habitats is: Aspen Woodlands, Coastal Dunes, Estuaries, Flowing Water and Riparian Habitats, Grasslands, Late Successional Mixed Conifer Forest, Natural Lakes, Oak Woodlands, Ponderosa Pine Woodlands, Sagebrush Habitats, and Wetlands. The purpose of the dataset is to support the objectives of the Oregon Department of Fish and Wildlife Oregon Conservation Strategy, through mapping the extent and distribution of Strategy Habitats.	Statewide		Generated in 2016	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=892.xml	Level 1	None	None	As is	High	High	High									well-developed metadata. Already published and available to public; data include terrestrial species. Aquatic habitats would need to be broken out if desired separately from terrestrial species.	
	ODFW		**Fish Passage Priority List**	This dataset represents the fish passage barriers identified in the 2019 ODFW Priority Barrier List. The dataset is a subset of the Oregon Fish Passage Barrier Data Standard (OFPBDS) focused on the 2019 priority fish passage barriers. The 2019 ODFW Priority Barriers Dataset is a subset of the features found in the Oregon Fish Passage Barrier Data Standard (OFPBDS) Database. Documentation for the OFPBDS can be found online at http://www.oregon.gov/DAS/EISPD/GEO/docs/bioscience/OregonFishPassageBarrierDataStandardv1dot1.pdf.Consistent with OAR 635-412-0015, staff used the information available at each barrier to create a prioritization equation based on the needs of native migratory fish.ODFW accomplished this by selecting the highest priority barriers within each of the 18 ODFW Fish Districts across the State. Then scoring each artificial obstruction based on standardized methods to develop a list of statewide priority barriers that are ranked within similar groups. More details of the prioritization process can be found in the lineage section of the metadata.	Statewide		Last updated in 2019	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=1094.xml	Contact Data Owner	Personally Identifiable Information in some dataset versions (not publicly shared versions)	None	As is	High	High	High								High External Interest; relied upon by multiple parties	High-quality metadata; Data is in a suitable format for publication; https://nrimp.dfw.state.or.us/FHD_FPB_Viewer/index.html. Data is also a layer published here and linked to on our website https://www.dfw.state.or.us/fish/passage/inventories.asp. We do have versions of the data with information we don't	

																										publish, such as landowner name. Those records are not included in the published data. Data is based on the Fish Passage Barrier list which has high quality metadata.	
	ODFW		**Priority Unscreened Diversion Inventory**	A list of priority water diversion that should be equipped with screening or by-pass devices. As required in ORS 498.326 and ORS 498.306 (14). In 1989, the Oregon Legislature passed Senate Bill 148 (ORS §498.326) which required the Oregon Department of Fish and Wildlife (ODFW) to determine the needs for and location of potential fish screening projects. Further direction in ORS §498.306 requires ODFW to identify 3,500 priority unscreened diversions. An initial report of priority unscreened diversion was released in 1990 (An Inventory of Water Diversions in Oregon Needing Fish Screens – prepared by David Nichols, ODFW, 1990). In working with the Fish Screening Task Force, it was determined that a new updated unscreened diversion inventory was needed. This was completed in 2013.	Statewide		Last updated in 2013			Publicly available data are Level 1	None	None	As is														
	ODFW		**Basin Investigation Report Instream Flow Targets**	Monthly streamflow targets necessary for fish species - used for instream water right applications and reviews of proposed consumptive water rights	Statewide, but select specific streams by Watershed District		Data are static. Studies were conducted in 1963-1977							High	Low	Low									High external interest	Data would be difficult to extract/potentially unavailable for some	
	ODFW		**Instream Flow Studies**	Combination of field-collected data and analysis results to determine optimal instream flows for fish	Statewide, but in select locations		2013 to Present							High	Low	Low									High external interest	Data difficult to aggregate. Most viable near-term option may be to develop a spatial layer identifying locations where studies exist to facilitate specific data requests.	
	ODFW		**Coordinated Assessment Abundance and Productivity High Level Indicators for juvenile and adult ODFW managed Middle Columbia and Snake**	Data is a collated set of high level indicators and metrics used for viability assessments of ESA-listed Snake River spring Chinook populations. Data is currently published on StreamNet's Coordinated Assessments website (See Coordinated Assessments Above).	Middle Columbia and Snake River SMUs		Individual datasets are updated annually	Yes	www.cax.streamnet.org	Level 1	None	None	As is	High	High	High									High external interest; relied upon by multiple parties	High-quality metadata. Data already in a suitable, machine readable format for publication. Highly vetted dataset that is already publicly available on StreamNet's Coordinated Assessments website (See	

			Chinook Populations																							Coordinated Assessments Above)	
	ODFW		**Coordinated Assessments Abundance and Productivity High Level Indicators for juvenile and adult Middle Columbia and Snake steelhead populations**	Data is a collated set of high level indicators and metrics used for viability assessments of ESA-listed Middle Columbia and Snake River steelhead populations. Data is currently published on StreamNet's Coordinated Assessments website (See Coordinated Assessments Above).	Middle Columbia and Snake River SMUs		Individual datasets are updated annually	Yes	www.cax.streamnet.org	Level 1	None	None	As is	High	High	High									High external interest; relied upon by multiple parties	High-quality metadata. Data already in a suitable, machine readable format for publication. Highly vetted dataset that is already publicly available on StreamNet's Coordinated Assessments website.	
	ODFW		**Oregon Fish Habitat Distribution Database**	Data that were collected for research and monitoring purposes have been built into the Fish Habitat Distribution (FHD) Database which functions more as an inventory; Publicly assessible dataset: These data describe areas of suitable habitat believed to be used currently or historically by native or non-native fish populations. The term "currently" is defined as within the past five reproductive cycles. Historical habitat includes suitable habitat that fish no longer access and will not access in the foreseeable future without human intervention. This information is based on sampling, the best professional opinion of Oregon Dept. of Fish and Wildlife or other natural resources agency staff biologists or modeling (see the fhdBasis field). Due to natural variations in run size, water conditions, or other environmental factors, some habitats identified may not be used annually. These data now comply with the Oregon Fish Habitat Distribution Data Standard that was adopted by the Oregon Geographic Information Council in April 2020. The Standard document can be found at: https://www.oregon.gov/geo/standards/OregonFishHabitatDistributionDataStandard_v4.pdf. Historical habitat distribution data are within the scope of the standard and are identified via the habitat use (fhdUseType) attribute. Historical habitats are only identified outside of currently accessible habitat and are not comprehensive. Data representing current habitat for anadromous and resident salmonid species are generally more comprehensive than data for non-game and non-native fish species. All datasets are subject to update as new information becomes available. Key features of the Oregon Fish Habitat Distribution Data include: species, run, life history, habitat use, origin, production, the basis for each record, originator name, originator entity and reference. Habitat distribution data are mapped at a 1:24,000 scale statewide and are based on the National Hydrography dataset. The data are made available as GIS files in both shapefile and ESRI geodatabase format. The data were developed over an extensive time period ranging from 1996 to 2022. The data are now managed on the National Hydrography Dataset and have been synchronized to December 2021 NHD geometry.	Geographic extent varies by each species-based dataset	varies by each species-based dataset	1996-2022; updated irregularly	Yes	Level 1 datasets are published here: https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=1167.xml	includes Level 1, Level 2 General (L2G) and Level 2 Specific (L2S)	None	HB2841	Level 1 data are publishable "as is" and account for approximately 90% of the datasets	High	High	High									High external interest; relied upon by multiple parties	At least some level 2 data would need to be generalized for publication. Data contains 160 separate GIS datasets; Data is already in a suitable, machine readable format for publication. Level 1 datasets are already publicly available. Note: there has been interest in a non-native/invasive fish distribution layer; currently,	
	ODFW		**Oregon Fish Passage**	Inventory current, removed / replaced and priority fish passage barriers in Oregon. Includes potential barriers that may currently provide for adequate fish passage	Statewide	Point locations of barriers	2009-2021; updates	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=	Level 1	None	None	As is	High	High	High									High external interest;	well-developed metadata;	

			Barrier Database	(e.g. culvert meeting fish passage criteria)This dataset is ultimately intended to support the need for an accurate, current and complete representation of the fish passage barriers affecting fish migration throughout the state of Oregon. The OFPBDS database is the most comprehensive compilation of fish passage barrier information in Oregon however, it does NOT represent a complete and current record of every fish passage barrier within the state. Efforts to address deficiencies in data currency, completeness and accuracy are ongoing. The Oregon Fish Passage Barrier Data Standard (OFPBDS) provides a consistent and maintainable structure for both producers and users of fish passage barrier data.			are ongoing		202&XMLname=44.xml																relied upon by multiple parties	data is already in a suitable, machine readable format for publication; Three sets of data are published (current barriers, removed/replaced barriers; priority barriers).	
	ODFW		**Streamflow Restoration Priorities**	Identify Oregon Water Resources Department water availability basins for streamflow restoration priorities and needs; The stream flow restoration priority maps show flow restoration needs and priorities. They were developed by the Oregon Department of Fish and Wildlife and the Water Resources Department, in fulfillment of Oregon Plan Measure IV.A.8, Identify Instream Flow Priorities.Stream flow restoration priorities have been identified for four seasons: Summer (July - September), Fall (October - November), Winter (December - March) and Spring (April - June).Priorities have been developed based on the Water Resources Department nested watershed structure, called Water Availability Basins (WAB). The maps display each river basin, with rankings for stream flow restoration need, stream flow restoration optimism, and the State's priorities for its restoration activities. Also included are maps showing streams and rivers in the basin, and maps showing Water Availability Basins (WAB).	18 separate basins		Data were compiled in 1998-2001; An update of the prioritization is in progress	Yes	Maps are published at: https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=streamflowmaps	Level 1	None	None	As is	Low	Low	Low									Low external interest; data not relied upon by multiple parties (but see data readiness comments)	The ODFW Fish Research Evaluation Data & Decision support (REDD) group is working with the Habitat Division Water Program to update this prioritization. The estimated timeline for completing the updated data is winter 2022. Data value and readiness should be re-evaluated when the new prioritization is available. Likely to be a high level of interest by external stakeholders.	
	ODFW		**State Species Population Boundaries (Bull Trout, Fall Chinook, Spring Chinook, Oregon Chub, Chum Salmon, Coho Salmon, Cutthroat Trout, Pacific**	Data are state species population boundaries	Statewide		Data are static boundaries			Level 1	No	None		Medium	Medium	Medium										May require additional metadata development	

			Lamprey, Redband Trout (Interior Closed Basins); Sockeye Salmon, Summer Steelhead, Winter Steelhead																								
	ODFW		**Species ESUs/SMUs (Bull Trout Core Areas (USFWS is data Originator), Bull Trout Recovery Units (USFWS is data originator), Chinook Salmon ESUs (NOAA is data originator), Chum Salmon ESUs (NOAA is data originator), Coho Salmon ESUs (NOAA is data originator), Cutthroat Trout ESUs (NOAA is data originator), Steelhead (ODFW is data originator), Species Management Units (ODFW is data originator)**	Data are boundaries of federal Evolutionarily Significant Units (ESUs) or state Species Management Units SMUs	Statewide		Data are static boundaries			Level 1	No	None		Medium	Medium	Medium										May require additional metadata development; Federal designations may be available from federal partners	
	ODFW		**Federal Species Population Boundaries (14 separate datasets)**	NOAA is the originator	Statewide		Data are static boundaries			Level 1	No	None		Medium	Medium	Medium										May require additional metadata development; Federal designations may be available from federal partners	

	ODFW		**Oregon Hatchery Facilities**	Data are locations of fish propagation facilities within the state of Oregon. Facilities are differentiated by their function as well as managing agency	Statewide	Fish Propagation Facility point locations	Data are static; updated in 2014	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=1116.xml	Level 1	No	None		Medium	High	Medium											
	ODFW		**ODFW Owned and Managed Lands**	Wildlife management areas owned or managed by Oregon Department of Fish and Wildlife. Purpose of the dataset is to delineate boundaries for management of fish and wildlife resources on lands owned or managed by Oregon Department of Fish and Wildlife.	Statewide	Property boundaries	Data are static; updated in 2021	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=861.xml	Level 1	No	None		Medium	High	Medium											
	ODFW		**Strategy Conservation Opportunity Areas**	ODFW Conservation Opportunity Areas (COAs) are a component of the Oregon Conservation Strategy, and highlight areas across the Oregon landscape where broad fish and wildlife conservation goals would best be met, and aim to increase the likelihood of long-term success, maximize effectiveness over larger landscapes, improve funding efficiency, and promote cooperative efforts across ownership boundaries. COAs were developed to guide voluntary conservation actions in Oregon. Land use or other activities within these areas will not be subject to any new regulations as a result of being designated an ODFW COA. The ODFW COA map, dataset, and underlying profile information should only be used in ways consistent with these intentions. The Geodatabase version of the ODFW COAs includes the latest exported COA Profile, generated from OregonConservationStrategy.org (http://oregonconservationstrategy.org/conservation-opportunity-areas/), and a relationship class joining the COA boudnary feature class to the COA profile table. The purpose of the dataset is to show areas in which conservation actions would best meet the needs of Strategy species and habitats. These areas are generally either areas of high biodiversity, areas with unique habitat values, or areas with known restoration needs.	Statewide	COAs are collections of 1 sq. mile hexagonal polygons	Data are static; updated in 2016	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=897.xml	Level 1	No	Data is presented at a landscape-scale and is not intended to establish specific boundaries for site-specific planning, regulation, or acquisition. See metadata documentation for additional use limitations.		High	High	High										Additional work would be necessary if there is interest in extracting the more water-oriented conservation opportunity areas	
	ODFW		**Oregon Crucial Habitat Assessment Aquatic Crucial Habitat**	This layer serves as the Oregon Department of Fish and Wildlife (ODFW) component of the Western Governors' Association Crucial Habitat Assessment Tool (WGA CHAT), which is a result of coordination among state fish and wildlife agencies throughout the Western United States. This dataset is intended to improve understanding of fish and wildlife habitat priorities throughout Oregon, and can be useful for state-specific queries. Note that this data was updated in February, 2014 to fix an issue found in the Terrestrial Species of Economic and Recreational Importance aggregation methods. As a result, this data may not match exactly with the data currently available on the WGA CHAT site (http://westgovchat.org/). Crucial habitat data can be used to facilitate landscape decision-making in the early stages of land use project planning, and to facilitate efforts to identify important areas for conservation using regionally consistent analyses and data definitions.	Statewide	Data is presented at a landscape-scale and is not intended to establish specific boundaries for site-specific planning, regulation, or acquisition. See metadata documentation for additional use limitations.	Data are static; Updated in 2014	Yes	https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=1095.xml	Level 1	No	COAs were developed to guide voluntary conservation actions in Oregon. Land use or other activities within these areas will not be subject to any new regulations as a result of being designated an ODFW COA. The ODFW COA map, dataset, and underlying profile information should only be used in ways consistent with these intentions. Please refer to the Oregon Conservation Strategy (http://oregonconservationstrategy.org/conservation-opportunity-		High	High	High											

												areas/) for methodology, intended usage, and datasets used in the formation of COAs.															
	ODFW		**Adult Fish Passage Counts - Multiple datasets**	Counts of adult fish (focus is anadromous salmonids but may include lamprey and other migratory species). Sites include data from counting or trapping facilities at Foster Dam, Leaburg Dam, Minto Fish Facility, Upper and Lower Bennett Dams, Oregon Hatchery Research Center, Seine Counts at Huntley Park (Rogue River), Sherars Falls, Willamette Falls and Winchester Dam. These are separate datasets, not maintained in the same database system	Statewide	Data are at point locations of fish passage or trapping facilities	Data are updated annually and intervals during targeted run timings, dependent on facility			Level 1	No	None		High	Low	Low									High external interest; relied upon by multiple parties	Datasets are not managed together; variable metadata. Additional work would be required to comprehensively share data records	
ODOE-20220303-00001	ODOE	Oregon Department of Energy	**American Recovery and Reinvestment Act of 2009 (ARRA) Energy Project Database**	Dataset containing energy projects completed using ARRA money provided to ODOE. (Program ended after money was spent and all LD employees left.)	Oregon	Street Address	Never	No	N/A	Level 3	PII	Contains PII that should be redacted or removed	Redaction required	Low	Medium	Low											
ODOE-20220303-00003	ODOE	Oregon Department of Energy	**Energy Incentive Program (EIP)**	Dataset containing energy tax credits given to businesses. Program ended in 2019??	Oregon	Street Address	Annually	Yes	Redacted dataset is published on Oregon Transparency website	Level 3	PII	Contains PII that should be redacted or removed	Redaction required	Medium	Medium	Medium											
ODOE-20220303-00004	ODOE	Oregon Department of Energy	**State Energy Loan Program (ELP)**	Dataset containing energy loans given to businesses. No new loans are being created and repayment of existing loans is the only activity in this program.	Oregon	Street Address	Monthly	No	N/A	Level 3	PII	Contains PII that should be redacted or removed	Redaction required	Low	Medium	Low											
ODOE-20220303-00005	ODOE	Oregon Department of Energy	**Green Technology Program**	Dataset containing information about energy projects by public entities that are required to spend 1.5% of public building construction costs on green energy technology.	Oregon	Street Address	Monthly	Yes	Annual legislative report detailing projects completed in the past year.	Level 2	No	None	As-is	Medium	Medium	Medium											
ODOE-20220303-00007	ODOE	Oregon Department of Energy	**Residential Energy Tax Credit Data**	Dataset containing energy tax credits given to residential projects. Program ended in 2014.	Oregon	Street Address	Never	Yes	Redacted dataset was published on Oregon Transparency website	Level 3	PII	Contains PII that should be redacted or removed	Redaction required	Medium	Medium	Low											
ODOE-20220303-00009	ODOE	Oregon Department of Energy	**Oregon Solar + Storage Rebate Program**	Dataset containing solar incentives given out for solar panel installations in Oregon	Oregon	Street Address	Daily	Yes	Redacted dataset published on Oregon Transparency website	Level 2	No	Address redaction may be necessary.	Redaction required	Medium	Medium	Medium											
ODOE-20220303-	ODOE	Oregon Department of Energy	**Renewable Portfolio Standard Database**	Data related to Renewable Energy Facilities and their eligability for the RPS.	Oregon	Street Address	Daily	No	N/A	Level 2	No	Some redaction may be necessary	Redaction required	Low	Medium	Low											

00015																											
ODOE-20220303-00016	ODOE	Oregon Department of Energy	**Oregon Rural and Agricultural Energy Audit Database**	Data related to grant applications for funding energy audits in agriculture.	Oregon	Street Address	Daily	No	N/A	Level 2	No	Some redaction may be necessary	Redaction required	Medium	Medium	Low											
ODOE-20220303-00017	ODOE	Oregon Department of Energy	**Radiological Shipments Database**	Data related to radiological shipments that travel through Oregon	Oregon		Daily	No	N/A	Level 3	No	Some redaction may be necessary	Not publishable	Low	Low	Low											
ODOE-20220303-00019	ODOE	Oregon Department of Energy	**Wildfire Recovery Assistance Database**	Data related to applications for homes rebuilt to code that were destroyed or damaged by wildfires.	Oregon	Street Address	Daily	No	N/A	Level 3	PII	Some redaction may be necessary	Redaction required	Medium	Medium	Low											
ODOE-20220303-00020	ODOE	Oregon Department of Energy	**Community Renewable Energy Program (CREP) Database**	Data related to grants for community renewable energy projects.	Oregon	Street Address	Daily	No	N/A	Level 2	No	Some redaction may be necessary	Redaction required	Medium	Medium	Low											
	OHA	OHA-DWS	**Water System and Facility Inventory**	Information for all public water systems (PWS) in Oregon and their facilities, such as sources, treatment plants, and distribution.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/ and ArcGIS Online https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=86938c6844be48b0b75a9326f500a748)	Level 3	PII		Redaction required	High													
	OHA	OHA-DWS	**Site Visits**	Record of PWS inspections, including any deficiencies and rule violations and their resolution status.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/wss.php)	Level 1	No		As-is	Medium											Value is primarily for DWS, partners, and water systems		
	OHA	OHA-DWS	**Sample Results**	Analytical results for PWS monitoring samples.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 2	No		Redaction required	High													
	OHA	OHA-DWS	**Monitoring and Violations**	PWS monitoring schedules and violations, including violation status.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/violcounty.php)	Level 1	No		As-is	High													
	OHA	OHA-DWS	**Compliance and Enforcement**	Compliance schedules and enforcement actions and their status.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/compliance.php)	Level 1	No		As-is	High													
	OHA	OHA-DWS	**Certification**	Certification information for water system operators and backflow testers/specialists.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 3	PII		Redaction required	High													
	OHA	OHA-DWS	**SWAP**	Source water assessment information for water systems using groundwater.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 2	No		Redaction required	Medium													
	OHA	OHA-DWS	**Plan Review**	Plan review projects and status for water systems.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/plancounty.php)	Level 3	PII		Redaction required	Medium											Value is primarily for DWS, partners, and water systems		

	OHA	OHA-DWS	**Advisories and Contact Reports**	Record of communication with water systems regarding water quality advisories and other issues, including status of advisories.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/advisories.php and https://yourwater.oregon.gov/cr-all.php; Advisories are also on ArcGIS Online: https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=aad8990776b44107adfb94363e258545)	Level 3	PII		Redaction required	Medium											Value is primarily for DWS, partners, and water systems		
	OHA	OHA-DWS	**Annual Fees**	Fee amounts and payment status for annual water system fee and annual cross connection fee.			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 3	PII		Redaction required	Medium											Value is primarily for DWS, partners, and water systems		
	OHA	OHA-DWS	**Post-Wildfire VOC Data**	Sample data from water systems affected by wildfires			Daily	Yes	Website (Data Online https://yourwater.oregon.gov/wildfirevocs.php)	Level 1	No		As-is	Medium													
	OHA	OHA-EPH	**Domestic Well Sample Results**	Analytical results for various domestic well monitoring samples.	Oregon	lat/long	Irregular	Yes	Internal web application	Level 2	No	TBD	Redaction required	High													
	OHA	OHA-EPH	**Domestic Well Sample Admin Data**	Information about real estate transaction, relevant wildfire or other special project	Oregon	Address	Irregular	Yes	Internal web application																		
	OHA	OHA-DWS	**Water System and Facility Inventory**	Information for all public water systems in Oregon and their facilities, such as sources, treatment plants, and distribution.	Oregon	Address or lat/long	Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 3	PII	Contains critical locational data of wells and springs used as drinking water sources owned and operated by Public Water Systems. Locational data should not be shared publicly.	Redaction required	High	Medium	High			https://yourwater.oregon.gov/			Drinking Water & Public Water Supply; Facilities		Microsoft SQL		The high-interest data are already published on our website (updated daily). Data are also available through EPA's ECHO site (updated quarterly). To publish elsewhere: Data exist in a complex relational database; it might not be feasible to make it all available as a flat file. Some work would be required to identify fields that need to be removed, cleaned, or explained. Documentation would be needed to assist external	

																										users in properly using the dataset.	
	OHA	OHA-DWS	**Drinking Water Quality Data**	Analytical results for water system monitoring samples and water quality alerts to notify regulators when certain thresholds are exceeded	Oregon	Address or lat/long	Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 2	No	Some sample results are tied to specific residential addresses, which should not be shared publicly.	Redaction required	High	Medium	High			https://yourwater.oregon.gov/			Drinking Water & Public Water Supply; Water Quality		Microsoft SQL		The data are already published on our website (updated daily); there are plans to implement a more user-friendly download option. Data are also available through EPA's ECHO site (updated quarterly). To publish elsewhere: Data exist in a complex relational database; it might be challenging to make it all available as a flat file. Some work would be required to identify fields that need to be removed, cleaned, or explained. Documentation would be needed to assist external users in properly using the dataset.	
	OHA	OHA-DWS	**Drinking Water Violations and Enforcements**	Water system violations and enforcement actions	Oregon	Address or lat/long	Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 1	No	None	As-is	High	Medium	High			https://yourwater.oregon.gov/			Drinking Water & Public Water Supply; Regulatory/ Compliance & Enforcement		Microsoft SQL		The data are already published on our website (updated daily). Data are also available through EPA's ECHO site (updated quarterly). To publish elsewhere: Data exist in a complex relational database; it might not be	

																										feasible to make it all available as a flat file. Some work would be required to identify fields that need to be removed, cleaned, or explained. Documentation would be needed to assist external users in properly using the dataset.	
	OHA	OHA-DWS	**Source Water Sensitivity Data**	Sensitivity analysis results for wells and springs owned by public water systems using groundwater	Oregon	Address or lat/long	Daily	Partial	Website (Data Online https://yourwater.oregon.gov/)	Level 2	No	None	Redaction required	Medium	Medium	Low			https://yourwater.oregon.gov/			Drinking Water & Public Water Supply; Groundwater & Wells		Microsoft SQL		Some work would be required to identify fields that need to be removed, cleaned, or explained. Documentation would be needed to assist external users in properly using the dataset.	
	OHA	OHA-DWS	**Drinking Water Advisories**	Drinking water quality advisories including advisory type, reason, and status	Oregon	Address or lat/long	Daily	Yes	Website (Data Online https://yourwater.oregon.gov/)	Level 3	PII	Contains some contact information that should not be made public.	Redaction required	High	Medium	High			https://yourwater.oregon.gov/			Drinking Water & Public Water Supply		Microsoft SQL		The data are already published on our website (updated daily). To publish elsewhere: Some work would be required to flatten the data.	
	OHA	OHA-DWS	**Water System Locations**	Water system service area points and boundaries	Oregon	lat/long	As needed, weekly to monthly	Points- yes, boundaries- no	Web app (https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=86938c6844be48b0b75a9326f500a748)	Level 1	No	Initial boundary dataset given to DWS from another program at OHA with caveat that it not be shared publicly, as some water systems shared their boundaries with this stipulation.	Points- As-is	High	Medium	Medium			https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=86938c6844be48b0b75a9326f500a748			Drinking Water & Public Water Supply; Boundaries		Microsoft SQL; ArcGIS Online	Data are requested frequently internally and by other agencies (and occasionally in public records requests). These data can help agencies identify disadvantaged	Data have some quality issues and would require cleaning and preparation.	

																									communities and respond to emergencies.		
	OPRD		**Oregon State Scenic Waterways**	This data set represents the centerline of the river segments designated and described as Scenic Waterways by ORS 390 and OAR Division 40, 736-040. This data set also provides a representation of the "Related adjacent land" described in ORS 390.805 and OAR 736-040-0015 and its corresponding classification from OAR 736-040-0040. This data was designed for use as a guide in determining the potential for certain lands to be covered by the Oregon statues and rules related to State Scenic Waterways.																Web service		Regulatory/ Compliance & Enforcement	ArcGIS Online				
	OPRD		**Oregon Shoreline Protection Structures**	This layer provides a spatial representation of Oregon Shoreline Protective Structures (SPS) and shore permits administered by the Oregon Parks and Recreation Program. ORS 390.640, 390.715, 390.725																Web service		Infrastructure	ArcGIS Online				
	OPRD		**Oregon Statutory Vegetation Line**	This map is designed to be used as a reference for the purpose of identifying lands subject to the Oregon Department of Parks and Recreation's authority to regulate improvements on the ocean shore. The ocean shore is defined in ORS 390.605 as being the land lying between extreme low tide of the Pacific Ocean and the statutory vegetation line as described by ORS 390.770 or the line of established upland shore vegetation, whichever is farther inland.																Web service		Regulatory/ Compliance & Enforcement	ArcGIS Online				
	OSMB	Boating Facilities	**Boating Access Sites**	A GIS dataset aggregate of boating facilities owned by cities, counties, state, federal, tribes, and other entities that provide public recreational boating access to Oregon's waterways.	Oregon	A point placed at the top center (start) of boat ramp, gangway, or the boating facility providing access.	Daily	ArcGIS Online	GIS Data	Level 1	No	No	As-is	High	Medium	High										Metadata and data dictionary is needed.	
	OSMB	Boating Facilities	**Boating Facility Grants**	Facilities, Clean Vessel Act and Boating Infrastructure Program Records	Oregon		Biennium			Level 3	PII	Unlikely but may contain cultural/archaeological surveys or reports	Redaction required	Medium	Low	Low											
	OSMB	Boating Facilities	**Boating Facility Grants**	Facilities, Clean Vessel Act and Boating Infrastructure Program Records	Oregon		Biennium			Level 3	PII	Unlikely but may contain cultural/archaeological surveys or reports	Redaction required	Medium	Low	Low											
	OSMB	Boating Facilities	**Boating Facility Guides, Procedure Guides, Six Year Plan etc.**	Marine Facility Publications	Oregon		Annually	electronic	PDF, Reports	Level 1	No	No	As-is	High	High	High											
	OSMB	Boating Facilities	**Boating Facility, potential boating access, boating use or activity photos**	Site conditions, construction, amenities, use and activities for both grant and non-grant locations	Oregon		Monthly			Level 1	No	No	As-is	Medium	Low	Low											

	OSMB	Boating Facilities	**Clean Vessel Act Facilities**	A GIS dataset consisting of information about boat holding tank pumpout and potty dump stations in Oregon, as well as floating restroom locations. These are public facilities paid for with Clean Vessel Act funds.	Oregon	Point data located at the center of the feature.	Daily	ArcGIS Online	GIS Data	Level 1	No	No	As-is	High	Medium	High										Metadata and data dictionary is needed.	
	OSMB	Boating Facilities	**County Files**	boating access site information, waterway information, planning or potential development. Items are not associated with a grant	Oregon					Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Facilities	**Facilities Program Reference Library**	Site or waterway plans, technical reference manuals, maps, charts, aerial photos	Oregon			hardcopies	Site or waterway plans, technical reference manuals, maps, charts, aerial photos	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Facilities	**Federal Boating Infrastructure Grants**	Facilities, Clean Vessel Act and Boating Infrastructure Program Records	Oregon					Level 3	PII	Unlikely but may contain cultural/archaeological surveys or reports	Redaction required	Medium	Medium	Low											
	OSMB	Boating Facilities	**Federal Boating Infrastructure Grants**	Facilities, Clean Vessel Act and Boating Infrastructure Program Records	Oregon					Level 3	PII	Unlikely but may contain cultural/archaeological surveys or reports	Redaction required	Medium	Medium	Low											
	OSMB	Boating Facilities	**Federal Clean Vessel Act Grants**	Facilities, Clean Vessel Act and Boating Infrastructure Program Records	Oregon					Level 3	PII	Unlikely but may contain cultural/archaeological surveys or reports	Redaction required	Medium	Medium	Low											
	OSMB	Boating Facilities	**Maintenance Assistance Program Grants**	Maintenance/Emergency Assistance Program Records	Oregon			hardcopies and some portions may be electronic	allocation, certification, financial reports, performance reports, complaints and compliance	Level 1	No	No	As-is	Medium	Medium	Low											
	OSMB	Boating Facilities	**New item - 2019**	Cultural Resource Reports	Oregon			hardcopy and electronic	site survey, report, photos, correspondence	Level 3	PII	Yes	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**Boat Procurement Records**	Law Enforcement Boat Records	Oregon			various	Photos, repair & maintenance files, inspection data	Level 1	No	No	As-is	Medium	Medium	Low											
	OSMB	Boating Safety	**Boated Waterways**	A GIS dataset representation of waters in Oregon where boating is known to occur.	Oregon	Polygon features, digitized shore to shore using the latest and greatest aerial imagery. Waterways are split into sections where impacts to navigation occur or to identify distinct reaches of a waterway.	Daily	ArcGIS Online	GIS Data	Level 1	No	No	As-is	High	Medium	High										Metadata and data dictionary is needed.	

	OSMB	Boating Safety	**Boating Accident Reports**	Boating Accident Reports	Oregon			various	Maps, reports, newspaper articles, photos	Level 3	PII/PHI	Yes	Redaction required	Medium	Medium	Medium											
	OSMB	Boating Safety	**Boating Safety Education Materials**	School and Water Safety Education Curriculum Materials	Oregon			hardcopy and electronic	Curriculums, sheets, guides, supporting material	Level 1	No	No	As-is	Medium	Medium	Low											
	OSMB	Boating Safety	**BUII Files**	Boating Under the Influence/Registration Revocation Files	Oregon			various	Reports	Level 3	PII/PHI	Yes	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**Charter Licenses**	Charter Boat License Files	Oregon			various	Applications, complaints, supporting documents	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**Fatality Reports**	Summary Report of Boating Fatalities	Oregon			electronic	Reports	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**LE Database**	Law Enforcement Activity Reporting	Oregon			electronic	Enforcement activity by county, such as cites, warns, inspections, hours per waterway, shore patrol, water patrol, vessel use, vessel maintenance, etc.	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**Mandatory Ed Files**	Mandatory Education Records	Oregon			various	Applications, issuance records	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**Outfitter Guide Licenses**	Outfitter/Guide Registration Files	Oregon			various	Applications, complaints, supporting documents	Level 1	No	No	As-is	Medium	Medium	Low											
	OSMB	Boating Safety	**Special Use Permits**	Special Use Device Permits	Oregon			electronic	Applications, issuance records	Level 1	No	No	Redaction required	Medium	Medium	Low											
	OSMB	Boating Safety	**US Coast Guard Annual Reports**	Electronic report files.	Oregon			electronic	Data available via USCG dashboard	Level 1	No	No	As-is	High	Medium	Low											
	OSMB	Boating Safety	**Waterway Marker Applications**	Waterway Markers Approved Applications and Placement Plan Records	Oregon					Level 3	PII	Yes	Redaction required	Medium	Medium	Low											
	OSMB	Policy and Environmental	**Abandoned and Derelict Vessels (ADV)**	A GIS dataset for abandoned and derelict vessels and vessels of concern on Oregon waterways. Contributed by multiple agencies.	Oregon	Point located at the center of the feature	Daily	ArcGIS Online	GIS Data	Level 3	PII	Yes	Redaction required	Medium	Medium	No Priority										Contains personal identifiable information and would require redaction. The location of the features if known to the public would raise concerns for public safety. The features in this dataset have the potential to move at any given time, the data is accurate only at the time of collection.	

	OSMB	Policy and Environmental	**Abandoned and Derelict Vessels (ADV) Reports**	information on abandoned and derelict boats seized by OSMB or OSMB partners	Oregon			electronic	Reports	Level 1	No	No	As-is	High	Medium	High											
	OSMB	Policy and Environmental	**Annual AIS Program Summaries**	Activity summary of work completed in the calendar year	Oregon			electronic	Reports	Level 1	No	No	As-is	High	High	Low											
	OSMB	Policy and Environmental	**Clean Marina Records**	Evaluations of participating marinas, current management practices	Oregon					Level 1	No	No	Redaction required	High	Medium	Low											
	OSMB	Policy and Environmental	**Clean Marinas**	A GIS dataset representing Marinas that meet the requirements to be a Certified Clean Marina. The Oregon Clean Marina program is a voluntary program, administered by the Oregon State Marine Board, working to protect and improve local water quality by promoting the usage of environmentally sensitive practices at marinas.	Oregon	Point data located at the center of the feature.	Annually	ArcGIS Online	GIS Data	Level 1	No	No	As-is	High	High	High										Metadata and data dictionary is needed.	
	OSMB	Policy and Environmental	**Foam Encapsulation Program**	Program certifications	Oregon					Level 3	PII	Yes	Redaction required	Medium	Medium	Low											
	OSMB	Policy and Environmental	**Triennial Survey**	Triennial Survey (1971-ongoing)	Oregon			hardcopy and electronic	final reports and raw data on surveys	Level 1	No	No	As-is	Medium	Medium	Medium											
	OSMB	Policy and Environmental	**Waterway Plans**	Waterway Plans Project Files (1974-ongoing)	Oregon			hardcopy and electronic	OSMB archive storage	Level 1	No	No	As-is	Medium	Medium	Low											
	OSMB	Registration	**Applications for Boat Titles and/or Registration**	Title and Registration Records	Oregon					Level 3	PII	Yes	Redaction required	Low	Low	Low											
	OSMB	Registration	**Floating Property Records (floating homes, houseboats, boat houses)**	Title and Registration Records	Oregon					Level 3	PII	Yes	Redaction required	Low	Low	Low											
	OSMB	Registration	**Marine Board Boat Registration Agent Files**	Applications for titles and/or registration	Oregon					Level 3	PII	Yes	Redaction required	Low	Low	Low											
	OWEB	OWEB	**Tide Gate Inventory**	Information about existing tidegates, their condition, etc. will encompass data from ODFWs barriers database	Oregon coast	lat/long	Compiled from 1997-2018	Yes	Oregon Water Explorer, Oregon Spatial Data Library	Level 1	No	None. Informational only, not suitable for legal, engineering, or surveying purposes.	As-is		Low		Published, Downloadable			https://spatialdata.oregonexplorer.info/geoportal/details;id=099a40124ece4a1a9653f7c93a0b1827		Infrastructure			Key Data	additional stakeholder support needed to fully populate this dataset	Recommendation from WCT
OWEB-20220331-00001	OWEB	Technical Services	**Oregon Watershed Restoration Inventory**	Data submitted by restoration practitioners to report completed restoration projects to inform the comprehensive data repository, the Oregon Watershed Restoration Inventory (OWRI). Some restoration projects implemented have a mandatory reporting requirement due to being funded by OWEB grants, or other state grant funding. Data may include	Oregon	Tabular data - 4th field HUC, county, stream name, TRS Spatial	Internal data and tabular data accessed via public online	Yes	Search OWEB's publication page https://www.oregon.gov/oweb/resources/Pages/Publications.aspx for OPSW Biennial Reports, County	Level 2	PII	Data contains PII as submitted by respondents including landowner names/location.	Redaction required	High	High	No Priority	Not Published			https://oregonexplorer.info/content/enhancing-watersheds-	.mdb or .xls (db exports)	OWRI data standard (see data dictionary)	Ecosystems & Wildlife	The Oregon Watershed Restoration Inventory database name is revised for	SQL internal database/Exports to MS Access or MS Excel templates.		High Priority (From SME Review 9/9/22). Already publicly available.

				project costs, dates, participants and funding, location, goals, species to benefit, project results, and treatments and metrics.		data - on-the-ground location	tools change hourly, while publicly accessible exports of tabular database and geodatabase, and mapped locations via online tools are refreshed annually.		Investments Fact Sheets, Voluntary Forest Restoration Efforts in the Oregon Coast Range, etc. Also, visit https://oregonexplorer.info/content/enhancing-watersheds-oregon?topic=56&ptopic=38#TheOWRIDatabaseandGISdata to download tabular database and the complimentary GIS geodatabase or to launch the Watershed Restoration Tool.											oregon?topic=56&ptopic=38#TheOWRIDatabaseandGISdata Note: Scroll to the bottom of page to download the data in different formats and the data dictionary. The GIS data are not intended to stand alone. A tabular database should also be downloaded.				each annual database export with a suffix (e.g. e.g. as OwriDbExport_011022.mdb, or .xls). See OWRI Data Dictionary for the outward facing data and definitions. OWRI origin tables have nomenclature within the OWEB production database with prefix 'ri_' . Some data tables are for internal use only.			
OWEB-20220331-00002	OWEB	Technical Services	**Application Review and Management - Grant Application Evaluations**	Evaluations document grant application review results and recommendations for funding. Evaluations include mostly narratives describing the grant application, strengths and concerns documented from the technical review team project evaluation, and recommendations related to funding the project.	Evaluations identify the region (e.g. Central Oregon, Willamette, Eastern Oregon, Southwest Oregon, North Coast, and Mid-Columbia) and county location of the project.	Evaluations identify the region (e.g. Central Oregon, Willamette, Eastern Oregon, Southwest Oregon, North Coast, and Mid-Columbia) and county location of the project.	There is not a consistent frequency for evaluations to be entered into OGMS, it is based on when grant review processes end and can range from monthly to several months between data entry.	Yes	The information is made available through a public log in on OGMS at: https://apps.wrd.state.or.us/apps/oweb/fiscal/default.aspx (ID: grantee; Passwd: OWEB).	Level 1	No	No	As-is	High	Medium	Low	Not Published			*add link	.csv		Funding		SQL. See column E for more info		Low Priority. OGMS Data (Rows 3-5), not relevant to portal
OWEB-20220331-00003	OWEB	Technical Services	**Application Review and Management - Project Completion Reporting**	The PCR is submitted by Grantees to demonstrate the project scope of work was completed as described in the grant agreement and grant application. The report is used for staff to determine compliance with the grant agreement. Key data fields include project summary, background on the project, description of the work completed, any project changes from the original scope of work, summary of outreach to raise public awareness, lessons learned, recommendation for similar projects in the future, documentation of all funding contributed to the project, and photos. The PCR data is mostly narratives. Electronic submission of PCRs became a requirement in 2018, PCRs prior to this year were mostly submitted by paper.	Geographic information is not collected in the PCR, it is collected in the Grant Application and OWRI.	Geographic information is not collected in the PCR. (Latitude/Longitude is collected in the Grant Applicatio	There is not a consistent frequency for receiving PCRs, it is based on when grant projects end and can range from daily	Yes	The information is made available through a public log in on OGMS at: https://apps.wrd.state.or.us/apps/oweb/fiscal/default.aspx (ID: grantee; Passwd: OWEB).	Level 2	PII	Yes	Redaction required	Low	Medium	Low	Not Published				.csv		Funding		SQL. See column E for more info		Low Priority. OGMS Data (Rows 3-5), not relevant to portal

						n and OWRI.)	to monthly.																				
OWEB-20220331-00004	OWEB	Technical Services	**OWEB Grant Management System - Fund Source Data**	Keeps track of funding types used to fund individual grants.	Oregon	N/A	Monthly when contact information changes	Yes	Desktop application, no access to external users.	Level 2	PII	Yes	Redaction required	High	Medium	Low	Not Published			https://www.oregon.gov/oweb/manage-grant/Pages/ogms-help.aspx	.csv		Funding		SQL. See column E for more info		Low Priority. OGMS Data (Rows 3-5), not relevant to portal
OWEB-20220331-00005	OWEB	Technical Services	**Pacific Coast Salmon Recovery Funds grant database**	OWEB project dataset submitted to satisfy federal reporting requirements for Pacific Coastal Salmon Recovery Fund grants. Data includes project summary, funding sources, and individual project metrics.	Oregon	Single point representing project area	Semi-annually	Yes	Public portal to view all appropriate OWEB restoration projects reported to the Pacific Coastal Salmon Recovery Fund database at https://www.webapps.nwfsc.noaa.gov/apex/f?p=309:15:0	Level 1	No	No	Not publishable	High	High	Low	Not Published										Low Priority. Restoration actions reported in OWRI (Above).
OWEB-20220331-00006	OWEB	Technical Services	**Application Review and Management -Grant Offerings and Cycles**	Created and curated by OWEB staff to organize grant offerings by program and application submission windows.	Oregon	N/A	Daily	Yes	Web application, only staff are allowed access.	Level 1	No	Yes	As-is	High	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-00007	OWEB	Technical Services	**Application Review and Management-Application Type Content**	Created and curated by OWEB staff to manage grant application type content.	Oregon	N/A	Daily	Yes	These are behind staff and reviewer credentials	Level 1	No	Yes	As-is	High	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-00008	OWEB	Technical Services	**OWEB Online Grant Application**	Utilized by external users to apply for grant funds.	Oregon	Single point representing project area	Daily	Yes	These are available only to individual grantees and staff/reviewers through the ARM	Level 2	PII	Yes	Redaction required	High	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-00009	OWEB	Fiscal Program	**OWEB Grant Management System - Ficial Data**	Manages money and grant data Payments, Disbursements Fund Sources etc. could be further broken out into parts if the need arises.	Oregon	N/A	Daily	Yes	Public login exposes grant fiscal data and reporting for all grants	Level 2	PII	Yes	Redaction required	High	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-00010	OWEB	Technical Services	**OWEB Grant Management System - Grant Data**	Manages grant data Amendments, Final Reports, Metrics etc could be broken out into parts if the need arises.	Oregon	N/A	Daily	Yes	Public login exposes grant fiscal data and reporting for all grants	Level 2	PII	Yes	Redaction required	High	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-00011	OWEB	Fiscal Program	**Grant Numbering Guide**	A guide that helps define the funding application number titles of subsequent grants.	Oregon	N/A	Monthly	No	N/A	Level 1	No	No	As-is	Low	Medium	Low	Not Published										Low Priority. OWEB Grant Management System Data (Rows 7-12), not relevant to portal
OWEB-20220331-	OWEB	Technical Services	**FIP Geographies**	Boundary data for FIP Implementation	Oregon	polygons-6th Field HUC	Biennially	Yes	ArcGIS Online Map connection through OWEB Website	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			https://geo.maps.arcgis.com/apps/webappviewer/index.ht	ArcGIS WebApp	Oregon Geospatial Metadata Standard	Boundaries	I_FIPs_20220231	Shapefile created in .mxd (ArcMap) or .aprx (ArcPro).		High Priority.

00012																				ml?id=3ca5cfa313f74f73b85af3a95cefbcb6							
OWEB-20220331-00013	OWEB	Technical Services	**Oregon Watershed Councils Boundaries**	Boundary data for all Oregon Watershed Councils	Oregon	polygons-6th Field HUC	Only when boundaries change, not consistent	Yes	ArcGIS Online Map connection through OWEB Website	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=52ed4a7dc1274b8195dd345a2da1822d	ArcGIS WebApp	Oregon Geospatial Metadata Standard	Boundaries	Watershed_Councils_Boundaries_2017_No_Overlap	Shapefile created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority.
OWEB-20220331-00014	OWEB	Technical Services	**Oregon Watershed Councils Centroids with Contact Information**	Centroids and contact information for all Oregon Watershed Councils Boundaries	Oregon	points/contact attributes-6th Field HUC	Monthly when contact information changes	Yes	ArcGIS Online Map connection through OWEB Website	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=52ed4a7dc1274b8195dd345a2da1822d	ArcGIS WebApp	Oregon Geospatial Metadata Standard	Boundaries	WATERSHED_COUNCILS_2017_withContactInfo_Centroids	Shapefile created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority.
OWEB-20220331-00015	OWEB	Technical Services	**Reporting Basins**	Reporting Basin Boundaries	Oregon	polygons-6th Field HUC	No changes	Yes	Through OGMS during application process	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.ReportingBasins	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.ReportingBasins	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Low Priority.
OWEB-20220331-00016	OWEB	Technical Services	**Small Grant Areas**	Small grant area boundaries	Oregon	polygons-6th Field HUC	No changes	Yes	ArcGIS Online Map connection through OWEB Website	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.SmallGrant_Areas	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.SmallGrant_Areas	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Low Priority.
OWEB-20220331-00017	OWEB	Technical Services	**Oregon Soil & Water Conservation Districts**	Boundary data for all Oregon Soil & Water Conservation Districts	Oregon	polygons-6th Field HUC	Only when boundaries change, not consistent	Yes	ArcGIS Online Map connection through OWEB Website	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.SWCDs	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.SWCDs	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority.
OWEB-20220331-00018	OWEB	Technical Services	**OWEB Land Acquisitions**	Boundary data for all OWEB land acquisitions	Oregon	polygons-6th Field HUC	Semi-annually	No	Not publishable	Level 3	PII	Yes	Not publishable	High	Low	No Priority	Not Published			SDE.OWEB_Acquisitions_Land	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.OWEB_Acquisitions_Land	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority.
OWEB-20220331-00019	OWEB	Technical Services	**OWEB Water Acquisitions**	Point data for all OWEB water acquisitions along streams/rivers	Oregon	points-6th Field HUC	Semi-annually	Yes	Included in Oregon Watershed Restoration Inventory	Level 1	No	No	As-is	Medium	Medium	No Priority	Not Published			SDE.OWEB_Acquisitions_Water	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.OWEB_Acquisitions_Water	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority. Many Water Acquisitions are required to enroll in WRD instream leases; more spatially explicit/accurate data is likely captured thru

																											WRD datasets.
OWEB-20220331-00020	OWEB	Technical Services	**OWEB Grants**	Point data for all OWEB awarded grants	Oregon	points-6th Field HUC	Monthly when contact information changes	Yes	ArcGIS Online Map connection through OGMS during application process	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.OWEB_grants	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.OWEB_grants	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Medium Priority.
OWEB-20220331-00021	OWEB	Technical Services	**OWEB Regions**	OWEB Regions Boundaries	Oregon	polygons-6th Field HUC	Only when boundaries change, not consistent	Yes	ArcGIS Online Map connection through OGMS during application process	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.OWEBRegions	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.OWEB Regions	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		Low Priority.
OWEB-20220331-00022	OWEB	Technical Services	**Oregon Watershed Restoration Inventory**	All geospatial data submitted to OWRI by OWEB grantees and voluntary submission by restoration practitioners	Oregon	points, lines, polygons-6th Field HUC	Monthly-Internal data, Annually-Public data on Oregon Explorer	Yes	Included in Oregon Watershed Restoration Inventory	Level 1	No	No	As-is	Medium	Medium	No Priority	Not Published			https://oregonexplorer.info/content/enhancing-watersheds-oregon?topic=56&ptopic=38#TheOWRIDatabaseandGISdata Note: Scroll to the bottom of page to download the data in different formats and the data dictionary. The GIS data are not intended to stand alone. A tabular database should also be downloaded.	.gdb	OWRI data standard (see data dictionary)	Boundaries	OWRI_Export_95_to_xx.gdb (changes each year)	Geodatabase created in .mxd (ArcMap) or .aprx (ArcPro).		High Priority (From SME Review 9/9/22). Already publicly available.
OWEB-20220331-00023	OWEB	Technical Services	**Super ESUs**	An aggregate of the individual ESUs (maintained by NOAA) into one non-overlapping dataset	Oregon	polygons-6th Field HUC	No changes	Yes	Through OGMS during application process	Level 1	No	No	As-is	Medium	High	No Priority	Not Published			SDE.Super_ESUs	.gdb	Oregon Geospatial Metadata Standard	Boundaries	SDE.Super_ESUs	Feature class created in .mxd (ArcMap) or .aprx (ArcPro).		High Priority.
OWEB-20220331-00024	OWEB	Technical Services	**OWEB Investment Tracking**	Tabular and point data for all OWEB investments from 1995-present	Oregon	points-6th Field HUC	Annually	Yes	Published through OWEB Investment Tracking Tool	Level 1	No	No	As-is	Medium	Medium	No Priority	Not Published			https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=oitt	.gdb	Oregon Geospatial Metadata Standard	Boundaries	OITT_Export_01_15_2021.gdb	Geodatabase created in .mxd (ArcMap) or .aprx (ArcPro).		Low Priority.

OWEB-20220331-00024	OWEB	Technical Services	**StreamTeam Monitoring Map**	Points, Lines and Polygons of monitoring sites around Oregon by OWEB, OWRD, ODFW, ODA and DEQ	Oregon	6th Field HUC	Annually	Yes	ArcGIS Online Map as part of the StreamTeam Group for Oregon Agencies	Level 2	No	Yes	Redaction required	Medium	High	No Priority	Not Published			Invitation only AGOL Workgroup	.gdb	Oregon Geospatial Metadata Standard	Locations	StreamTeam2022MonitoringMapData.gdb (changes each year)	Geodatabase created in .mxd (ArcMap) or .aprx (ArcPro).		
Data Need	*OWRD*	*OWRD*	***Dam Safety - see Dam Inventory dataset***	*Dam Conditions*											*Low*							*Infrastructure*			*Key Data*	*See Dam Inventory dataset; includes hazards and inspections*	*Recommendation from WCT*
Data Need	*OWRD*	*OWRD*	***Irrigation Infrastructure - see irrigation districts dataset***	*Irrigation district infrastructure location and condition*											*Low*							*Infrastructure*			*Significant Need, Key Data*	*Additional stakeholder support needed to fully populate this dataset*	*Recommendation from WCT*
Data Need	OWRD	OWRD	**Basin Level Groundwater Reports**	Studies to better understand groundwater resources - geologic framework, water budget, surface water/groundwater interaction											Low							Groundwater & Wells			Significant Need, Key Data	3 of 18 basins completed, needs to be expanded elsewhere in the state	Recommendation from WCT
Data Need	OWRD	OWRD	**Potential Storage Sites Inventory**	Location of potential storage sites. Includes locations that have not been vetted, or have been determined not to be feasible. Probably has more emphasis on on-channel loctions given data sources											Low							Water Quantity; Water Planning					Recommendation from WCT
OWRD upload 20221016	OWRD	Field Services Division	**Wells reported as dry**	This is currently a Microsoft Form that is being entered into the Field Activities Database on the Groundwater Issue tab. Some information gets added into the FAD from other sources. This will have some overlap with the Groundwater Issues dataset.	Oregon	Points (wells)	Daily/yearly	No	None	Level 2	PII	Addresses, emails, phone numbers, names, and some information provided in comments may be used to directly identify an individual	Redaction required	High	Low	High	Not Published										
OWRD upload 20221017	OWRD	Technical Services Division/Dam Safety Program and Field Services Division	**Dam inventory**	Dam locations, inspections, hazard levels, and other information for dams regulated by the State of Oregon, data comes from dbo.ds tables (dbo.ds_dam_inventory?). What we don't know is dam removal dates, as dams are removed from public view when it is no longer regulated by the State. Dam design reviews/approvals and emergency action plan (completion dates, exercise dates) data is stored in spreadsheets.	Oregon	Points (dams) and section-scale	Daily to quarterly	Yes	Search Portal (https://apps.wrd.state.or.us/apps/misc/dam_inventory/)	Level 2	PHI	Dam designs, security evaluations, critical infrastructure info, and local resident phone numbers are private	Redaction required	High	Medium	High	Not Published										
OWRD upload 20221018	OWRD	Technical Services Division/Field Services Division	**Surface water issues**	Regulation, distribution, illegal use, interference complaints, surface water and well-to-surface water interference complaints and proactive investigations. Since 2018 this data has been in the Field Activities Database, but older data is likely a combination of Filemaker/Access databases and hard copy diaries. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon	N/A	Daily	No	None	Level 3	PII	Data contains PII around complaits and confidential investigation and outcome information. Not currently listed in our internal guidance on exemptions. Classification based on sample regulatory data inventory from EIS.	Redaction required	High	Low	High	Not Published										
OWRD upload 202	OWRD	Technical Services Division/Field Services Division	**Groundwater issues**	Regulation, distribution, illegal use, well-to-well interference complaints and proactive investigations. Since 2018 this data has been in the Field Activities Database, but older data is likely a combination of an old Filemaker database and hard copy diaries. Note	Oregon	N/A	Daily	No	None	Level 3	PII	Data contains PII around complaits and confidential investigation and	Redaction required	High	Low	High	Not Published										

21019				that dry well reports are included in this tab within the Field Activities Database but are a distinct dataset. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)								outcome information. Not currently listed in our internal guidance on exemptions. Classification based on sample regulatory data inventory from EIS.															
OWRD upload 20221020	OWRD	Technical Services Division/Field Services Division	**Instream water right issues**	Watermaster initiated investigations (instream flows, miscellaneous measurements or gaging station operations, checking the value of instream water right, potential regulation if instream requirements not met). Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon	N/A	Daily	No	None	Level 3	PII	Data contains PII around complaits and confidential investigation and outcome information. Not currently listed in our internal guidance on exemptions. Classification based on sample regulatory data inventory.	Redaction required	High	Low	High	Not Published										
OWRD upload 20221021	OWRD	Technical Services Division/Field Services Division	**Senior calls**	Calls from senior water right holders requesting juniors be regulated off and resultant action by FSD. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon	N/A	Daily	No	None	Level 3	PII	Data contains PII around complaits and confidential investigation and outcome information. Not currently listed in our internal guidance on exemptions. Classification based on sample regulatory data inventory from EIS.	Redaction required	High	Low	High	Not Published										
OWRD upload 20221022	OWRD	Technical Services Division/Groundwater Hydrology Section	**Critical Groundwater Area allocations**	Summary tables of water level change and water use in the Butter Creek and Stage Gulch Critical Areas by water year, broken up into subareas and reporting sustainable annual yield, pumped water, and allocated water from the previous year, exported from Filemaker database (gw_cgwa_new)	Butter Creek and Stage Gulch Critical Groundwater Areas, northeast Oregon	Points (wells) and subareas	Annual (June 1st)	Yes	Webpage link to PDF (https://www.oregon.gov/owrd/programs/GWWL/GW/Pages/AdminAreasAndCriticalGWAreas.aspx), hard copies mailed to water right holders	Level 1	No	None	As-is	High	Low	High	Not Published										
OWRD upload 20221023	OWRD	Technical Services Division/Groundwater Hydrology Section	**Critical Groundwater Area reports**	Summary tables of proposed allocations in the Butter Creek and Stage Gulch Critical Areas for the next water year, reported by owner, water right, and well and broken up into subareas, exported from Filemaker database (gw_cgwa_new)	Butter Creek and Stage Gulch Critical Groundwater Areas, northeast Oregon	Points (wells) and subareas	Annual (June 1st)	Yes	https://www.oregon.gov/owrd/programs/GWWL/GW/Pages/AdminAreasAndCriticalGWAreas.aspx	Level 1	No	None	As-is	High	Low	High	Not Published										
OWRD upload 20221024	OWRD	Technical Services Division/Groundwater Hydrology Section	**OWRD Groundwater Administrative Areas**	Table describing groundwater restricted areas and summarizes the Oregon Administrative Rule establishing each area, boundaries are mapped but the map and table are currently separately published	Oregon	Sub-basin scale	Sporadic	Yes	Table (https://www.oregon.gov/owrd/programs/GWWL/GW/Documents/GWAdminAreasTable.pdf) and Map (https://www.oregon.gov/owrd/programs/GWWL/GW/Documents	Level 1	No	None	As-is	High	Medium	High	Not Published										

									/GWAdminAreasMap.pdf)																		
OWRD upload 20221025	OWRD	Water Right Services Division	**Document vault**	These are scanned documents saved in our structured SQL database (image), but they themselves are considered unstructured data. They are referenced frequently and the ability to link these documents to our database tables is essential for internal workflows. Could be published with URLs and metadata in the open data platform (image file metadata is considered a dataset under ORS 276A.350(1)(a)). The current search tool is lacking in usability and publishing on the open data portal may provide a way to prioritize the improvement of this dataset and could reduce public records requests.	N/A	N/A	Daily	Yes	Standalone search portal (https://apps.wrd.state.or.us/apps/misc/vault/) and integrated with WRIS query	Level 1	No	PHI/PI is usually omitted/redacted when being scanned/before upload.	As-is	High	Medium	High	Not Published										
OWRD upload 20221026	OWRD	Administrative Services Division/Information Services	**Surface and storage water right PODS (as NHD)**	This is just a look at the POD table but it adds in an NHD reach code and measure.	Oregon	Points	Nightly	Yes	https://arcgis.wrd.state.or.us/data/oregon_wr_pods_nhdevents.zip	Level 1	No	None	As-is	Medium	High	Low	Not Published										
OWRD upload 20221027	OWRD	Administrative Services Division/Policy Section	**Public records requests**	Spreadsheet of public records requests, organized by year, with the requester, requested information, resultant work done by OWRD to retrieve this information, and tracking info. Tracking spreadsheet dates back to 2015.	N/A	N/A	Daily	No	None	Level 1	PII	Some contact information present in the requests may need to be redacted.	As-is	Medium	Medium	Low	Not Published										
OWRD upload 20221028	OWRD	Director's Office	**Litigation and cost summary**	Tracking on litigation, including which court they are in (circuit, court of appeals, supreme court), and other case-associated stuff. We also try and track the approximate costs of each case based on monthly bills from DOJ.	N/A	N/A	As needed	No	None	Level 1	No	None	As-is	Medium	Medium	Low	Not Published										
OWRD upload 20221029	OWRD	Director's Office/Policy Section	**Vulnerable water systems list**	This dataset is currently in development and has been populated twice (2015 and 2021) and was used during drought to monitor systems that had some sort of conservation or curtailment or systems that have had challenges or have addressed challenges in some way. This is not a list of systems that are in trouble or in danger of having issues. Inclusion or exclusion from the list does not mean there there are or are not any issues.	N/A	N/A	Infrequently	No	None	Level 1	No	None	As-is	Medium	Low	Low	Not Published										
OWRD upload 20221030	OWRD	Technical Services Division/Groundwater Hydrology Section	**Groundwater review findings**	Findings from groundwater application and transfer reviews, including findings of over-appropriation, groundwater injury, capacity of the resource, and potential for substantial interference (PSI). This dataset has hidden complexity that leaves it open to misinterpretation, but it could be clarified sufficiently for public consumption with appropriate formatting, metadata, and documentation. This information is requested occasionally through the PRR process.	Oregon	N/A	Daily	No	None	Level 1	No	None	As-is	Medium	Low	Low	Not Published										
OWRD upload 20221031	OWRD	Technical Services Division/Groundwater Hydrology Section	**Groundwater Information System (GWIS) well sites and list of available data**	This database is used to tie together water rights information (WRIS) and well log information (GRID) so that there is one point location that can represent multiple well logs and multiple water rights. This is also used to link to external databases and publications, like the US Geological Survey database. Not all wells in GRID or WRIS have been given a GWIS site, as sites are created on an as-needed basis. Key data includes well use and location information, aquifer determinations, well construction information, lithologic descriptions, stratigraphic unit determinations, geochemical data, flowmeter/power meter readings, and measured water levels. This database includes tables whose names start with dbo.gw_, list out available data associated with each site, make sure to indicate which wells are dedicated	Oregon, some bordering states	Points (wells)	Daily	Yes	Search portal (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx) and interactive map (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_map/Default.aspx)	Level 1	No	We generally exclude stakeholder contact information.	As-is	High	High	Low	Not Published										

				observation wells. In some cases available data can mean data that exists but has not yet been entered into the database.													
OWRD upload 20221032	OWRD	Technical Services Division/Groundwater Hydrology Section	**Measured Water Levels in Wells**	Measured water levels. Includes measurements conducted by OWRD staff, measurements pulled from the USGS database and/or publications, and measurements by owners, consultants, and other monitoring groups. Includes permit condition required water levels which are used to determine if a water right holder has fulfilled their permit conditions.	Oregon, some bordering states	Points (wells)	Quarterly	Yes	https://apps.wrd.state.or.us/apps/gw/gw_info/gw_hydrograph/Hydrograph.aspx	Level 1	No	None	As-is	High	High	Low	Not Published
OWRD upload 20221033	OWRD	Technical Services Division/Groundwater Hydrology Section	**Flowmeter and power meter readings**	Readings from flowmeters and power meters connected to wells, mostly taken by OWRD staff and used to estimate annual water use.	Oregon, some bordering states	Points (wells)	Quarterly	Yes	ttps://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx	Level 1	No	Serial numbers and descriptions of equipment setup are generally not published	Redaction required	Medium	High	Low	Not Published
OWRD upload 20221034	OWRD	Technical Services Division/Groundwater Hydrology Section	**Lithology by well**	Lithologic descriptions entered into the database based on drillers' logs. This is being tracked both by Groundwater staff and Well Construction/Compliance in different formats. Lithology is not available for every well.	Oregon, some bordering states	Points (wells)	Daily	Yes	https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx	Level 1	No	None	As-is	Medium	High	Low	Not Published
OWRD upload 20221035	OWRD	Technical Services Division/Groundwater Hydrology Section	**Pump Tests**	Single and multi-well aquifer tests conducted by consultants, pump installers, well owners, and OWRD staff. Most of these tests are submitted to satisfy water right permit conditions and therefore these records include approval status. The pump test database consists of two main tables, tests and wells associated with each test. Each well on a test is associated with test information, calculated aquifer property data and technical review of the test, and several child tables with time-dependent measurements. The majority of single-well tests have been entered but most multi-well tests are still only available in paper files. Staff-evaluated aquifer transmissivity values are updated periodically and are subject to change.	Oregon	Points (wells)	Daily	Yes	https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx	Level 1	No	Some serial numbers may be present in newer pump tests and we generally don't publish this	As-is	Medium	Medium	Low	Not Published
OWRD upload 20221036	OWRD	Technical Services Division/Groundwater Hydrology Section	**OWRD groundwater sites correlated to partner agency sites**	From the Other IDs table in GWIS, make a table of our sites (by Logid) and various identifiers we've correlated to these sites in partner agency databases (i.e. USGS site number, State of California site number, Oregon DEQ IDs, Washington Ecology site numbers, etc.)	Oregon, some bordering states	Points (wells)	As-needed by project	No	None	Level 1	No	None	As-is	Medium	Medium	Low	Not Published
OWRD upload 20221037	OWRD	Water Right Services Division	**Irrigation districts**	Irrigation districts and their names and water rights associated with them. Tables are wr_irrigation_district and lkp_irrigation_district.	N/A	N/A	Daily	No	None	Level 1	No	Tables contain a public_viewable (yes/no) flag. Some internal discussion may be needed before determining what may be published.	As-is	Low	Medium	Low	Not Published
OWRD upload 20221038	OWRD	Water Right Services Division	**Current water rights**	All currently valid water rights and their most recent stage (application, permit, transfer, certificate, etc.). This is a view table that links to other tables showing individual stages of a water right and to points of diversion/appropriation and places of use. Could include location information and dates to facilitate generating statistics.	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	Low	Not Published
OWRD upload 202	OWRD	Planning, Collaboration, & Investments Section	**Grant program applications and agreements**	Grant applications, reviews of applications, learning lessons, whether or not an award was granted, amounts, grant agreement and progress reports received, progress toward meeting requirements of grant agreement, when the final report was submitted	N/A	N/A	?	No	None	Level 1	No	No	As-is	Medium	Medium	Low	Not Published

21039																											
OWRD upload 20221040	OWRD	Planning, Collaboration, & Investments Section	**Place Based Planning Projects**	List of place based planning projects and the external groups associated with each and five steps associated with each project, technical assistance requests and time spent responding to requests and their categorizations, links to each external group's website where progress reports are published	N/A	N/A	Six months	No	No external publication of tracking or updates, each group publishes their own progress reports on their own websites (not owned by OWRD).	Level 1	No	No	As-is	Medium	Medium	Low	Not Published										
OWRD upload 20221041	OWRD	Water Right Services Division	**Public notices**	Metadata tables for scanned public notices	N/A	N/A	Daily	Yes	https://apps.wrd.state.or.us/apps/wr/wr_public_notice_query/	Level 1	No		As-is	Medium	Medium	Low	Not Published										
OWRD upload 20221042	OWRD	Field Services Division	**Regulatory Status by watermaster district**	Updated by watermasters, districts 4 and 17 were the only ones that added to these tables for 2021 water year. Tables are dsb_item, dsb_area, dsb_lkp_status, and dsb_lkp_type. Each record has a free text field that acts as a blog for a particular area and water year.	Oregon	Lines (streams)	Daily to monthly	Yes	https://apps.wrd.state.or.us/apps/misc/dsb_area_status/Default.aspx?wm_district=17	Level 1	No	None	As-is	High	Low	Medium	Not Published										
OWRD upload 20221043	OWRD	Field Services Division and Technical Services Division/Well Construction and Compliance	**Well inspections**	Overlap with well location dataset and water level measurements, but unique information about inspection purpose/remarks, conditions and deficiencies observed, etc. Also includes well construction standard enforcement actions. Location information overlaps with well location dataset.	Oregon	Points (wells)	Daily	No	None	Level 3	PII	Well inspections generally occur after the startcard is filed but before the well report is filed. The startcard is considered confidential for one year after filing or until the well report is filed.	Redaction required	Medium	Low	Medium	Not Published										
OWRD upload 20221044	OWRD	Technical Services Division/Groundwater Hydrology Section	**OWRD-sponsored dedicated observation wells drilled (or planned?)**	What wells have been drilled for OWRD specifically as monitoring wells, who drilled and what was the winning bid, who all bid	Oregon	Points (wells)	As needed	No	None	Level 2	No	None	As-is	Medium	Low	Medium	Not Published										
OWRD upload 20221045	OWRD	Water Right Services Division	**Drought declaration status**	Current drought declaration status map and summary of current status table by county. There is a more detailed table of drought declarations with links to the document vault with scans of the declarations (e.g. executive orders). This info lives in the water right tables (wr_drought....). We also have a table of all county-declared, governor-declared, and federal-declared droughts along with relevant dates and executive orders going back to 1991.	Oregon	Polygons (counties)	Frequently during the dry season	Yes	Map (https://apps.wrd.state.or.us/apps/WR/drought_dashboard/Default.aspx) and more detailed table (https://apps.wrd.state.or.us/apps/wr/wr_drought/declaration_status_report.aspx)	Level 1	No	None	As-is	High	High	Medium	Not Published										
OWRD upload 20221046	OWRD	Water Right Services Division	**Water right applications**	Water right applications received, denied, and approved along with acreages by county that can be easily summarized. This would be a useful table as an open dataset for the whole state, with more info about the applications, including drought (yes/no) so users can summarize this info themselves based on their criteria of interest. Could include location information (which basin/county/district). This information is currently summarized for drought applications but could be expanded to include all applications. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs). Application types include AL (aquifer storage/recovery), E (enlargement), G	N/A	N/A	Daily	Yes	Drought water right summary report is published, but we could expand this and let users make their own summaries (https://apps.wrd.state.or.us/apps/wr/wr_drought/wr_summary_report.aspx)	Level 1	No	None	As-is	High	Medium	Medium	Not Published										

				(groundwater), HE (hydroelectric), IS (instream), LL (limited license), MF (minimum flow), P (pond), R (reservoir), RM (reclaimed municipal), RW (road watering), S (surface), and U (underground). Some application types are listed under their own datasets due to different workflows/processes associated with each. This includes current and non-current applications and applications that have been superseded by permits, certificates, etc.																									
OWRD upload 20221047	OWRD	Water Right Services Division/Transfer and Conservation Section	**Deschutes Mitigation**	New groundwater applications within the Deschutes study area can be approved provided that mitigation is used to offset the groundwater withdrawal. This information is tracked in an internal mitigation database and in Excel. This program relates to OARs 690-505, 521, and 522. This dataset is related to instream leases and instream transfers.	N/A	N/A	Annually	No	None	Level 1	No		As-is	Medium	Low	Medium	Not Published										
OWRD upload 20221048	OWRD	Water Rights Services Division/Protest Program	**Protests and contested cases**	Protests received for water right applications are tracked in WRIS workflow under 'Protested' or 'Protest Received.' Information is limited and includes received date and completed (final order) date. Additional tracking information is compiled internally for individual workflows and can be used to answer miscellaneous questions that come up from internal parties (Director's Office) or through the public records request process, but this information has little value on its own or outside of internal tracking. Final orders in contested cases are stored in the orders table and names and contact information of people who submitted public comments are related to the workflow table on a water right.	N/A	N/A	As needed	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	The information that is currently published has no restrictions, if we were to expand this dataset we would need to consider more restrictions	As-is	High	Low	Medium	Not Published										
OWRD upload 20221049	OWRD	Water Rights Services Division/Transfer and Conservation Section	**Water management and conservation planning**	This information is tracked in a Microsoft Access database and is associated with a mix of paper and electronic documents. Information that is being tracked includes water right information that ties the record back to WRIS, municipality information, and due dates for submitting water management conservation plans and progress reports. Water right permits for municipal or quasi-municipal uses that don't fully develop their permit by the expiration date may be included in this dataset if a water management and conservation plan is required as a permit condition. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	No	N/A	Level 2	No	Receipt number/comments. Conservation plans themselves have more concerns on the part of municipalities (sabotage, theft, etc.)	Redaction required	High	Low	Medium	Not Published										
OWRD upload 20221050	OWRD	Water Rights Services Division/Transfer and Conservation Section	**Allocations of conserved water**	These are the "CW" transfers. This program allows water users who conserve water to use a portion of that water on additional lands, lease or sell the water, or dedicate the water to instream use. These transfers are tracked in WRIS but additionally have a tracking spreadsheet that contains information on transfer number, stream(s) involved, received date, initial order date, instream quantity, instream certificate numbers, the applicant's portion of conserved water, the applicant's portion of conserved water applied on farm, and the applicant's portion of conserved water managed instream for future out-of-stream use (which can be applied to lands or left instream). The spreadsheet holds more of a compilation of statistics that could be obtained through WRIS but are more geared toward tracking this particular program. More information about this program can be found at https://www.oregon.gov/owrd/WRDPublications1/ACW_One_Pager_11_13.pdf.	Oregon	Water right places of use (polygons), points of diversion (points), and stream reaches (lines)	Daily	Yes	Web search	Level 1	No	No	As-is	Medium	Medium	Medium	Not Published										
OWRD upload 202	OWRD	Technical Services Division/Groundwater Section	**Aquifer Storage and Recovery (ASR) and Artificial**	ASR and AR projects are tracked in a Filemaker database and also exists as a subset of the application, permit, and certificate datasets. ASR applications are tracked with the application character "AL" and AR is licensed through the limited license program and have an application character "LL," but only "LL" water	N/A	N/A	As needed	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.stat	Level 2	No	None	As-is	Medium	Low	Medium	Not Published										

21051			**Groundwater Recharge (AR) Projects**	rights with the artificial recharge use type are included in this dataset. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs). Includes information relating to the project and methods, contact information, complaints related to the projects, conditions and compliance with meeting conditions, as well as progress reports for each project.					e.or.us/apps/gis/wr/Default.aspx)								
OWRD upload 20221054	OWRD	Water Right Services Division/Certificates Section	**Certified Water Right Examiners registration information**	Data providing name, license number, and contact information of Certified Water Rights Examiners (CWREs). The main table is dbo.wrd_license_cwre. Individual CWREs are responsible for adding themselves and keeping their information up-to-date so potential clients can find them through our website. Licenses are issued through OSBEELS. CWREs can indicate which county/counties they are available to work in.	Contact information spans multiple states within the United States, we also have a table explaining what county or counties a particular CWRE wants to be associated with within Oregon, which is used as a search parameter (dbo.wrd_license_cwre_county)	N/A	As needed	Yes	Search Portal (https://apps.wrd.state.or.us/apps/wr/cwre_license_view/)	Level 2	PII	Table contains a flag that indicates whether or not the record is visible. This table also includes license status and suspension information, email address, and additional phone numbers, which are not publicly viewable.	Redaction required	Medium	High	No Priority	Not Published
OWRD upload 20221057	OWRD	Administrative Services Division/Field Services Division	**Regional offices and watermasters directory**	Map of watermaster districts and regions with contact information.	Oregon	Polygons (regions)	Yearly/every two years	Yes	https://www.oregon.gov/owrd/aboutus/contactus/Pages/RegionalOfficesandWatermastersDirectory.aspx	Level 1	No	None	As-is	High	High	No Priority	Not Published
OWRD upload 20221058	OWRD	Administrative Services Division/Information Services	**Location information lookup**	This is a tool for users to type in a location and it returns spatial information, political features including OWRD/DEQ/ODFW regions, hydrologic features, and groundwater restricted areas and rules applicable in that location. This could probably be turned into an interactive map showing a number of different boundaries and likely has overlap with other mapping applications.	Oregon	Points, polygons (Public Land Survey) and addresses	Sporadic (rarely)	Yes	http://apps.wrd.state.or.us/apps/misc/lkp_trsqq_features/default.aspx	Level 1	No	None	As-is	Low	Medium	No Priority	Not Published
OWRD upload 20221059	OWRD	Administrative Services Division/Information Services	**Oregon 2018 Drought Impact Stories**	Story map on the 2018 drought, includes interviews with water users from around the state organized by different water uses.	Oregon	N/A	Not updated regularly	Yes	https://geo.maps.arcgis.com/apps/MapSeries/index.html?appid=b73cfd610aad4a0482971ea321653648	Level 1	No	None	As-is	Low	High	No Priority	Not Published
OWRD upload 20221064	OWRD	Administrative Services Division/Information Services/Data Techs	**Water right places of use (POUs)**	Water right uses, priority dates, type of use, and acreage (if applicable). Includes snp_id, which links the use to a water right, and includes the status of the use on the water right. Also included is location information (township/range/section-quarter-quarter). There can be multiple uses and acreages on a water right.	Oregon	Polygons (fields, TRSs and TRSQQs)	Daily	Yes	https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_summary_pou.aspx and https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_platcard.aspx	Level 1	No	None	As-is	High	High	No Priority	Not Published

OWRD upload 20221065	OWRD	Administrative Services Division/Information Services/Data Techs	**Water right points of diversion/appropriation (PODs/POAs)**	Points of diversion/appropriation for water rights, including both surface water and groundwater points. Includes priority dates, use (multiple uses possible per point of diversion), maximum rate allowed per point (caution should be exercised in summarizing max rates for a water right), snp_id (which links the point to a water right), location by township/range/section-quarter-quarter, legal (surveyed), and latitude/longitude location. Surface water points of diversion list the source stream and what it is tributary to. Also included are start and end dates allowed for use. and the status of the use on a water right.	Oregon	Points	Daily	Yes	https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_summary_pou.aspx and https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_platcard.aspx	Level 1	No	This dataset includes designations of maximum allowable rates/volumes per point, however, caution should be applied with regards to using these rates to calculate maximum rates by snapshot (which is not tracked anywhere) - max rate only should be reported, not individual rates?	As-is	High	Medium	No Priority	Not Published
OWRD upload 20221066	OWRD	Director's Office	**Attorney General guidance**	Advice from the attorney general. This is attorney client privileged information.	N/A	N/A	As needed	No	None	Level 4	No	Attorney-client privileged	Not publishable	Low	Medium	No Priority	Not Published
OWRD upload 20221067	OWRD	Director's Office	**Attorney General opinions**	Formal documents from the attorney general. These go through an extensive review process in case they get released to the public, depending on the topic.	N/A	N/A	As needed	No	None	Level 2	No	Some information may be restricted	Redaction required	Low	Medium	No Priority	Not Published
OWRD upload 20221068	OWRD	Director's Office	**Water Resources Commission Members**	List of commission members, terms of service, etc.	N/A	N/A	Yearly	Yes	Biographies (https://www.oregon.gov/owrd/aboutus/Commission/Pages/WRCBios.aspx)	Level 1	No	None	As-is	High	Medium	No Priority	Not Published
OWRD upload 20221069	OWRD	Technical Services and Field Services Divisions	**Well locations**	Well location information comes from a number of sources and the nuances between the different sources is understood internally but does not lend itself well to external users. There has been discussion surrounding showing the "best available location" of a well from any of a number of sources, including Groundwater Information System (GWIS) well sites, Groundwater use/exempt well mapping, well reports, well inspections, and water right POD locations. Locations mainly come from GPS locations from Field and Groundwater Section staff, from legal locations related to water rights, and from owner/driller reported well locations.	Oregon, some bordering states	Points (wells)	Daily	Yes	https://apps.wrd.state.or.us/apps/gw/well_report_map/Default.aspx	Level 1	No	None	As-is	High	Low	No Priority	Not Published
OWRD upload 20221070	OWRD	Technical Services Division	**Miscellaneous appendices related to published scientific reports**	Miscellaneous reports numbered as Open File Reports published by scientists within the Technical Services Division. Much of the raw data is not available in a machine-readable format but some of the newer reports may be made available if requested. We might also be able to make a table containing bibliographic metadata for reports published by OWRD if requested, but this is not regularly maintained as a dataset. We may have more data in the future.	Oregon, some bordering states	N/A	Sporadic - years, months	Yes	https://www.oregon.gov/owrd/publicationsandreports/Pages/default.aspx	Level 1	No	None	As-is	Low	Low	No Priority	Not Published
OWRD upload 202	OWRD	Technical Services Division/Groundwater	**Continuous recorder water level, barometric**	Set of wells that have continuous recorders installed, with data collected at various intervals (15 minutes to 2 hours in general). This is a very large dataset. We currently make daily averages available. We also have an inventory of what data is available for which wells	Oregon, some bordering states	Points (wells)	Quarterly/daily	Yes	https://apps.wrd.state.or.us/apps/gw/gw_info/gw_hydrograph/Hydrograph.aspx	Level 1	No	None	As-is	Medium	High	No Priority	Not Published

21071		Hydrology Section	**pressure, specific conductivity, and temperature in wells**	and the period of record, which may be more useful as an open dataset (include in GWIS available data dataset).																							
OWRD upload 20221072	OWRD	Technical Services Division/Groundwater Hydrology Section	**Stratigraphy by well**	OWRD hydrogeologist interpreted stratigraphy based on drillers' logs, drill cuttings, video logs, and geophysical surveys (which are mostly unstructured documents/files).	Oregon, some bordering states	Points (wells)	Daily	Yes	Search portal (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx) and interactive map (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_map/Default.aspx)	Level 1	No	None	As-is	Medium	High	No Priority	Not Published										
OWRD upload 20221073	OWRD	Technical Services Division/Groundwater Hydrology Section	**Rock geochemistry**	Results of geochemical analyses performed on rock samples that were mainly sourced from drill cuttings of wells. Analyses are contracted out. These are used to make stratigraphic unit determinations.	Oregon, some bordering states	Points (wells)	Daily	Yes	Search portal (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx) and interactive map (https://apps.wrd.state.or.us/apps/gw/gw_info/gw_map/Default.aspx)	Level 1	No	None	As-is	Medium	High	No Priority	Not Published										
OWRD upload 20221074	OWRD	Technical Services Division/Groundwater Section	**Groundwater Concerns Map**	Published 2021, plans to update over time	Oregon	Township/Range (polygons)	Yearly/every two years	Yes	https://apps.wrd.state.or.us/apps/gw/gw_info/gw_map/Default.aspx	Level 1	No	None	As-is	Medium	High	No Priority	Not Published										
OWRD upload 20221075	OWRD	Technical Services Division/Surface Water Hydrology Section	**Peak discharge estimates**	Peak discharges are measured at a limited number of locations (i.e., gaging stations) in Oregon. At unmeasured sites, peak discharges are estimated. In either case, the peaks are reported for recurrence intervals of 2, 5, 10, 20, 25, 50, 100, and 500 years. Data is available pre-computed or calculated on-the-fly per requests from the mapping tool. There are accompanying studies that explain the equations and methods.	Oregon	Points and lines (gages and streams)	Near real-time	Yes	https://apps.wrd.state.or.us/apps/sw/peak_discharge_map/	Level 1	No	None	As-is	High	Low	No Priority	Not Published										
OWRD upload 20221076	OWRD	Technical Services Division/Surface Water Hydrology Section	**Water Availability Reporting System (WARS)**	Water availability basins in map and table form showing the amount of water that can be appropriated from a given point on a given stream for new instream and out-of-stream consumptive uses. Includes natural streamflow, in-stream water rights, and out-of-stream consumptive uses for calculations.	Oregon	Polygons (subbasins)	Weekly	Yes	https://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/MainMenu1.aspx	Level 1	No	None	As-is	High	High	No Priority	Not Published										
OWRD upload 20221077	OWRD	Technical Services Division/Surface Water Hydrology Section	**Historical streamflow and lake level data**	Compilation of flow, stage, and volume time-series data from gaged sites with some period of continuous record.	Primarily Oregon but also includes some out-of-state gages	Points (gages)	Daily	Yes	https://apps.wrd.state.or.us/apps/sw/hydro_report/	Level 1	No	None	As-is	High	High	No Priority	Not Published										
OWRD upload 20221078	OWRD	Technical Services Division/Surface Water Hydrology Section	**Miscellaneous surface water measurements**	Discreet observations of flow and/or stage at ungaged sites, with locations and dates/times	Oregon	Points	Variable	Yes	Query (https://apps.wrd.state.or.us/apps/sw/misc_measurements_view_only/) and map (https://apps.wrd.state.or.us/apps/sw/sw_misc_measurement_map/)	Level 1	No	None	As-is	Medium	High	No Priority	Not Published										
OWRD upload	OWRD	Technical Services Division/Surface Water	**Near real time hydrographics data**	Near real-time water stage, flow, and volume data for various surface-water gages throughout the state, with locations and dates/times.	Primarily Oregon but includes	Points (gages)	Primarily 15 minute	Yes	https://apps.wrd.state.or.us/apps/sw/hydro_near_real_time/	Level 1	No	None	As-is	High	High	No Priority	Not Published										

20221079		Hydrology Section			some out-of-state gages																						
OWRD upload 20221080	OWRD	Technical Services Division/Surface Water Hydrology Section	**Reported water use**	Water use reported by water right permit holders as a permit condition. Water use is reported monthly by well and well locations are a separate dataset. Note that water use for municipalities does not include use by individual customers.	N/A	N/A	Daily	Yes	https://apps.wrd.state.or.us/apps/wr/wateruse_query/	Level 1	No	None	As-is	High	High	No Priority	Not Published										
OWRD upload 20221081	OWRD	Technical Services Division/Well Construction & Compliance	**Driller education data**	Information related to licensed well drillers and continuing education courses that they have taken. Can be searched by course, by license number, or by name. This is distinct from actual license information.	N/A	N/A	As needed	Yes	https://apps.wrd.state.or.us/apps/gw/driller_education_view_only/	Level 1	No	None	As-is	Medium	High	No Priority	Not Published										
OWRD upload 20221082	OWRD	Technical Services Division/Well Construction & Compliance	**Licensed well constructors**	List of licensed well constructors, including names, companies, addresses, phone numbers, and license types and numbers.	Oregon, some bordering states	Addresses	As needed	Yes	https://apps.wrd.state.or.us/apps/gw/well_license/default.aspx	Level 3	PII	License table contains PII (SSN's, DOB's, login information).	Redaction required	Medium	High	No Priority	Not Published										
OWRD upload 20221083	OWRD	Technical Services Division/Well Construction & Compliance	**Groundwater use/exempt well mapping**	Landowners (and drillers?) are able to use an interactive map to find their well and determine its latitude and longitude and submit that information to the department within 30 days after their well is completed.	Oregon	Points (wells)	Daily	Yes	Mapping tool (https://apps.wrd.state.or.us/apps/gw/exempt_use_map/) collects data but does not publish it. Location information is integrated in with the well report query (https://apps.wrd.state.or.us/apps/gw/wl_well_report_map/Default.aspx)	Level 1	No	None	As-is	High	High	No priority	Not Published										
OWRD upload 20221084	OWRD	Technical Services Division/Well Construction & Compliance	**Start cards**	Start cards are filed prior to the start of work on a well and preceed the filing of a well construction report. This dataset refers to the metadata surrounding a start card, not the actual document itself. Also includes ficial transaction information.	Oregon	Addresses	Daily	No	None	Level 3	PII	Start cards are confidential for one year or until the associated well log is received and the retention period is 60 years. Contact information and transaction information may be restricted	Redaction required	Medium	High	No Priority	Not Published										
OWRD upload 20221085	OWRD	Technical Services Division/Well Construction and Compliance	**Landowner well construction permits**	A landowner in Oregon may construct their own well in the state of Oregon provided that they adhere to specific rules. Landowner well permits are tracked in the enforcement tables and contain information about the landowner, well, and bond number.	N/A	N/A	As needed	No	None	Level 2	No	Startcard info may be confidential up to one year after filing	Redaction required	Low	Medium	No Priority	Not Published										
OWRD upload 20221086	OWRD	Technical Services Division/Well Construction and Compliance and Groundwater Hydrology Section	**Well reports and construction history**	Any work that has been done on a well, tied to the "original" well log. This is being tracked both by Groundwater staff and Well Construction/Compliance. Could create a view of just the original logs and another view of current construction. We will occasionally be asked for information on all of the "wells" in a given area in Oregon and their uses, although "use" is tracked in three different places and is often incomplete or discrepant information. Location information may overlap with "Well Locations" dataset. Also indicates if well construction special standards apply (special standard requests are	Oregon	Points (wells)	Daily	Yes	Well reports here (https://apps.wrd.state.or.us/apps/gw/well_log/Default.aspx) and map here (https://apps.wrd.state.or.us/apps/gw/wl_well_report_map/Default.aspx)	Level 1	No	None. Start cards themselves have confidentiality requirements, but not the numbers on the logs. Start cards are no longer confidential once the well report is submitted	As-is	High	High	No Priority	Not Published										

				tracked in a separate internal database that is used to generate/edit well reports). Also includes start card numbers and well tag numbers.													
OWRD upload 20221087	OWRD	Water Right Services Division	**Water right permits**	Current and cancelled permits (could make a view for each), original and extended completion dates, number of extensions applied for and received, associated application, cancellation date, subsequent transfer/certificate, permit conditions and progress toward meeting those conditions, include originating/superseding transfer (if applicable). Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published
OWRD upload 20221088	OWRD	Water Right Services Division	**Water right certificates**	Certificate number, associated water right, signature date, and type (original, confirming, remaining, or correcting). Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published
OWRD upload 20221089	OWRD	Water Right Services Division	**Water right limited licenses**	Limited license (application character 'LL') applications and permits. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published
OWRD upload 20221090	OWRD	Water Right Services Division	**Water right transfers**	Transfers, including type of transfer, originating and resultant permits are tough because there can be many (add a pivot table?), results of technical review, transfer status (approved, denied, withdrawn, etc.). Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published
OWRD upload 20221091	OWRD	Water Right Services Division	**Orders**	Some of these are tied to specific water rights but others are special orders tied to rulemaking. The orders themselves are published in "the vault," but the associated metadata and search fields (by keywords in the description) have room for improvement.	N/A	N/A	As needed	Yes	https://apps.wrd.state.or.us/apps/misc/vault/	Level 1	No	None	As-is	High	Low	No Priority	Not Published
OWRD upload 20221092	OWRD	Water Right Services Division/Adjudications	**Adjudicated areas within Oregon (surface water)**	Map of areas adjudicated for surface water, including areas in progress and those currently unadjudicated.	Oregon, some bordering states	Polygons (basins and sub-basins)	Last update 2003	Yes	Map of adjudicated areas here (https://www.oregon.gov/owrd/programs/WaterRights/Adjudications/Documents/Adjudicated_Areas.pdf)	Level 1	No	None	As-is	Medium	Medium	No Priority	Not Published
OWRD upload 20221093	OWRD	Water Right Services Division/Adjudications	**Surface water registrations/claims**	Surface water right claims. Includes SW (surface water registrations), PC (power claims), and KA/KL (Klamath adjudications). Some of these have gone through transfers - we might list the most current snapshot. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon, some bordering states	N/A	As needed (infrequently)	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	Medium	No Priority	Not Published
OWRD upload 20221094	OWRD	Water Right Services Division/Adjudications	**Surface water decrees**	Decrees for various surface water features (streams, lakes, springs, etc.). Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon, some bordering states	N/A	As needed (infrequently)	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	Medium	No Priority	Not Published
OWRD upload 20221095	OWRD	Water Right Services Division/Adjudications	**Groundwater registrations/claims**	Groundwater right claims. Includes GR (groundwater registrations), which represent pre-1955 rights. Some of these have gone through transfers - we might list the most current snapshot. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	Oregon	N/A	As needed (infrequently)	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	Medium	No Priority	Not Published

OWRD upload 20221096	OWRD	Water Right Services Division/Hydroelectric Program	**Hydroelectric projects**	Includes hydroelectric projects, water rights, contact information, expiration dates, location information, and technical information(Killowatt, THP, CFS, and head). Will want to include decommissioning information, annual fees, and application information.	Oregon	PLS Section	Daily/monthly	Yes	https://apps.wrd.state.or.us/apps/sw/hydro_electric_query/	Level 1	No	None	As-is	Low	High	No Priority	Not Published										
OWRD upload 20221097	OWRD	Water Right Services Division/Transfer and Conservation Section	**Klamath Tribal instream claims**	These are like instream leases, but related to Senate Bill 206, which allows â€œdetermined claims,â€ being water rights determined and established in the Klamath Basin Adjudication Corrected Partial Order of Determination, to be temporarily leased instream for up to five years. An instream lease application shall not be approved if the determined claim has been stayed by a court judgement or if its approval would cause enlargement or injury to another claim or water right. The ability to submit an instream lease application that includes a determined claim expires January 2, 2026, the expiration date for Senate Bill 206. These are tracked in WRIS and in Excel.	N/A	N/A	Daily	Yes	https://apps.wrd.state.or.us/apps/wr/klamath_sif_dashboard/Charts.aspx	Level 1	No		As-is	High	Medium	No Priority	Not Published										
OWRD upload 20221098	OWRD	Water Rights Services Division/Transfer and Conservation Section	**In-stream leases**	Water right holders can lease all or part of their water right to instream use for 1 to 5 years with options to renew for additional periods. This can also be a split-season instream lease. These are tracked in WRIS and Excel and are related to existing water rights.	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No		As-is	Medium	Medium	No Priority	Not Published										
OWRD upload 20221099	OWRD	Water Rights Services Division/Transfer and Conservation Section	**Instream water rights**	New water right applications filed by state agencies (ODFW/ODEQ) submitted to save particular streams. Minimum perennial streamflows established via the administrative process and generally included as part of a Basin Program or by Commission order. ORS 537.346 gave the Department the authorization to convert the minimum flows existing prior to June 25, 1988, to instream water rights. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published										
OWRD upload 20221100	OWRD	Water Rights Services Division/Transfer and Conservation Section	**Reuse program**	Reuse registrations (to include CAFO, Industrial, and Reclaimed water reuse). Permits are issued by DEQ and applicants register the reuse with us or apply for a water right permit to reuse the water. Information related to this program is mostly on paper but tracked in WRIS using the application character 'RM'	N/A	N/A	Daily	No	N/A	Level 1	No	None	As-is	Medium	Medium	No Priority	Not Published										
OWRD upload 20221101	OWRD	Water Rights Services Division/Transfer and Conservation Section	**In-stream transfers**	Water right holders can transfer all or part of their water right to instream use permanently or on a time-limited basis. A permanent transfer will result in a certificate and a time-limited transfer creates an instream right that could be protected instream for a defined or indefinite period of time. These are tracked in WRIS and Excel and are related to existing water rights. Location information related to water rights captured in separate datasets (water right PODs/POAs and POUs)	N/A	N/A	Daily	Yes	Query (https://apps.wrd.state.or.us/apps/wr/wrinfo/) and map (https://apps.wrd.state.or.us/apps/gis/wr/Default.aspx)	Level 1	No	None	As-is	High	High	No Priority	Not Published										
OWRD upload 20221102	OWRD	Technical Services Division/Well Construction & Compliance	**Water and Monitoring Well Constructor examination schedule**	Schedule of Water and Monitoring Well Constructor examination dates and locations posted on the web.	Salem	Address	Quarterly	Yes	https://www.oregon.gov/OWRD/programs/GWWL/WCC/resourcesforwellconstructors/Pages/Licensing-Examp-Information.aspx	Level 1	No	None	As-is	Medium	Medium	No Priority	Not Published										
Data Need		??	**Future population and land use projections**												Low							Land; Water Planning			Not key data at this point, but can inform subsequent needs assessments and		

																									prioritizations		

Appendix I: Long-Term Agency-Level OWDP Projects

June 2023 Draft Version

Building a single point of access water data portal requires easily accessible data from reliable, trusted data sources. The analysis necessary to build the OWDP will generally reveal weaknesses in our respective agency-level business processes and technology infrastructure. It is likely that each agency that is responsible for water data will have a number of long-term projects to undertake to make their data ready for publishing or to create the appropriate data sets. The OWDP project itself will have multiple long-term issues which will need follow up. There are likely to be issues and data sets which will be joint efforts between Oregon state agencies and the OWDP project.

The projects listed below are initial and informal draft write ups, not yet evaluated or validated by the respective agency's IT staff or executive management. The OWDP project staff will collect project lists such as these for all of the state's water data agencies, and for data sets needed for which no state agency currently has responsibility or authority. In some cases, as determined jointly by the respective agency and the OWDP project, the project may assist in further develop of the agency project. Additional agencies are expected to participate in the future.

A second source of likely agency data projects is the list of Data Needs, derived from the Oregon Water Core Team's 2018 efforts. The perspective of that list is different from the draft write-ups below and is very dated relative to the speed of technology change in Oregon. This list will need to be analyzed and turned into agency-level water data project write-ups, similar to what the attached drafts will become. Some projects have no identified agency and may become work of the project itself.

Water decision-making data is necessary to the future of the state of Oregon. However, the agency (not this project) is the working level of State government. In all cases, this project will honor the responsible agency's authority and wishes while seeking to provide analysis and resources, such that all portions of state government become better able to fulfill their various responsibilities and generate data for the portal as an automatic byproduct of daily work.

For various reasons, not all agencies will have the resources necessary to pursue long-term projects that will support their own business processes, and better state-wide water data and information. Agencies are the working level of state government. The OWDP project is dependent on data and information, and most of all on subject matter expertise from the state water data agencies. The OWDP project may need to meet with agencies with resource challenges and negotiate resources and assistance to be able to support the work needed for these agencies' water data projects.

This appendix is included as material to estimate impact of statewide agency water data projects.

Draft Project List

Oregon Department of Environmental Quality

The Oregon Water Data Portal (OWDP) is a long term project that aims to produce an internet accessible, single point of access for all of Oregon's water decision-making data and information. Geospatial data, tabular data, documents and reports, and data parcels such as FLIR or satellite data will be available that would support important decisions about management, planning and investing in water resources including natural and human-made water infrastructure throughout the state. Data and information will come from and be accessible to federal agencies, tribes, state agencies, special service districts, local governments, the regulated community, nonprofits, and the public. Participating state agencies will need to identify and change processes to make this project attainable. Below are summaries of some of the major workflow improvements that are proposed for DEQ.

1. *Develop methodology, data flows and a location (GIS) data layer for identifying and understanding groundwater impacts related to DEQ's regulatory programs*. Develop an inter-agency data collection and integration strategy designed to manage data necessary to handle known groundwater uses and issues in Oregon. Concentrate on the areas associated with known issues and GWMAs. Data is now known to probably include, at a minimum:

    a. Onsite program permits (septic talk locations)
    b. Cleanup
    c. Haz/Emergency response
    d. UIC well sites
    e. UST program data
    f. WPCF land application sites
    g. DEQ-associated monitoring wells
    h. Groundwater management areas data
    i. Other needed hydrography data as determined
    j. State and local data from other agencies

    The primary audience for this data layer is state and local water agencies, to support locating or understanding impacts to groundwater. Other state agencies such as WRD, ODA and OHA have data that could be used to support the development of this layer. This project should be pursued with all relevant agencies informed or actively involved. OWDP will develop a set of data standards for maintenance and operations that will apply, and expectations for how these data will be managed to allow for inclusion in the portal automatically.

2. *Develop a geographical data infrastructure of DEQ's Onsite Wastewater Management Program.* The DEQ's septic system program manages the construction, alteration, repair, operation, and maintenance of onsite wastewater treatment systems. DEQ is currently making progress in upgrading and streamlining the way information is accepted, processed and shared with DEQ through, "Your DEQ Online", a public facing web-based system; however, the intent of this

system does not get the information formatted to a geographical database. Specifically, DEQ currently receives paper documents and scanned pdfs of data that does not create a framework for ease of data accessibility. The location of septic tanks are not in a geographical warehouse available to DEQ or the public. Improvements needed to the program would include a new state data framework, including geographical location of all new and current septic tanks extracted from submitted forms or reports and committed to a database.

3. *Establish the capability to identify, by query, Publicly Owned Treatment Works (POTWs) that need infrastructure improvements to meet the Clean Water Act requirements*. Within DEQ's National Pollutant Discharge Elimination System (NPDES) Program for the POTWs, there is a need for DEQ to determine what small communities are continuously failing to meet technology-based effluent limitations on a long-term compliance level. The number of small POTW's operating with outdated permits and functioning on old technology due to lack of funding is a problem within Oregon. Long compliance schedules and discharge violations have been accepted as normal by DEQ due to lack of funding within those small communities. DEQ needs to be able to identify what POTWs need to update infrastructure by identifying the small communities with over extended compliance schedules and inability to meet discharge requirements.

   - POTW NPDES permits that have been administratively extended
   - POTW NPDES permits with compliance schedule
   - POTW NPDES permits with variances
   - POTW CWSRF Applicants – on Intended Use Plan, but projects not yet underway

   We may also want to consider including Drinking Water Provider Applicants – on DWSRF IUP, but projects not yet underway (OHA, DEQ, Business Oregon)

4. *Agency level environmental data submission procedure and repository warehouse.* A handful of programs within DEQ have developed ways of managing environmental data (as opposed to Permitting and Regulatory data, DEQ's other main data flow) but overall DEQ's environmental data is not centralized or easily accessible. Some managed data, like DEQ permitted data through EPA's NetDMR and laboratory data through Ambient Water Quality Management System (AWQMS) are achieved through different web-based tools that are specific to program needs. Most environmental data submitted to DEQ are not standardized, readily available, or in a serviceable format (e.g. data submitted in pdf document or paper report). DEQ collects environmental data for developing standards, assessing water quality, determining Total Maximum Daily Loads (TMDLs), prevention and elimination of water pollution from nonpoint sources and numerous other decisions responsible for protecting and enhancing the state's natural resources. These data come from federal and state agencies, universities, consultants, regulated entities and volunteers and often DEQ is the only state agency holding these data. Decisions are based on data submitted to DEQ but reproducibility is difficult as the data are not stored following concentric procedures. These decisions are potentially effective for many decades and can affect human health, environmental health, and the livability and economy of Oregon, and are subject to review and challenge. To improve DEQ's success as a science-based

agency, it needs a procedure to receive and process all environmental data into an accessible and serviceable centralized data warehouse.

- This effort would be agency-wide at DEQ, to include Air, Land, and Water, programs headed in the regions and the DEQ laboratory

5. *Develop a Mixing Zone database.* DEQ's NPDES permittees are often assigned a "mixing zone" at the outfall(s) of the permitted facility. Each mixing zone is defined using non-standardized geometric tools. The location of the origin of the mixing zone is the location of the geographical point of permitted outfall. The data set of these points is key to connecting the state's primary water quality permitting and regulatory data flows to its environmental data, which is an extremely important function. At the most recent evaluation of DEQ's needs these data sets existed, but were out of date and not adequately supported by data infrastructure or business processes. DEQ's permitting and regulatory data structures are currently being redeveloped, such that this situation needs to be reexamined and probably developed as a DEQ data project.
    - Update the 2008 NPDES permitted Outfall location database geographic data layer
    - Identify the boundary of a mixing zone associated/approved/required by the terms of the NPDES permit associated with the outfalls

Oregon Water Resources Department

The Oregon Water Data Portal (OWDP or "data portal") is an ambitious project that may span decades. It is currently being led by DEQ, but supporting the OWDP will require significant ongoing resources from OWRD. This document attempts to summarize some of the main contributions that are likely to be expected of OWRD during each of the remaining stages of the project.

- **Pilot Data Portal (Stage 2)**. During the 2023-2025 biennium, if the OWDP is further funded by the Legislature, the plan is to set up a pilot portal. DEQ is expected to continue managing the project during the pilot phase, and the pilot portal is being designed to limit the required participation by agencies like OWRD. However, OWRD will likely be expected to:
    a. Continue to collaborate with the project leadership, including:
        i. Steering committee
        ii. Subject matter expert (SME) workgroup
        iii. Stakeholder engagement workgroup
        iv. Technical workgroup
    b. Connect the portal to OWRD datasets that are already in core data systems, such as the Water Rights Information System (WRIS), Groundwater Information System (GWIS), and Water Availability and Reporting System (WARS). To the greatest extent possible the features of the pilot data portal will be limited to leverage existing Application Program Interfaces (APIs) that already exist to serve WRIS and GWIS to external websites, to avoid needing to create new services on a tight timeline. Nonetheless, expertise from OWRD Information Services, Water Rights, Groundwater, and Surface Water staff will be necessary to ensure that data accessed through the Portal is appropriately represented and limited for the supported use cases.
    c. Develop Policy Option Packages to support the collection, management, and service of datasets that were not ready for the pilot phase of the portal (see below).

- **Full Data Portal (Stage 3).** If the data portal is supported by stakeholders enough to receive continued funding through the 2025 Legislature and beyond, then it will be expanded to answer more questions. Some of those questions (or use cases) will depend on data that were not yet mature enough to be connected through the data portal during its pilot stage.
    a. Continued collaboration with project leadership, as described above.
    b. Hosting the data portal. The initial discussions suggested creating an entity independent of the data sources, such as a standalone organization, to host the data portal. The DAS Office of Open Data could alternately serve as an independent arbiter without the regulatory associations tied to DEQ and OWRD. However, OWRD will likely serve a significant fraction of the data hosted through the data portal, and it may be nominated as the ultimate keeper of the OWDP. This would represent a significant program with ongoing requirements for management.
    c. Continue to connect (and potentially create APIs) for more OWRD datasets that are already in core data systems.
    d. Ongoing support for API and tools to appropriately limit and summarize OWRD databases.
    e. Collection, management, and service of datasets that were not ready for the pilot phase of the portal. This work is expected to be supported by agency-specific policy option packages, which may be developed and funded over coming biennia.

Example datasets that may need to be generated or further managed to support the full data portal include:

1. *Statewide characterization of aquifers* sufficient to support generation of aquifer-specific groundwater budgets. While groundwater budgets are not a complete solution for water management, they do provide a useful foundation and were the most highly requested item among long-term priorities indicated by non-state stakeholder groups in a survey. Currently, OWRD develops a hydrogeologic framework for a major hydrologic basin as part of cooperative Groundwater Basin Studies with the USGS. These studies support development of a large-scale water budget and numerical model, but they do not resolve individual aquifers well enough to develop aquifer-specific groundwater budgets in many parts of the state. Further, they have only been substantially completed in 4 of 18 basins, and the results are not compiled into a coherent dataset. The 2021 Legislature funded OWRD and the USGS to develop basin-wide groundwater budgets across Oregon, but these also lack the detail necessary to support aquifer-specific budgets. One project that could be motivated by the data portal is creation of a database to compile spatial characterizations of aquifers in Oregon, along with associated evaluations of their connections with other aquifers and surface water bodies, as well as estimates of aquifer-specific recharge and discharge.

2. *Forecasts of water availability and demand under climate change scenarios.* Stakeholders also strongly prioritized understanding the likely impacts of climate change on water quantity, including supply and demand. OWRD currently engages in drought modeling but has not integrated long-term climate forecasts into its water availability or use tools. Demand for this information through the portal could motivate funding to support OWRD in this work.

3. *Success protecting instream flows.* Stakeholders have indicated significant concern about protecting and restoring streamflows and the life that depends on them, including understanding where and when instream flow targets are being met or not. OWRD tracks instream rights in WRIS, but estimating whether particular instream flow requirements are being met requires some combination of ad-hoc observations and detailed evaluation and modeling of streamflows from streamgages that may be distant from the instream right's reach. Demand for this information through the data portal could motivate and fund OWRD to develop a coherent method and dataset for evaluating success at protecting instream flows.

4. *Combined water infrastructure dataset.* OWRD currently tracks the capacity and condition of dams across the state, and these data are available through OWRD webapps and via the Army Corps of Engineers. OWRD also tracks well logs. However, data on transmission infrastructure like canals and pipes is typically kept by operators like irrigation districts and municipal water utilities. Further research is needed to determine whether this transmission infrastructure would be important to share through the data portal along with other built water infrastructure, but if so, then OWRD could play a role in compiling these data along with miscellaneous infrastructure like tide gates. Stakeholders also indicated than natural water infrastructure is important to access via the portal. Floodplains and wetlands are likely best tracked by OWEB, but source water areas including headwaters, aquifer recharge zones and even aquifers themselves (see item (i) above) may be considered important infrastructure to begin tracking.

Oregon Department of Agriculture

ODA Long Term Goals – Data Support, Access and Distribution

Preface: As part of the framing and scoping of the proposed Oregon Water Data Platform 'ODWP', following are future data projects which will have ties to the portal.

1. *New Dataset – ODA WQ Programs*
   Water Quality Program will have a database to track program and partner effectiveness, costs, associated partner inputs, and area outcomes; this will include each ODA WQ program, including SOWs, Focus Areas, SIA's and future programs. This database is to include a 'Project Layout' to visualize Status and timeline of each Program 'SOW/FA/SIA/…' by Management Area, Partner, Location, or All(unfiltered). Along with the timeline, stored will be vegetation status GIS files, to show vegetation changes. Basic data export will allow for data integration into other reporting mechanism or consumption. Protected data entry into the DB, along with the data export, will allow for the elimination of time consuming and error prone flat files.

2. *New Dataset – ODA Monitoring Data*
   Water Quality Program will have a database to input and display partner collected monitoring data. This is a visualization tool for outreach and education on Agricultural Water Quality project data, a service to the partners, as well as provide a common statewide tool to re-use known methods and data displays across the state. Datasets contained within the database can be designated as automatically shared with DEQ according to a completed DEQ SAP.

3. *Expanded Dataset – ODA WQ GeoData*
   Water Quality Program will have a geodatabase that shows Program Areas in relation to watersheds, agriculture and ag practices by year or biennium. Included in this database are the Ag WQ Management Areas, watershed council & soil and water conservation district boundaries, NHD Hucs. Layers available (by year or biennium) for display in relation to these are ODA WQ Program Areas, CAFO areas, Ag Lands, current DEQ 303d Integrated Report Layer.

4. *New Dataset – ODA WQ Climate Change*
   Water Quality Program will have a climate change database to assist Oregon Agriculture adapt, assess, educate, quantify, and implement on-the-field climate actions. Base geo layers will include crop/vegetation type, area, irrigation practices, with layers of conservation measures such as tillage practices, wetland practices, cover crops, crop rotations.

5. *New Dataset – Statewide Crop and Sprinkler System Inventory*
   Protecting water quality in conjunction with enhancing Oregon Agriculture is reliant on having access to the data relevant to the utilization and distribution of agricultural water; 80% of Oregon's total water consumed is by agriculture. Programs to improve sprinkler system efficiencies have immediate benefits in reducing water use, increased water in streams for fish & wildlife, and reducing waste of water and contained nutrients to groundwater and streams. Data regarding sprinkler system types and inventory allow prioritization of area programs, as well as quantification of potential benefits. Crops grown in all areas of Oregon adapt to changing markets, climate, and available water. The quantity of water needed for agriculture is mostly determined by the type and quantity of crops, along with the sprinkler system types. This data is needed for both short-term best management plan development and local analysis, and long-term area-wide crop/climate change assessments. This dataset will utilize, further refine, and add to OWRD's digitization efforts of the OpenET program, and is being done in cooperation with their efforts.

Institute for Natural Resources

Efforts that contribute to data informed water decision-making in Oregon

The following Oregon Explorer tools support data informed water decision-making in Oregon at different geographic scales (local, statewide, and regionally). Once the OWDP framework is solidified, we will be in a better position to assess whether these tools, including their functionality and associated data, will best be integrated internally to the OWDP or externally (or not at all) and the associated integration costs. These would be potential long-term projects (FY25/27 and beyond) that could add to the spectrum of OWDP uses for accessing water data and associated content. Each of these tools were developed by the Oregon Explorer program in collaboration with Oregon Water Resources Department (OWRD) and other partners. The intent would be to continue the collaboration with OWRD and existing partners in any future OWDP integration efforts.

1. **Mid-coast Water Planning Map Viewer: Supporting water action planning at the local level**
   https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=midcoast

The Mid-Coast Water Planning Partnership (MCWPP) is an inclusive community forum that examines water use in their region, identifies water challenges, and proactively balances water needs. The Mid-Coast Water Planning Map Viewer was developed to support collaborative development of a water action plan. There is additional need to develop mapping and reporting tools that support the implementation of agreed upon water actions in this geographic area. One of the eight imperatives listed in their action plan specifically addresses monitoring and data sharing. The MCWPP is one of four place-based water planning groups in the state that have developed water action plans.

Original project cost was $140,200 (includes project facilitation by Creative Resource Solutions). The estimated cost to integrate the Mid-Coast Water Planning Map viewer into the OWDP and enhanced to support implementation of water actions and report on progress is anticipated to be higher due to the high number of actions that are associated with new data gathering efforts and reporting needs.

Needed next steps: This tool is sponsored by the MCWPP and would require approval from the MCWPP to be integrated in the OWDP and endorsed by the Oregon Water Resources Department to be expanded for use by other place-based planning groups in Oregon.

2. **Oregon Water Map Viewer (Beta)***:* **Informing water planning statew**
   https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=water

   Building on the Mid-Coast Water Planning Map Viewer, the Oregon Water Map Viewer makes accessible readily available statewide water-related data and information generated by the Oregon Water Resources Department and partner agencies (Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, Oregon Department of Agriculture) to support water planning throughout Oregon. It includes a reporting feature that dynamically generates a "water report" for a user defined area of interest (user drawn or uploaded) or a pre-defined area of interest of a selected county, watershed, watershed council, or Agricultural Water Quality Management. The water map viewer and preliminary water reporting tool helps users characterize the status, assets, and needs of each "place" with respect to water condition using available data and information.

   Original project cost was $31,100 leveraging foundational work associated with the Mid-Coast Water Planning Map Viewer. The funding also covered development of a Water Planning landing page on the Oregon Explorer. The estimated cost to integrate the Oregon Water Planning Map viewer into the OWDP and enhanced to support implementation of water actions and report on progress statewide would be significantly higher and would depend on the number of approved action plans in the state and the associated data collection efforts and reporting needs.

   Needed next steps: This tool is sponsored by the Oregon Water Resources Department and would require approval from the Oregon Water Resources Department to be integrated in the OWDP.

3. **Columbia River Basin Evapotranspiration Mapping Tool: Evaluating water use regionally**
   https://tools.oregonexplorer.info/OE_HtmlViewer/index.html?viewer=columbia_river_basin

   Water planning and management requires quantifying aspects of water budgets from the field to the basin scale. Stakeholders within the Columbia River Basin (CRB) are reliant on evapotranspiration (ET) data from irrigated lands for water management, water rights, hydrologic modeling and prediction, and water planning. This mapping tool provides summarized evapotranspiration (ET) data at the 12-digit hydrologic unit level from the OpenET Data Explorer for the CRB. There is an additional need to expand the geographic extent of consumptive use water reporting beyond the Columbia Basin watershed to include the full statewide extent and provide ET estimates beyond irrigated agriculture water use.

Original project cost was $240,000 (includes Washington, Idaho and Desert Research Institute). The estimated cost to integrate the Columbia River Basin Evapotranspiration Mapping Tool into the OWDP and expanded to support mapping and report of water consumption estimates statewide in partnership with the Desert Research Institute OpenET program could be less if the focus remains on irrigated agriculture water use but expanded for application to the whole state.

Needed next steps: This tool is sponsored by the Oregon Water Resources Department and would require approval from the Oregon Water Resources Department to be integrated in the OWDP for statewide application and use. DRI would also need to be funded to develop the OpenET data aggregations at the HUC-12 scale for the State of Oregon.

Oregon Watershed Enhancement Board

OWEB has been a strong partner with the Oregon Water Data Portal project team. At this time, this agency does not have any long-term projects as they utilize WRD data for their work. There is one missing data set in the attached “Missing data” worksheet for OWEB.

Oregon Department of Forestry

Under OAR 340-042-080(2), the Oregon Department of Forestry is the Designated Management Agency (DMA) for water quality protection from nonpoint source discharges or pollutants resulting from forest operations on non-federal forestlands within the state. The Forest Practices Act rules sets expectations for water quality outcomes and prescribes required best management practices. The Forest Practices Act has provisions for both criminal and civil penalties if forest operators do not comply with water protection regulations.

ODF uses the following data sources to implement the FPA rules: stream layers, fish distribution, landslide hazard areas, geological site specific data, critical resource information (wetlands, rivers, waterbodies., endangered species -birds, amphibians, fish), cultural resource areas, wild and scenic areas, landowner tax lot information, road layers, landslide risk areas). The ODF fire program uses additional data sources related to fire protection.

Starting in 2023, ODF will be tracking specific water quality parameters related to issued DEQ TMDL’s

The Oregon Department of Forestry’s Forest Resource Division is undergoing significant program changes with the recent Private Forest Accord Agreement and resulting rule changes. ODF is currently working with Terrainworks (contractor) and ODFW on a new fish distribution model and flow duration model. The fish distribution data layers should be ready by July 1, 2023. The flow duration model day is not anticipated to be complete until around 2026. ODF is also working on the development of a steep slopes model for Western Oregon. The model will help determine the steep slopes most vulnerable to mass wasting if a timber harvest activity were to take place.

As part of the Private Forest Accord and resulting rules ODF will need to develop Forest Road Inventory Assessment (FRIA) for large forest landowners and for small forest landowners conducting certain operations. Large landowners will be required to provide ODF with a pre-inventory completed by 2025 and a full inventory by 2029. Small forestland owners will also need to provide a Road Condition Assessment (RCA) when conducting certain harvest operations on their property. ODF has also been tasked with developing a statewide abandoned roads inventory. ODF is still working on determining how to conduct such an inventory. The FRIA, RCA and abandoned roads inventory still need platforms developed to manage and track the information over time. The goal of the three inventories is to identify areas of concern that are contributing to potential stream water quality degradation and then fixing issues identified.

ODF is working with ODFW on the fish distribution and stream layer data.

ODF will be working with DEQ in the future on water quality monitoring and possibly effective shade gap ground verification.

Most data layers ODF uses come from other sources.

Steep Slopes – Need to be publicly viewable May 1 to allow landowners time to plan for rule implementation January 1, 2024

Streams Data Layers– Need to be completed and in FERNS July 1, 2023.

Road inventory data will be an ongoing data collection and tracking process. Working on identifying a platform to receive and track the information landowners provide. (Starting 1/1/2024 - Years 5-20).

The abandoned road inventory project needs a plan and funding (Starting 1/1/2024 - Years 5-20).

Oregon Health Authority

Public Health Water Recreation Advisory Portal

Oregon Health Authority issues recreational public health advisories related to fecal contamination in marine waters at ocean beaches, cyanotoxins in recreational freshwater locations, and fish and shellfish consumption advisories. There are no formal databases for any of these data; data are maintained as documents of different formats in shared server drives. This makes retrieval of information related to advisories difficult and prone to individual analyst filing conventions. There is also currently no way for the public to easily determine what kind of recreational advisories may be in place for a particular waterbody. One must visit separate websites to glean this information. A map-driven interactive portal would allow users to readily see different recreational public health advisories for particular waterbodies.

Assign public health advisories to geo-referenced waterbodies (lakes, ocean beaches, river stretches) and facilitate internal retrieval of data related to current and past advisories.

This is a 1 to 2 year project.

Expand geodatabase for public water system facility locations and service area boundaries

Collecting water system facility locations and service area boundaries will fill a data gap. Service area boundaries will help multiple agencies in emergency response efforts and to identify disadvantaged communities. Facility location data (wells, treatment plants, storage tanks, etc.) will also help emergency response efforts.

Water System Locations- expand service area boundary dataset and update previously collected data; acquire permission to share publicly. We currently have boundaries for ~400 out of ~3200 public water systems.

ODHS Office of Resilience and Emergency Management is in the process of hiring someone whose responsibilities will include collecting and updating service area boundaries. We have discussed creating a MOU and project plan but have not yet begun those efforts.

This project is expected to take 3-5 years.

Oregon Department of Fish and Wildlife

Develop a stream temperature monitoring program and associated data management infrastructure. ODFW is developing a stream temperature monitoring program to 1) obtain stream temperature estimates for each stream reach in the State of Oregon to describe broad spatial patterns in the thermal regimes throughout the year, (2) develop a statewide network of coupled water temperature and discharge-telemetered gages to monitor and forecast water temperatures in waterways with water temperature-related fish issues, (3) intensively monitor temperature select basins to understand fine-scale patterns, research new covariates, and understand different applications of the data, (4) map thermal heterogeneity to identify cold water patches and thermal refuge locations, and (5) determine the appropriate repository for thermistor data. Successful development of the stream temperature monitoring program, its data repository, and resultant analyses/models will inform fish management and habitat conservation actions, and result in tangible improvements to the status of important fish species (e.g., sensitive, ESA listed, or economically important) and their habitat. Developing an agency strategy for monitoring, analyzing, and reporting water temperature would benefit numerous species while enabling and informing a myriad of management actions. Examples of management actions include protective angling closures during warm conditions, instream water right transfers, addressing limiting factors for species recovery, and targeting locations to implement restoration and protection efforts.

The program has been in development with existing staff as time allows over the last two biennia, but resource limitations have not allowed for a concerted effort. Data management needs include dedicated staffing to assist in collecting, storing, and curating temperature data, and providing high-level technical support (data analysis and modeling).

This program would develop and curate existing and new water temperature datasets (ODFW-Water Temperature Datasets - continuous water temperature monitoring at multiple locations) to support sharing through existing public data repositories (e.g., DEQ's Ambient Water Quality Monitoring System, AQMS), and/or the OWDP and to facilitate other data gaps, identified below).

This project will support addressing the following data gaps:

- Species Temperature and Flow (Species Specific Vulnerability Assessments & Flow from BiOp, ISWRs, other methods)
- Cold Water Resources (Identification and Mapping Reach-scale temperature estimates based on empirical temperature data obtained from instream thermistors or model estimates.
- Distribution Projections for Native and Non-Native Fish (i.e., presence under future scenarios).

This program is informed by temperature modeling currently in development by NOAA, USGS, and other partners. It also requires establishing effective partnerships with other entities collecting stream temperature data. Data could complement DEQ's Ambient Water Quality Monitoring data and provide data for DEQ's Call for Data (Integrated Report).

This program should be considered a long-term, sustained effort (10 years+), but some datasets (e.g., water temperature data) could start becoming available during the 2025-27 biennium.

ODFW's Oregon Fish Passage Barrier Data Standard (OFPBDS) dataset contains barriers to fish passage in Oregon watercourses. Barriers are structures which do, or potentially may, impede fish movement and migration. Barriers can be known to cause complete or partial blockage to fish passage, they can be completely passable, or they may have an unknown passage status. The OFPBDS database is the most comprehensive compilation of fish passage barrier information in Oregon, but it does not represent a complete and current record of every fish passage barrier within the state. Consistency in attribution also varies among data originators. Dataset attributes, including some key attributes such as fish passage status, are often unknown or incomplete. Fish passage status is a key attribute but many barrier features have an unknown passage status.

Efforts to address deficiencies in data currency, completeness and accuracy are ongoing and are often limited by lack of sufficient resources, including resources for field verification of barrier status. Field verification of barrier features and their attributes will be an important component to making this dataset current, comprehensive, and accurate.

This project provides the basis for the Oregon Fish Passage Barrier Database and helps to inform the Fish Passage Priority List.

Fish passage barrier data are compiled from multiple agencies, counties, watershed councils and tribes into the OFPBDS geodatabase. The OFPBDS dataset currently contains over 40,000 barrier features from 19 separate sources including: Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Transportation (ODOT), Oregon Department of Water Resources (OWRD), Oregon Department of Forestry (ODF), Oregon Watershed Enhancement Board (OWEB), Oregon Department of Land Conservation and Development (DLCD) US Bureau of Land Management (BLM), US Forest Service, Nez Perce Tribe, Benton SWCD, Washington county, Lower Columbia River Estuary Partnership and watershed councils representing the Rogue, Umpqua, Siuslaw, Santiam, Calapooia, Clackamas and Scappoose basins.

The OFPBDS is currently made publicly available, but continued refinement should be considered a sustained and long-term project (10+ years). Progress is limited by availability of resources for data compilation, management, and field verification.

ODFW's Oregon Fish Habitat Distribution dataset describes areas of suitable habitat believed to be used currently or historically by native or non-native fish populations. This information is based on sampling, the best professional opinion of Oregon Dept. of Fish and Wildlife or other natural resources agency staff biologists or modeling. Data representing current habitat for anadromous and resident salmonid species are generally more comprehensive than data for non-game and non-native fish species. All datasets are subject to update as new information becomes available. Data are updated, as resources allow, to refine species distributions and improve coverage for non-game and non-native fish species.

The Oregon Fish Habitat Distribution dataset is currently made publicly available, but continued refinement should be considered a sustained and long-term project (10+ years). Progress is limited by availability of resources for data compilation and management, and by data collection/availability for some species (e.g., non-game and non-native fish species).

Appendix J: Oregon Water Data Technical Team Final Report

The Oregon Water Data Portal (OWDP) Technical Team was convened to identify the desired water data portal functions and to recommend possible technical solutions for Oregon. The following is a summary of the recommendations of the technical team followed by a detailed overview of the portal data functions and technical solutions considered.

SUMMARY

The OWDP should leverage the State of Oregon's existing Tyler Technologies Data and Insights (formerly Socrata) Open Data licensing to create the OWDP as a part of the larger Oregon Open Data Portal (OODP). The OODP is managed by the State of Oregon's Enterprise Information Services, Data Governance and Transparency office which offers a suite of data publishing support and services. OODP has established a robust set of data governance guidelines and protocols for publishing data in Oregon that dovetail well with the needs of the OWDP.

The OWDP can start by identifying and tagging water related data that is already in the OODP and that aligns with a strategic use case(s) for the pilot project. Additional data should be identified to support the use case and prioritized to be added to the OODP and included into the OWDP. Data and services from data providers with well established data and protocols can be directly added or federated to the OODP. Data and services that need to be harvested and published could leverage the State of Oregon's Data Governance and Transparency services to assist in setting up data workflows to publish data as services to the OODP and/or to the State's ArcGIS Online. These data services can then be added as catalog records in the OODP with water data tags to create the OWDP collection.

The front-end of the OWDP could start as a Data and Insights story template, which is a built-in content management web page available in the OODP. The story template can provide links to water data by themes in the OODP, context about the OWDP, links to tools developed for further exploration, and user guides on how to incorporate data in the OODP via external applications.

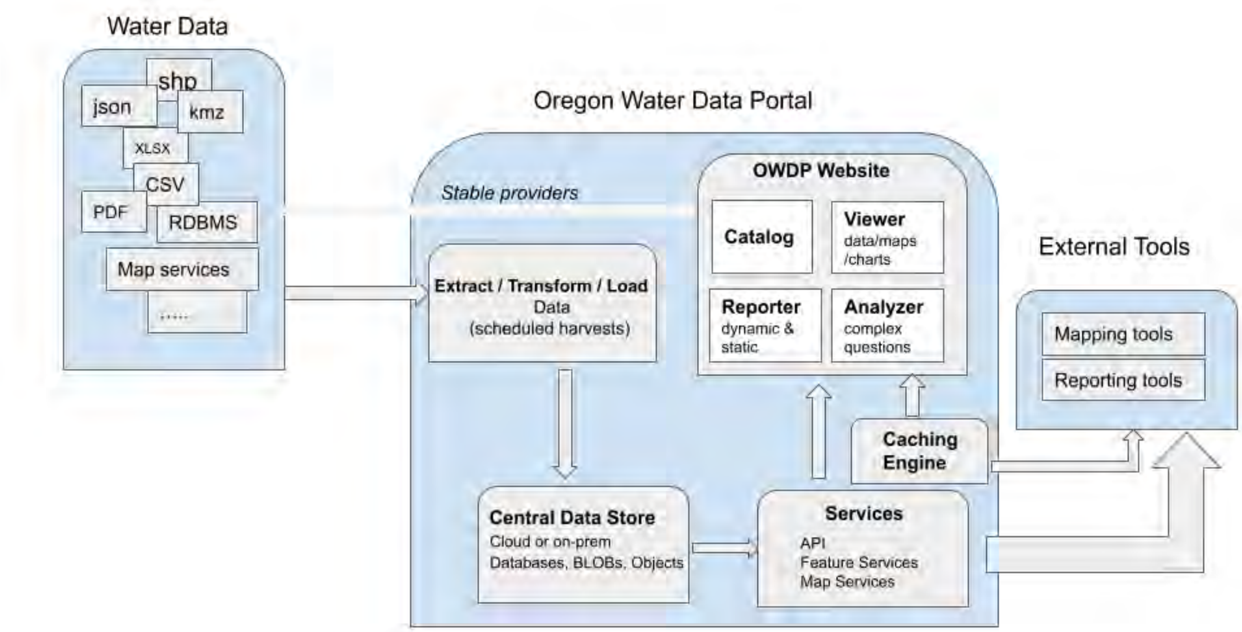
The OODP includes an Application Programming Interface (API) to connect to and use data in the OODP via structured web requests. The OWDP can leverage this existing API to demonstrate examples of connecting applications and tools to water data. Other API's may need to be integrated in order to merge external data via an aggregated, higher level API.

A separate web map viewer could be developed to guide users' exploration of the available water data in the OWDP. The web map viewer could be developed to further expand the reporting and analysis capabilities. To directly address the identified use case(s) for the pilot project, adding reporting and analysis tools will be needed. The reporting and analysis tools can initially be extensions of the water data map viewer or separate stand-alone tools and can demonstrate the API access of water data.

Detailed Overview

In support of the planning and scoping effort for an Oregon Water Data Portal a Technical Team was formed with representation from multiple state agencies, the Institute of Natural Resources at Oregon State University, and the Internet of Water. The Technical Team reviewed a range of solutions developed by other states (New Mexico, Texas, California, and Colorado) and software vendors (Foundry Spatial and Google with True Elements) to help inform a recommended approach for the Oregon context.

The following architecture schematic was created to help understand how the various functions could fit together.



Data Portal Functions

The following water data portal functions were identified that would be components of a fully working portal.

1. Data harvest/translation/standardization
2. Data storage
3. Data publishing
4. Data caching
5. Data discovery (catalog)
6. Data access (human data access via download/streaming/API)

7. Data viewing
8. Data reporting
9. Data analysis

For each of the portal data functions, the Technical team identified potential technical solutions and evaluated how well each solution could be implemented in Oregon with existing expertise and licensing.

1. Data Harvest/Translation/Standardization

Water data is collected, curated, and stored by numerous local, state, and federal government agencies in a wide range of formats. Some agencies have well established processes for publishing their data as downloads or services, while others do not. A key portal function is the ability to establish data pipelines that will gather water data in an organized and structured manner. Standardizing access to this data will save time and effort when using and integrating the data in order to better understand the overall water dynamics in Oregon.

To establish this baseline of data gathering, workflows will need to be developed for each data provider in order to make their data and information consistently available via the data portal. Some providers will have a stable data access pathway that can be directly incorporated into the catalog, viewer, reporter, and/or analyzer components of the data portal, while other providers will need the portal to provide the stable data access pathway.

The Technical Team considered whether there was a need to gather all of the data via data gathering workflows or whether data gathering workflows would only be needed for data providers without well established data services. Gathering all of the data would create a standardized one-stop location for all data in the portal and provide the possibility of time versioned data archiving and retrieval. The disadvantages of gathering all of the data include the additional time and duplicated effort required to make that data available, the increase in data hosting and storage costs, and potential user confusion on what data is most current. The Technical Team determined that initially it would make sense to only set up the harvesting workflows for providers without a stable data access pathway.

The following technical solutions were considered for data harvesting, translation, and standardization:

1. Custom data harvest scripts
    a. Foundry Spatial
    b. HydroBase (Colorado)
    c. Notebook Server workflow via ArcGIS Online,
2. ETL (extract, transform, load) Tools
    a. ESRI Spatial ETL Tools (Uses FME) ArcGIS Pro, ESRI video on ETL examples
    b. FME Server from Safe Software (DAS GEO and ODOT use)
    c. AirByte: New Mexico
    d. Google Cloud DataFlow (To Google data storage)
3. Data and Insights (Tyler Tech) Data Ingestion

Custom data harvest scripts and extract, transform, and load (ETL) tools provide a way to set up data pipeline workflows that systematically harvest data on a scheduled basis. In assessing the various options identified, the Technical Team considered the ease of implementation in the Oregon context in terms of costs and local Oregon knowledge. The custom data harvest scripts and cloud based solutions from AirByte and Google would likely require additional contracts/licensing and increase overall costs to implement, and do not have a clear advantage over the ESRI or FME options. ESRI Spatial ETL Tools are included in the existing state licensing with ESRI and could leverage existing staff knowledge. If more powerful workflows are needed, then upgrading to FME Server directly could be a good option with an additional license cost.

Data and Insights (formerly Socrata), which is what the Oregon Open Data Portal is built on, provides a suite of data ingestion tools. The following figure shows the range of options available via Data and Insights.

Tool	Access	Complexity	Transformations	Schedulable	Software Installation Needed	Developer Skills Needed
Manual file upload	Dataset Management Experience	Low	Yes	No	No	None
URL link	Dataset Management Experience	Low	Yes	Yes	No	None
Gateway	Dataset Management Experience	High	Yes	Yes	Yes	Some
Link to External Source	Dataset Management Experience	Low	No	No	No	None
Catalog connector	Admin panel	Low	No	Partially	No	None
DataSync	Off platform	Moderate	No	Off platform	Yes	None
API	Off platform	High	Yes	Off platform	No	Yes
FME	Off platform	High	Yes	Off platform	Yes	None

Given the range of integrated support for data upload, URL links, integrated ETL via FME, and federated connections, Data and Insights provides a compelling data harvest solution and leverages existing State of Oregon license and staff support. The State of Oregon's Data Governance and Transparency (DGT) office within Enterprise Information Services has increased staffing and support to offer a catalog of data publishing services for state agencies to add data to the Open Data Portal. There was widespread support for leveraging the services of the Data Governance and Transparency staff to facilitate data harvest, translation, and standardization.

RECOMMENDATION: Use Data and Insights data ingestion options to harvest data via support from the State of Oregon's Data Governance and Transparency Staff.

2. Data Storage

Data that has been gathered via data harvesting workflows will need to be housed in a centralized data storage location to streamline subsequent data publishing work. The Technical

Team considered a range of data storage options from adding managed server(s) to the State Data Center's server stack to cloud based data storage options.

Hosting a server infrastructure adds the need for staff support for system administrators to keep the servers secure and up to date, but also provides more control and flexibility. Using a cloud based data storage solution reduces some of the staff costs to maintain the system, scales to meet varying use demands reliably, and can be more widely accessed. However, the cost structures with cloud based data storage can be more fluid and harder to anticipate and cloud based data storage is vulnerable to network issues that are not within local control.

In addition to whether data is stored in a hosted server vs cloud based solution, it is important to consider how the data is stored. Since water data can be in a wide range of formats, multiple storage options may need to be employed. A file storage solution would create a structured folder organization to store data, whereas a database approach might be used to store data and/or manage data registration.

The Technical Team explored the costs of using the State of Oregon's data storage via the State Data Center. Monthly costs were found to be:

Enterprise Storage: $0.07/GB

Backup storage: $0.007/GB

Data and Insights data ingestion provides cloud based data storage as part of the State of Oregon's existing license. There are currently no caps on storage space for data ingested to the Open Data Portal.

Given the existing support for data storage in Data and Insights via the Oregon Open Data Portal, it was determined to start with leveraging the existing data storage available with Data and Insights to serve the Oregon Water Data Portal data sets. Many state agency data providers have existing data storage that may also be able to link to the OWDP via Data and Insights to offer a distributed data storage solution.

RECOMMENDATION: Use the cloud based data storage of Data and Insights along with existing State Agency data storage options where applicable.

3. Data Publishing

Making the data published in an usable format is a key function of the OWDP. Publishing data as services provides the ability to interact with the data by querying the data and extracting data in various formats. Since water data comes in a variety of formats (textual documents, tabular, geospatial data, imagery, etc), multiple published data service types will need to be supported. In order to do this a standardized publishing process will need to be deployed.

For the identified stable data providers whose data is already published in usable formats the published data endpoint could be incorporated into the data discovery catalog solution and would only need to be registered to aid in discovery. Data gathered and stored from all other sources will need to be made available as services that are exposed and consumed by the data portal for use in its tools as well as in external applications.

To make the published services as useful as possible, it will be important that the services include good metadata adhering to metadata standards. For geospatial data, data useability will be enhanced by GIS staff adding helpful cartographic display and understandable pop-up definitions for identification.

The Technical Team considered a range of service creation options including:

1. ESRI Tools (ArcGIS Pro/ArcGIS Online/Enterprise)
2. Google
3. CKAN
4. Data and Insights

The State of Oregon has an active ArcGIS Online platform where data can be published. This platform is used widely by state agencies and supports publishing services for a wide range of data formats (tabular, geospatial, imagery). In addition, there are built-in options for creating cached versions of services to improve performance for large datasets.

In addition to the ESRI publishing tools, the Technical Team considered a Google solution that would involve accessing data stored in the Google cloud storage and accessed via a variety of protocols. From our preliminary understanding, this would still require setting up specific publishing workflows to support spatial data services that could be used in geospatial tools and made available for download in a catalog application.

CKAN, is an open source data management system used in other states as part of their water data portals to publish data to the CKAN catalog. CKAN provides the ability to publish data with limitations on size and formats. CKAN is primarily used as a catalog solution vs a robust data service publishing platform.

Data and Insights provides a wide range of data service publishing options. There is a Data Management Experience web tool to facilitate importing a wide range of data formats. It includes the ability to edit data, content, schemas, and to append to an existing dataset. Data imported can be published with access to the data, or linked to external published services like from ArcGIS based platforms.

After a review of the range of data publishing options and a consideration for the likely mix of other components of the OWDP, the Technical Team recommends that a combination of ESRI's tools and Data and Insights be used to publish data. The ESRI data publishing tools will be used for geospatial data that do not currently have published services. Data and Insights will be used to publish and catalog the remaining data and offer a consolidated set of data service endpoints that include the data published using ESRI tools.

RECOMMENDATION: A combination of Data and Insights and ESRI ArcGIS tools.

4. Data Caching

Data caching can be helpful to improve the performance of published data services. Caching can pre-generate server requests so that when a request comes in the already processed data can be quickly retrieved versus having to make the server generate the response each time. Caching is most helpful for large datasets that require a lot of server processing resources for frequent, repeated requests.

For the OWDP, there will likely be some base datasets identified that will be served well by adding a cached version. For the geospatial data and services published with ESRI's ArcGIS Online, the ability to add a tiled cache or vector tiled cache exists as well as the ability to optimize drawing performance for complex shapes. In addition to these built-in ESRI publishing capabilities, Data and Insights has built-in service caching to reduce the direct impact of requests to a hosting service.

RECOMMENDATION: Combination of ESRI and Data and Insights. Create tile caching workflows for large spatial data layers and leverage Data and Insights based service caching.

5. Data Discovery (Catalog)

A core component of the OWDP will be the ability to discover what water data is available. There are many examples of data catalogs that have been created to help users find data. Some of the key characteristics of a useful data catalog include the ability to search by facets related to the source, date, thematic tags, location, and format. Data catalogs can be federated to search other repositories to help link resources and data.

The Technical Team considered and reviewed the following options for the data discovery catalog component:

1. CKAN
2. Data and Insights

CKAN is an open source data management system used by governments and other water data portals. The Internet of Water, a partner in the scoping phase of this project, has worked with several states (New Mexico and California) that have implemented a CKAN solution for their water data portals. CKAN can handle a broad range of data types and has an integrated data management module for direct data uploads. It includes an API for searching its repository and data. Data can be dynamically viewed in the tool. CKAN requires knowledgeable support staff that can install and update software and resources. External contractors would likely be needed to customize and maintain the installation.

Data and Insights (formerly Socrata) is an open data software solution used by the State of Oregon for its Oregon Open Data site. Data and Insights is a cloud based data catalog solution. It supports a large range of data formats and has integrated data viewing functionality. Data and Insights includes an extensive API and can be easily integrated with numerous data connectors including ESRI data and services. The state has expertise and an active license which could be leveraged for the OWDP. Data and Insights also provides a content management system (CMS) that can be used to scaffold the broader OWDP landing page and links to tools and catalog viewing. Colorado has a water data portal that includes Data and Insights as part of its solution.

Based on the review and comparison of other water data portals and the context of Oregon's existing licensing and expertise, the Technical Team is recommending that Data and Insights be used for the data discovery catalog function of the OWDP.

RECOMMENDATION: Data and Insights for both the catalog and overall OWDP site web page hosting.

6. Data Access

Water data access is an integral part of a functional water data portal. Many applications are built with the ability to incorporate streamed data services so that data does not need to be copied and served for one-off applications. Data stewards are able to maintain their data streaming service and the data utilized in external applications is updated automatically without having to re-gather the data. Specific data queries can be applied to streaming services to answer specific questions. There are also use cases that would require a user to have a copy of the data to do local computational analytics that are not feasible in a streamed service scenario, so users will have the ability to access data in the OWDP by downloading, querying, or streaming the data.

To support data access a cohesive API (Application Programming Interface) will be needed. An API provides a standardized protocol to send and receive information and data. An API needs to be well documented so that users know how to use it and get the most out of the services and data.

The Technical Team reviewed a range of options for data access and based on the data publishing recommendation of using ESRI ArcGIS publishing tools and Data and Insights, data access should be supported by streaming services directly from ESRI services, or via Data and Insights endpoints. Data and Insights has a well developed and documented Socrata Open Data API (SODA) that offers a good starting point for data access. Data and Insights also provides data downloads in some formats. Custom data downloads where a user can select specific data by area, format, and projection will likely need to be a later enhancement if deemed important.

RECOMMENDATION: Use Data and Insights's SODA API to support streaming and query based data access.

7. Data Visualization

Data can be visualized in various ways depending on the type of data. Geospatial data can be viewed on a map, tabular data can be viewed as charts and tables, and times series data can be viewed in animated maps and charts. The ability to view data in the context of other data and to explore potential relationships between datasets is an important function of a data portal.

For the OWDP to help users understand Oregon's water landscape, an integrated water data viewer will need to be included. Based on the recommendation to use Data and Insights, single data layer views will be supported by default. Data and Insights includes the ability to view data as a table, map, or chart with dynamic filterings and attribute searching. Map services published and configured to be displayed in Data and Insights can also be grouped together with the ability for users to toggle layers and explore attributes which can be a helpful thematic view of data. What is still missing is an overall exploratory view in a map of all the available data throughout the OWDP.

The Technical Team is recommending that the OWDP develops and maintains an integrated data viewer. The tool will need to support viewing geospatial and tabular data and allow for interactive functionality including identifying, querying, and navigation. Colorado has a good example of this sort of water data map viewer that pulls together the services made available via their water data portal.

ESRI is the leading geospatial platform and an integral part of the State of Oregon's data resources. Highly configurable data viewing tools can be developed leveraging the ESRI platform. Experience Builder is an ESRI application development tool that can be used to integrate a wide range of application components into a single tool. In addition to ESRI, VertiGIS Studio, formerly Geocortex, provides the ability to extend the ESRI services and tools further with advanced workflow and reporting capabilities that can be used in VertiGIS web viewers, or brought into ESRI Experience Builder applications as widgets .

Based on a review of a range of data viewer technologies, the Technical Team is recommending that the OWDP use either ESRI's Experience Builder or VertiGIS Studio to create a feature rich water data exploration tool.

RECOMMENDATION: Use Data and Insights integrated data viewing for individual and service layer views. Create an integrated data viewer to view many data services on the same map using either ESRI's Experience Builder or a VertiGIS Studio Map Viewer.

8. Data Reporting

The ability to create custom data reports for specific areas of interest can greatly add to the value of a water data portal by making it simple to pull together data in an understandable way that can be easily shared with others to help inform decisions related to water. A good report on water data would be easy to launch, have the ability to be dynamically run for a custom area of interest, and clearly indicate the sources of the data used in the report. Reports should be able to be saved as a PDF and to be re-run with easily shared links. Interactive dynamic reports in the tool add extra value by allowing users to toggle layers and view maps and tables in the context of the report.

An example of this type of reporting capability can be found in Oregon Explorer's Oregon Water Map Viewer (beta) developed for the Oregon Water Resources Department. The tool incorporates existing map and image services and was built with VertiGIS Workflow and Reporting Studio.

Another example of good dynamic reports can be found in Foundry Spatial's water tools. They have a custom development setup that harvests and stores the data to be used for quick reports that show historic changes in a nice display. The mapping application is built with MapBox which offers performant interactive tiles for engaging user experiences.

True Elements is another example that provides water reports based on curated water datasets that their water experts have combined to create a scoring system to give relative ranks and values to the status of water in an area. True Elements partners with Google to leverage datasets collected and stored on Google.

RECOMMENDATION: Having a technology agnostic platform should allow for a range of reporting tool technologies to interact with the OWDP. For a pilot phase, a reporting tool solution may be chosen, but it should not be considered prescriptive of all technology types used for reporting.

9. Data Analysis

Water data brings with it some very complex questions. A foundational goal of the OWDP is to help answer these complex water questions through well thought out and documented analysis. Adequately answering the complex use case questions requires transparent analyses and reliable data. It is yet to be determined if a shared analytical framework could be developed and if enough quality data exists to provide defensible answers to these complex questions.

The Technical Team would need more time to fully explore technical solutions to support deep data analysis. It may end up that data analysis becomes opinionated data reporting using the same chosen software to interpret and display results.

RECOMMENDATION: Similar to reporting, having a technology agnostic platform should allow for a range of analysis tool technologies to interact with the OWDP. For a pilot phase, an analysis tool solution may be chosen to demonstrate the possibilities, but it should not be considered prescriptive of all technology types used for analysis.

Staffing

The following staffing roles were developed to help estimate how much effort and cost would be required in a subsequent pilot phase and for continued operation beyond the pilot phase.

1. Project Manager
    a. Primary point of contact for OWDP
    b. Works with data providers to coordinate access to applicable data
    c. Handles budgeting
    d. Leads outreach and training activities
2. System Administrator
    a. Oversight of all servers
    b. System access (firewalls, permissions)
    c. Software installation
    d. Security and software updates.
3. Business Policy Analyst
    a. Documents requirements
    b. Curates and/or creates metadata and data standards
4. Full stack developer (front and back end) for site operations
    a. Architectural setup and solutions
    b. Software development as needed for custom tools, site/tool configurations
    c. API support/extension development
    d. Provides troubleshooting support
5. Data leader
    a. Develops and manages the ETL workflows

    b. Database administration
    c. Manages the data store
6. GIS/Data publishing/Caching
    a. GIS Analyst/Developer
7. Data providers (coordinate data readiness on provider end)

Potential Staffing Needs

Staffing Role	Pilot (2 yrs) FTE	Ongoing FTE /biennium
Project Manager	1.00	1.00
System Administrator	0.25	0.10
Business Policy Analyst	1.00	0.50
Full stack developer	1.00	0.25
Data leader	0.75	0.75
GIS Analyst	0.35	0.25
Data providers	0.20	0.10
TOTAL	**4.55**	**2.95**

Possible Project Development Steps:

Pilot Project

1. Tag existing and proposed OODP items from state agencies to see what is already covered by what agencies are committed to do.
2. Triage the data pathways for incorporation
    a. Identify non-open/public data for subsequent phases.
        i. Data that needs to be aggregated, summarized, or blurred
        ii. Data that needs to be restricted to state agency use only
    b. Identify datasets that may require central data storage.
3. Address one or more priority use case
4. Build front website landing page (Data and Insights story template)

    a. Create the branding look and feel
    b. Copy text and navigation
5. Establish data access using internal and external APIs
6. Build OWDP tools
    a. Tool and information directory
    b. Maps
    c. Reports
    d. Analyses
7. Assessment of the pilot

Appendix K: Data Processing Tools Inventory

Below is an initial assessment by the OWDP team of data processing tools currently or potentially could be utilized in Oregon for water data.

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
Drinking Water Mapping Application to Protect Source Waters (DWMAPS)	Maps	Locate drinking water providers, potential sources of contamination, assessed waterways, projects, and source water collaboratives.	U.S. EPA	United States			Link
Water Quality Portal	Data	Download water quality data from the Water Quality Exchange (EPA), NWIS Web Database (USDA), and STEWARDS (Sustaining The Earth's Watersheds - Agricultural Research Database System) (USDA ARS)	U.S. EPA	United States			Link
Geoconnex.us	Registry, Maps, API	Index registry of data sources with searchable linked data.	IoW, Duke	United States	Kyle Onda		Link
Pesticide Stewardship Partnership Data Viewer	Maps, Charts	The tool provides access to current and historic pesticide water quality data that DEQ and the Oregon Department of Agriculture use to inform the management of the program, which monitors for more than 130 chemicals in Oregon surface waters.	DEQ	Oregon			Link
Ambient Water Quality Monitoring System (AWQMS)	Data, Charts	DEQ data and data provided from partner groups, such as watershed councils, is available to view, query, chart, graph, and download	DEQ	Oregon		Direct exchange to the Water Quality Exchange network	Link
Drinking Water Protection Interactive Map Viewer	Maps	Identify land uses and potential sources of pollutants identified on regulatory databases within public drinking water source areas (DWSAs)	DEQ	Oregon			Link
Oregon Drinking Water Advisories	Maps	Map displays active system-wide drinking water advisories in Oregon, as well as partial advisories that affect a significant portion of the population served.	OHA	Oregon			Link
Oregon Public Water Systems	Maps	Map displays active public water systems in Oregon. Points represent approximate center of service area	OHA	Oregon			Link

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
Oregon Water Resources Department Near Real Time Hydrographics Data	Data, Charts	View near real-time and historical stage, discharge, and lake level data.	OWRD	Oregon			Link
Oregon Water Resources Department Historical Streamflow and Lake Level Data	Data	Locate surface-water measuring sites around the state, download data, and view statistics.	OWRD	Oregon			Link
Oregon Water Resources Department Water Availability Reporting System	Data	Water availability calculated at the pour points (i.e., mouths) of all WABs (Water Availability Basins) within each of the eighteen OWRD administrative basins.	OWRD	Oregon			Link
Oregon Water Resources Department Groundwater Information System	Data, Reports, Maps	Allows you to explore subsurface data managed by the state (Well Report Database, Groundwater Mapping Tool, Search for a Groundwater Site)	OWRD	Oregon			Link
Oregon Water Resources Department Water Rights Information System	Data, Reports, Maps	Warehouse of information pertaining to water right applications, permits, certificates, transfers, leases and related information (Water Rights Information Query, Platcard Report, Water Rights Place of Use Summary Report, Point of Diversion Summary Report, and Interactive Water Rights Maps).	OWRD	Oregon			Link
Oregon Water Resources Department Peak Discharge Estimation Mapping Tool	Maps, Reports	Estimate the magnitude of peak discharges (highest stream flows) for rural, “unregulated streams” in Oregon, which refers to areas where flows are not affected by in-channel storage projects	OWRD	Oregon			Link
Oregon Water Map Viewer	Maps, Charts, Report	Aggregates water data for a selected area of interest.	OWRD/OSU	Oregon	Oregon Explorer		Link
Oregon Watershed Restoration Inventory Tool	Maps, Reports	Watershed restoration data since 2005. OWEB data; tool developed by Oregon Explorer	OWEB/OSU	Oregon	Oregon Explorer		Link

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
Oregon Watershed Investment Inventory Tool	Maps, Reports	Watershed restoration investment data. OWEB data; tool developed by Oregon Explorer	OWEB/OSU	Oregon	Oregon Explorer		Link
Atlas of Oregon Lakes	Maps, Reports	Includes lake photos, links to the Oregon Department of Fish and Wildlife's recreational fishing web pages, bathymetric maps, links to the Oregon Marine Board facilities database, EPA National Lake Survey summary pages, and information about aquatic invasive plants and animals.	PSU	Oregon	Center for Lakes and Reservoirs		Link
Oregon Water Atlas	Maps, Charts	Maps of precipitation, groundwater, surface water, flooding, infrastructure, water use, drinking water, water rights, and fish	OSU	Oregon	Institute for Water and Watersheds		Link
Estuary Mariculture Shellfish Tool	Maps, Reports	Developed to assist in pre-application for shellfish mariculture site assessments. ODA, DLCD, ODFW	DLCD OCMP/ODA/OSU	Oregon	Oregon Explorer		Link
PRISM Climate Data	Data, Maps	Provides 30yr normal precipitation, temperature data	OSU, PRISM Climate Group	United States	Dylan Keon		Link
Regional Aquatic Prioritization and Mapping Tool	Maps, Scenarios	Decision support system. Automated analytical tool that is used to evaluate a wide array of watershed priorities given different species of concern and optional priority constraints such as watershed condition, climate change, and aquatic invasive species.	USFWS/Ecotrust	Oregon, Washington, Idaho		May not be available for State use?	Link
Water Utility Service Area Map	Maps, Reports	Developed to estimate water service area boundaries	Environmental Policy Innovation Center?	Oregon			Link
OpenET	API, Maps, Data, Remote Sensing	OpenET employs several well-established methods to generate daily, monthly, and annual satellite-based ET estimates at the field scale.	DRI	United States	DRI		Link
Oregon Aquaculture Map Viewer	Maps, Report, Financial Planning	Developed for Oregon Aquaculture Association with Business Oregon funds. Includes a site report and financial planning module.	Oregon Aquaculture Association/OSU	Oregon	Oregon Explorer		Link

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
Mid-Coast Water Planning Map Viewer	Maps, Report	Aggregates data on precipitation, water quality, and water rights for a selected area of interest.	Mid-Coast Water Planning Partnership/OSU	Mid-Coast of Oregon	Oregon Explorer		Link
John Day Basin Partnership Project Tracker	Map	Access information about projects of the John Day Basin Partnership	John Day Basin Partnership	John Day Basin, Oregon		May not be available for State use?	Link
City of Portland Environmental Services WebPortal	Data, Reports, Maps, Charts	Uses the AQUARIUS Web Portal. View maps, export data, create charts	City of Portland	Portland, Oregon		May not be available for State use?	Link
Monitoring Data (per type)		Explore, access and monitor different aspects of water information such as streamflow gauges, water quality, and weather data at a specific location. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia, Alberta		Not currently owned by Oregon	Example
Streamflow Depletion		Estimates the depletion of water from lakes, rivers, and streams due to groundwater withdrawals. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia, Alberta		Not currently owned by Oregon	
Water Use Analytics		Water usage and allocations information for any region. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia, Alberta		Not currently owned by Oregon	Example
Watershed Reporting		Provides a detailed summary of the watershed characteristics such as seasonal water availability, existing water rights, environmental flow needs, elevation, land cover, climatic conditions, as well as predictions of climate change impacts. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia, Alberta		Not currently owned by Oregon	Example
Cumulative Diversion Analysis		Evaluates the impact of natural variability and existing water demand for a new proposed diversion of surface water. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia		Not currently owned by Oregon	Example
Equivalent Clearcut Area (ECA)		Supports the retrieval and analysis of data describing 40 years of annual disturbance for any watershed, with the ability to account for forest regrowth. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia		Not currently owned by Oregon	Example

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
Groundwater Reporting		Comprehensive summary of groundwater knowledge for a user-defined area integrating dozens of sources of information. Additional details in Foundry Spatial Modules tab.	Foundry Spatial	British Columbia		Not currently owned by Oregon	Example
Western States Water Data Access and Analysis Tool (WestDAAT)	Maps, Data, Charts	West wide aggregation of state data	Western States Water Council	Western US			Link
StreamBank Toolkit			The Fresh Water Trust?			May not be available for State use?	Here
Tualatin River Watershed Navigator			Tualatin Soil and Water Conservation District & Clean Water Services				Link
Clean Water Services Maps & Data			Clean Water Services				Link
Boundary Sync		Boundary Sync is an open-source tool that enables utilities to create, digitize, and update their service area boundaries.	IoW, Duke				N/A
CA Freshwater Harmful Algal Bloom (FHABs)		Tool that enables users to view non-profit, tribal government, and state data on FHABs in bodies of water throughout California.	CA? (Open Source)			Recommended by IoW. Blog post with more information. https://internetofwater.org/blog/putting-tribal-community-science-data-to-work-in-state-systems/	Link
NC Water Supply Dashboard		integrates water use data from multiple utilities as well as federal and state data on water availability to improve water management in the state of NC.	NC? (Open Source)			This tool is open-source and easily transferrable to	Link

Name	Type	Description	Owner(s)	Geography	Contact	Notes	Access
						other states and has been recently adopted by the City of Boerne in Texas.	
Kisters Web Portal and Query Services	Maps, Data, Charts, API	Integrates water monitoring location and observation (sample and time series data)	Kisters (Commercial off the shelf)		https://www.kisters.net	OWRD uses, at least for groundwater monitoring	Example
Network Linked Data Index	API, Metadata	Discover monitoring locations of contributing organizations that are upstream or downstream points of interest according to NHDPlusV2	USGS	CONUS	USGS	Any data can be contributed	Link
National Groundwater Monitoring Network	Data	Provides standardized water level data and monitoring well metadata from 280 sites in Oregon, and many more nationally	USGS, OWRD in OR	United States	USGS		Link
Planet Planetary Variables	Data	Daily soil water content and surface temperature data derived from satellite imagery at 100m resolution	Planet	Global	Planet, Center for Geospatial Solutions at the Lincoln Institute of Land Policy	Commercial	Link
HydroClient	Data, API	Federated access to time series data for a variety of water and meteorological observations and models from over 400 sources	CUAHSI	Global			Link
Oregon Drinking Water Data Online	Tables	Drinking water quality testing data	OHA	Oregon	OHA		Link

Appendix L: Data Models Relevant to Oregon Water Data Portal

Data models describe how particular real or informational entities should be represented and related to each other in a standardized way. They can be used to specify how to structure data about a particular type of entity, including required metadata and data elements. They can be as simple as a list of required and optional column headings for a spreadsheet (e.g., name, address, and phone_number to represent a list of contacts), or they can represent complex relationships between entities, such as the relationship between a streamgage, its particular sensor equipment, the particular river segment it is on, and the organization maintaining it. In any case, data models typically include a list of entity types, a list of variables that are required or optional for each entity, and definitions for what types of values (e.g. numeric, integer, free text, text values from a specific code list, datetime, URL, etc) are allowed to populate each variable.

Data models for water data can be highly complex to implement depending on the type of information that needs to be represented. In the remainder of this document, references to official data model standards for common water data types are given.

Artificial Geospatial Polygons

These types of features are commonly Boundaries, Jurisdictions, Service areas, any type of area that is fundamentally drawn by humans and does not reflect a natural delineation such as a watershed or water body. The Federal Geographic Data Committee (FGDC) publishes a data standard for this kind of data.

https://www.fgdc.gov/standards/projects/framework-data-standard/GI_FrameworkDataStandard_Part5_GovernmentalUnitBoundaries.pdf/at_download/file

Surface Hydrography, Water Bodies and Streams

These types of features represent surface hydrology and hydrography, and include features such as stream flowlines, catchments, confluences, and diversions, as well as select infrastructure types that may be located at surface waters, such as dams, weirs, barrages, diversions, and monitoring equipment. The Open Geospatial Consortium publishes a data standard and conceptual model for representing such features.

https://docs.ogc.org/is/14-111r6/14-111r6.html

Surface Water Monitoring Locations

Surface water monitoring locations are places where one or more sensors or sampling activities have ever been placed and where observations about a body of water have been taken, or for which a model or forecast has generated data. While such locations are often represented in public agency data systems as simply a point location with a name and perhaps another identifier, several attributes of these locations are desirable to catalog. These include:

- the exact location within a stream network, as represented by a digital stream network dataset such as the National Hydrography Dataset
- The parameters or Observed Properties for which data has been collected or modeled
- The exact methods, such as sensor type, sampling method, or model that was used to generate the data
- The period of record and/or intended time spacing (eg intermittent, monthly, daily, hourly, etc.) for which data is collected for each parameter at the location

The Open Geospatial Consortium publishes a data standard and conceptual model for representing surface water monitoring locations as well as the observation data about them.

https://portal.ogc.org/files/?artifact_id=57222

Groundwater Features and Monitoring Locations

Groundwater hydrology features include aquifers, hydrogeologic units, as well as their monitoring locations such as wells, and relationships between groundwater features and surface water features, as well as observations or modeled data about them. The Open Geospatial Consortium publishes as data standard and conceptual model for representing and exchanging groundwater data.

https://docs.ogc.org/is/19-013/19-013.html

Appendix M: Oregon Water Data Portal Use Cases and Personas

Rationale

The Oregon Water Data Portal will deliver water and water-related datasets and information in a single, interactive online location, and will also help users synthesize and combine water data and information in new ways. The deliverables are driven by the needs of Oregon's water data users. Therefore, it is crucial to identify potential customers of the portal and understand their needs. Portal development has taken a user-focused approach, including a survey and extensive stakeholder and tribal listening sessions, which identified a diverse suite of potential use cases. The pilot project will include steps to build out a selection of use cases, including a clear objective (question); user persona; information about the source and current status of existing datasets; and the data workflow that will be required to publish and synthesize data to answer the users' question.

This section provides a few high-level examples of the personas anticipated to use the Portal, and outlines some deliverables as examples of what the Portal will provide.

Personas

Personas are frequently used in software and website development. They are fictional examples of the anticipated users for the new system or online planning tool. A suite of personas are included with this Report to provide an overview of the diverse types of users and user needs anticipated to make use of the Portal. Each persona description below provides information about the users' background and goals; their needs and pain points that bring them to seek out the Portal; and some example deliverables that the Portal could provide to meet their needs.

Introducing…

- Aubrey the A Student
- Scott the State Employee
- Fred the Family Farmer
- Dave the Decision Maker
- Padma the Project Manager
- Edwin the Engineer

Aubrey the A Student

Age: 16

Occupation: Student

Education: High School

Location: Wilsonville, OR

Background

Aubrey is a student at a local high school in Oregon. She's been tasked with completing a research project on the use of water by big data processing centers in Oregon for her AP Environmental science class. This is her first research project.

Goals

- Provide an informed presentation on a relevant project for discussion among her peers in class
- Get an A on the project
- Further her understanding of her chosen topic

Pain Points

- Unsure what geography to focus on (within Oregon)
- Difficulty in finding relevant and accurate water data
- Difficulty interpreting existing data
- Lack of supporting visual material

Needs

- An easily accessible interface to search for relevant data
- Visual tools to aid in understanding
- Clear way to understand and cite sources

Examples of Potential OWDP Deliverables

- Map of water bodies throughout the state, including local jurisdiction boundaries, so that her project can include a tangible example and real-world regulatory considerations
- Information about the organizations involved in managing water and providing recommendations for siting the proposed data processing facility
- List of datasets on water quantity and water quality within the selected area

Scott the State Employee

Age: 45

Occupation: Natural Resources Specialist with an Oregon State water agency

Education: Masters

Location: Salem, OR

Background

Scott has devoted his career to public service. He's currently working as a team lead at one of the state of Oregon's natural resources management agencies. He regularly works with monitoring specialists at his agency, as well as monitoring coordinators at other state agencies. He also works with contractors and researchers and develops information to inform policy briefings.

Goals

- Use accurate and up-to-date water data to inform policy briefings, legislative requests and public information requests related to water management in the state
- Contribute to education and outreach efforts about water issues and water conservation
- Collaborate with other agencies, scientists and researchers to understand how water is being managed and monitored
- Maximize efficiency among data collection efforts

Pain points

- Difficulty in finding, accessing and using large and complex datasets related to water
- Lack of a central location for water data that is easily accessible and searchable
- Difficult to understand who is responsible for what area of management
- Difficulty in collaborating with other state agency representatives, scientists and researchers

Needs

- A catalogue to find who is responsible for what area of water management
- A way to access and use water data online
- A way to easily search and filter large datasets to find the specific data needed
- Tools and resources for collaborating with other agencies, scientists and researchers on water-related projects and analyses

Examples of Potential OWDP Deliverables

- Maps and tables of water parameters, specific to an area of interest. Parameters could include water quantity, water quality and aquatic habitat. One example would be to understand the current status of water temperature using historic data; determine whether there are changes over time; and determine where new water temperature monitoring is planned.
- Information about who to contact to learn about planned data collection efforts in the area of interest

Fred the Family Farmer

Age: 63

Occupation: Farmer; Business Owner

Education: High School

Location: Ontario, OR

Background

Fred is a grass seed and alfalfa farmer. He's one of the state's largest exporters of high-quality alfalfa. Despite his lack of formal education, he's been a highly successful business owner and is well respected across the region.

Goals

- Grow high-quality grass seed on his farm to sell to local landscapers and golf courses
- Maximize crop yields and profits
- Keep up with industry trends and best practices

Pain points

- Limited access to information on water management and conservation techniques specifically tailored to agriculture
- Limited time to find, access and apply scientific data
- Limited resources to invest in analysis, expensive equipment or technology to monitor and optimize irrigation

Needs

- Practical, easy-to-understand resources on water management and conservation for grass seed farming
- Access to local and up-to-date weather and water data to inform irrigation and fertilization decisions
- Information on financial assistance or cost-effective technology for monitoring and optimizing irrigation

Examples of Potential OWDP Deliverables

- Annual precipitation and stream flow data for the local area
- Anticipated climate impacts to precipitation and stream flow in the area of interest, and information about how the parameters are anticipated to change throughout the season

Dave the Decision-Maker

Age: 58

Occupation: Representative, Cattle Rancher

Education: Bachelors

Location: John Day, OR

Background

Dave is a newly elected representative in the state of Oregon and has just been appointed to the Environment and Natural Resources committee. He decided to run for office after hoping to make a difference in his community. He grew up in rural Oregon; left for a few years to attend Oregon State University before returning to work a successful career managing his family's cattle ranch.

Goals

- Understand what water data is available, and how to find it
- Understand how Oregon water management agencies are operating; what information they produce and what additional information is needed to make decisions about how to allocate resources

Pain Points

- Concerned that state agencies are not making efficient use of public funds
- Not a subject matter expert and occasionally receiving conflicting information from interest groups

Needs

- A recommendation for the most current and comprehensive source of data and information about water in Oregon
- To be able to connect to the relevant management agencies and programs to request more detailed information or analysis

Examples of Potential OWDP Deliverables

- List of parameters and datasets that water managers use to make allocation decisions
- Description of what agencies manage the different types of water data
- Information about data quality control, and assurance that published data has met the requirements

Padma the Project Manager

Age: 37

Occupation: Project Manager

Education: Masters

Location: Lincoln City, OR

Background
Padma has been working at a non-profit watershed council for over 10 years. She has a bachelor's degree in biology and a master's degree in ecology. Padma is working with restoration project managers to submit grant applications to OWEB. OWEB has added new evaluative criteria to the agency's grant applications, asking for an assessment of the climate impacts on water-related parameters in the project area. Padma is also passionate about environmental conservation and wants to make a positive impact in her community, so she is also looking for information sources to help with environmental education and outreach.

Goals
- Collect and analyze water quality data to monitor and improve the health of local waterways
- Demonstrate the climate benefits from proposed restoration and watershed monitoring projects.
- Collaborate with community partners to promote environmental conservation and stewardship
- Develop and implement effective environmental education programs for students and community members

Pain Points
- Limited funding and resources to support the organization's programs and initiatives
- Difficulty in collecting and analyzing water quality data due to limited staff and technical expertise
- Finding ways to engage with and educate community members who may not be aware of or interested in environmental issues

Needs
- Funding and resources to support the organization's programs and initiatives, including staff and equipment to collect and analyze water quality data
- Information to respond to questions about the climate impacts on the water related parameters in the proposed project area.
- Training and technical support to effectively collect, analyze, and share water quality data with stakeholders
- Strategies and resources to engage with and educate community members about environmental conservation and stewardship in a way that is accessible and relevant to them.

Examples of Potential OWDP Deliverables

- Information about current condition of water quantity; water quality; and fish habitat in the proposed project area. For example: A table listing water temperature information at a proposed project site, including details about data source and seasonality.
- Information about how water quantity, water quality and fish habitat are projected to change under climate impact scenarios. For example: A table showing how water temperature at the project site is anticipated to change under different climate forecasts (including the data source for downscaled climate models; and seasonality).

Edwin the Engineer

Age: 47

Occupation: Water Resources Engineer

Education: Masters

Location: Portland, OR

Background

Edwin is a water resources engineer in Portland, OR. They oversee designing, maintaining, and managing the city's municipal stormwater and sewage system. They're tech-savvy and would like to plan in advance and make decisions to minimize flood risk. They want to be able to present the most current industry trends and recommendations to the City.

Goals

- Design & implement urban water resources projects
- Support community response to emergencies
- Ensure safe operation of urban water infrastructure
- Minimize costs related to repair & rehabilitation
- Ensure optimal water quality for public safety

Pain Points

- How are stormwater systems impacted
- Lack of real-time and forecast information
- Data and infrastructure systems seem outdated, but stakeholders want modern recommendations

Needs

- Short-term risk to stormwater & sewer systems
    - Which pumps to activate to reroute the flow?
    - Where to hold the volume until flooding subsides?
    - How will loss of power affect system?
    - Estimation of damage & restoration costs
- Long-term system design for reducing flood risk
    - Assess vulnerability of water infrastructure
    - Reduce risk of future overflows

Examples of Potential OWDP Deliverables

- Long-term datasets about streamflow
- Information about precipitation and projected impacts under climate change scenarios
- Information about the status of water infrastructure and water intake locations

Data Modernization Guidance for Water Sector Public Agencies

Internet of Water

Contents

INTRODUCTION

In 2016, the Water Policy Program (WPP) at the Nicholas Institute for Environmental Policy Solutions at Duke University launched a nationwide effort to modernize our nation's water data infrastructure. The Internet of Water project (IoW) began with a dialogue series in partnership with the Aspen Institute and has evolved into close engagements with those in the water sector at every level, from federal to state to local policy makers, to consultants and engineers, to local water managers in both urban and rural communities, including public water utility operators and managers, to irrigators, farmers, and ranchers. The results of these engagements are now implemented in four key states (California, New Mexico, North Carolina, and Texas) in a variety of pilot programs. A common theme among these pilots is the need for and challenges surrounding data infrastructure modernization. What is clear from this work is that resilient water management requires modern data infrastructure.

The following Implementation Guide is the result of the WPP's Technology Adoption Research Project. The Technology Adoption Research Project follows 18 months (2019-2021) of pilot engagements and focus groups conducted by the WPP IoW team at Duke University. In addition to already existing best practices in the field of digital transformation, the engagements from our four pilot states provided an opportunity to work closely with public agency partners in these states, and to observe how their agencies adopt new technology, and in particular, their challenges in doing so. We also conducted several focus groups to talk directly with a diverse range of public agency employees about their experiences working with data in their agency, challenges and barriers to improving water data infrastructure, their observed benefits and successes around modernization efforts, and recommendations on how they feel their agencies can modernize.

The results of these best practices and observations follow, along with a detailed roadmap of recommended actions that public agencies can take to implement the Water Data Sharing Pilots outlined in the 2021 Infrastructure Bill, and finally, estimated costs associated with such activities, modeled from the WPP's IoW pilot projects.

CONSIDERATIONS FOR PUBLIC AGENCIES

Generally, challenges with technology adoption and modernization in public agencies are rooted in four causes:

1. **Lack of Demand:** In the private sector a demand signal, powered by the market, indicates a desire for modernization. In the public sector, no such demand signal exists to drive action; instead the driver for action is the need to deliver the 'public good' in a manner that is effective and efficient.
2. **Necessary Transparency:** The private sector is not necessarily better at technology development. When the private sector makes a mistake or fails at technology development, it is not public knowledge. However, in the public sector, transparency requires that attempts and failures are public knowledge, often leading to questions surrounding appropriate use of public funds. Therefore, public agencies and the people that lead them are often **risk averse** and incentivized to maintain the status quo.

NOTABLE TERMS

Digital or data transformation: a fundamental change in how organizations think about, collect, and manage data, resulting in the modernization of data into a service rather than a single-use product.

Technology adoption: the implementation of the technological systems necessary to modernize an organization's data systems

Modernization: to bring a process, organizational structure, regulation, or mission up to a current standard. While standards do evolve over time, modernization does not necessarily mean "new." Modernization also does not mean "digital," as there are some processes that are not accessible or improved by digital formats (for example, services for populations without easy access to the Internet). It is also important not to equate modern with "permanent," as truly modern systems are those that resilient to contextual changes. A modern system should constantly reassess how well it responds to the changing context around it. This adaptability makes modern systems simple, usable, useful, reliable, and resilient.

3. **Competing Priorities:** Private organizations can identify and focus on a priority based on a market-driven organizational mission, which can be revised and changed in response to market demand. In contrast, the mission of public agencies is often codified in law and often more expansive than those from private agencies. This can create competing priorities that make cross agency coordination or centralized management difficult.

4. **Generational Conflict:** Public agencies often have multiple "generations of technology," under one roof. This means that cultural conflicts are the cause of much resistance to technology adoption and modernization within and between agencies. Today's systems are not only built upon legacy technologies, but also the *thinking* that created them.

Because of the challenges specific to public agencies, it is critical to the success of modernization efforts that technical frameworks and implementation plans developed through the process are done so within the context, capacities, and capabilities of the public agency. Modernization efforts require coordination across the divisions of the public agency and should be carried out in accordance with the organizational structures that commonly exist.

RECOMMENDATIONS

Best practices in the field of digital transformation, lessons learned from community and public agency engagement during the pilot period of the IoW project, as well as survey and interviews conducted during the Technology Adoption Research Project, provide the basis for the following recommendations:

1. **Identify and provide incentives for data modernization.** Because human capacity, digital infrastructure, and financial resources are limited for public agencies, an important mechanism for water data infrastructure modernization is to tie grant or other funds to the development of and compliance with standards for improved accessibility, interoperability, and modernization of public agency water data infrastructure. This would include grant programs offered by federal agencies, but also should include grants provided through philanthropic and other non-profit organizations. Documentation of standards and best practices for data modernization should be provided to grantors as guidance for incorporation into award requirements. While cultural barriers will not be resolved with incentives alone, the application of funds toward modernization can provide in-house demonstrations that can be persuasive to resistant leadership, particularly when

they result in improved employee efficiency. These demonstrations can also be used by agency leadership to champion water data modernization and urge policymakers to develop sustainable funding sources for these initiatives.

2. **Connect information delivery with policy outcomes.** While leaders often tout "data-driven decision-making," participants in the study and pilot period engagements struggled to provide evidence of decisions directly informed by data. This may be the result of cultural or behavioral process in which decision-makers, who have historically not had access to information delivered in meaningful ways, continue to fall back on their traditional methods of decision-making. To understand how data are informing decision-making, agencies need to ensure clear avenues of information delivery are accessible to decision and policymakers, then seek out and compile evidence about how their data modernization efforts have directly improved or informed decisions. These findings will promote further support of data modernization, as those who are tasked with resource allocation are also directly benefiting from the modernization process.

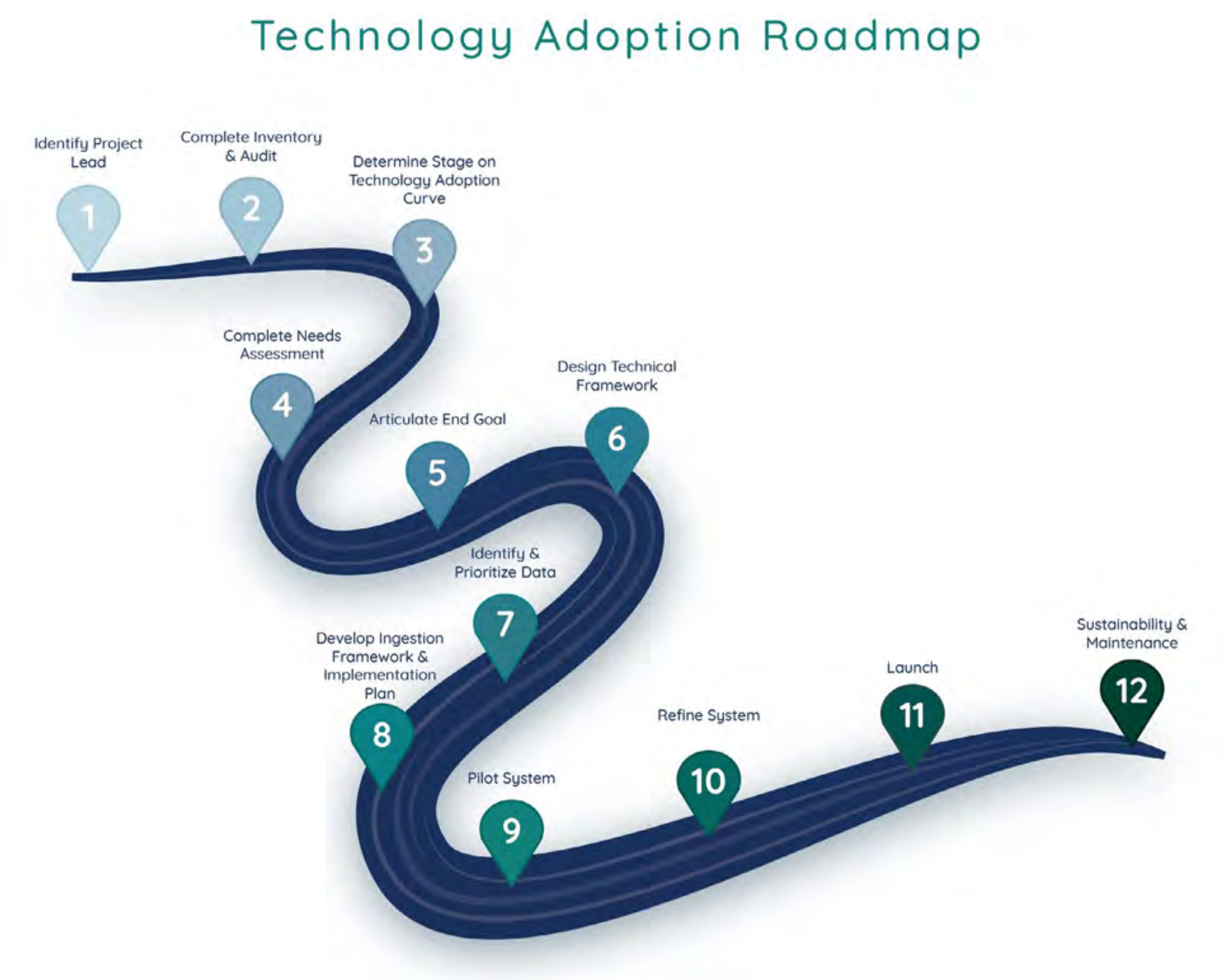
3. **Resolve issues with procurement processes.** Guidelines should be developed for agency procurement contracts to ensure that contractors follow modern data principles, meet agency needs for sharing and interoperability, and build in plans for sustained maintenance and maturity of systems.

4. **Identify leader for cross agency compliance and establishment of standards.** Executed contracts should be overseen by a Project Lead, as described in Observations and Lessons Learned #5 of the Technology Adoption Research Project Report.

5. **Invest in modernization and technology adoption training for water leaders.** Communication and training programs designed to inform decision and policymakers about how to interpret and understand data, apply data to decision-making, and appreciate the need for and power of modern data infrastructure will narrow the cultural divide between different generations of technology, equip leaders with the knowledge they need to engage with their agency staff about modernized data infrastructure, and remove much of the resistance and fear over technology adoption. Modeled after the Harvard Evidence for Policy Design program, water data modernization and technology adoption training for water leaders would deploy teams to states for in-situ training. Funding for such a program would come from a combination of public grant and philanthropic funds.

ROADMAP FOR MODERNIZING WATER DATA INFRASTRUCTURE

The following roadmap incorporates best practices for data ingestion, adapted from private industry (See Snowflake, Striim, and Qlik), and incorporates agile development guidance from the U.S. Digital Services Playbook. Additionally, the following represents public agency-specific guidance developed during the IoW's pilot studies and the observations and lessons learned from the Technology Adoption Research Project, all in accordance with the IoW Principles.



1. **Identify Project Lead**
    - Assign a project lead(s) responsible for the implementation of the water data modernization effort. This person(s) should have technical project management experience and appropriate knowledge of water data to

navigate engagement with users and stakeholders.

2. **Complete Asset Mapping, Inventory, and Audit**
    - Conduct asset mapping to understand the different skills, capacities, and capabilities from different teams across agencies or agency divisions. Understanding in-house capacity is important in creating an efficient, effective, and sustainable modern data infrastructure.
    - Conduct an inventory of current systems and platforms. (See the IoW's Water Data Inventory guidance).
    - Fundamental questions during this process are what does the existing system look like? What technical skills currently exist within the agency? What capacity do those with technical skills have to devote to modernization efforts?

3. **Determine Stage on Technology Adoption Curve**
    - In reference to the Technology Adoption Framework (Appendix A) determine current agency location along the technology adoption curve.

4. **Complete Needs Assessment**
    - Conduct internal engagement regarding barriers or challenges to movement along the technology adoption curve and identify internal and external resources that could be allocated to the modernization effort.

5. **Articulate End Stage Goal**
    - Set an end-goal for the stage on the Technology Adoption Curve. This determination should be based upon the starting point, needs assessment, and agency capacity and capability as identified in previous steps of the roadmap. Not every agency will move directly to Stage 4, for example. It is important to identify a realistic goal and end stage for data modernization.

6. **Design Technical Framework**
    - A technical framework document defines specifications and implementation for data modernization. The IoW recommends the following specifications:
        - » Metadata is published on the web, ideally in compliance with data-on-the-web best practices from W3C
        - » Data is available for download in bulk and/or API in OPEN, non-proprietary formats
        - » To the extent possible, data bulk download formats and/or APIs will follow community standard patterns (e.g. OGC standards); metadata

will be included with data and of sufficient quality for users to make judgments as to what purposes the data is fit for use; and data content will reference publicly available definitions, controlled vocabularies, and data standards appropriate to the data's subject matter

- » Data will be published and identified with version records and made available (to authorized users) so that workflows can be reproduced
- » Open formats data content standards, and data exchange or API standards for similar kinds of data should reference community, national, or international standards where practicable (See IoW Data 101 Guidebook).

- A technical framework should also:
  - » Be informed by engagement and needs assessment (Step 4)
  - » Responsive to current location on technology adoption curve and desired end stage (Step 5)
  - » Outline data standards, metadata standards, and software needs and acquisition plan (Step 6a)

7. **Identify and Prioritize Data**
   - Many public agencies hold large amounts of data, covering decades in time. Successfully modernizing data infrastructure requires a strategic approach to identify and prioritize data to be incorporated into a newly modernized data infrastructure. This is particularly important for legacy data. Not all legacy data need be digitized; therefore, datasets of most need should be prioritized for digitization. In addition, datasets that are commonly shared internally or externally should be prioritized for incorporation into a newly modernized infrastructure to address issues of version control and challenges with cross-agency collaboration as outlined in the Technology Adoption Project Report.

8. **Develop an Ingestion Framework and Implementation Plan**
   - An ingestion framework is a process for transporting data from various sources to a storage repository or data processing tool (See Snowflake, Striim, and Qlik). Data ingestion processes should be developed based on the data architecture, the volume of data to be ingested, and the frequency of data ingestion. An Ingestion Framework articulates these processes as well as any integration challenges (such as data compatibility and standardization) that are required for successful data modernization.
   - An Implementation Plan is a document that articulates an organizational

strategy for the execution and sustainability of a data modernization effort. An implementation plan consists of:

» an engagement strategy (how to identify and engage with targeted stakeholders or users of the newly modernized data system – these may be internal or external stakeholders),

» long term care and maintenance plan for the resulting systems or products,

» privacy restrictions and guidelines,

» funding requirements,

» associated staffing needs, and

» monitoring and evaluation strategy for impact assessment.

9. **Pilot System**

- In accordance with agile development best practices (See U.S. Digital Services Playbook), the development of new systems must include engagement with users and stakeholders to assess usability, functionality, and efficiency of the modernized system.
- Steps 9 and 10 articulate an iterative process for engagement and refinement. These steps should be repeated until such point in which the new system or product meets user expectations.

10. **Refine System**

- Based on feedback and lessons learned from the engagement in Step 9, refine the system.
- Return to Step 9 to further refine.

11. **Launch**

- Promote the system through internal and/or external communications and trainings to ensure that it is widely adopted by agency staff.

12. **Sustain, Maintain, and Improve**

- Perform routine maintenance to ensure system is sustained over time.
- At intervals defined in the implementation strategy, evaluate the newly modernized system, measuring and articulating impact and identifying opportunities for improvement.

BUDGETING FOR WATER DATA MODERNIZATION

In 2019, the New Mexico state legislature passed the New Mexico Water Data Act. The act established the Water Data Initiative within the New Mexico Bureau of Geology and Mineral Resources. A steering committee of representatives from partner agencies decided on a tripartite implementation structure, with specific responsibilities assigned to various work groups. User engagement was a critical component of the Water Data Initiative, designed to inform understanding of New Mexico agency capacity, assess needs of both agencies and stakeholders, and guide the development of public-facing data platforms. The New Mexico Water Data Initiative (NMWDI) provides a reliable model for other, similar initiatives because it required cross-collaboration between state agencies, funded a lead agency, incorporated stakeholder engagement, and resulted in a public facing platform to facilitate data integration and interoperability.

The initial funding provided for the NMWDI was $435,000 per year for years 1 and 2 of the initiative. The estimated cost for years 3-5 is an additional $500,000 annually to fully support an IT and operations team with up to four full-time dedicated staff who will develop and maintain the cyberinfrastructure and connections to data producers and users. The six other agencies named in the Water Data Act also requested funding. Their funding requests varied significantly depending upon existing agency capacity, existing data infrastructure, and the volume of data managed by the agency. Initial investments to modernize data infrastructure for these agencies averaged $410,000, and recurring annual costs averaged $421,330.

Using the New Mexico Water Data Initiative as a guideline, an estimated cost for implementation is $450,000 annual startup costs for the lead agency and $410,000 annual startup costs for each participating agency. Recurring costs are an estimated $500,000 per year for 5 years for the lead agency and $430,000 per year for 5 years for each participating agency.

APPENDIX A

STAGE 1	STAGE 2	STAGE 3	STAGE 4
• Most data are collected in paper formats and stored in filing cabinets. • Staff manually access and compile data. • Staff can not create data visualizations or analytics • Data are not standarized • Data quality is not documented • Staff cannot integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies.	• Most data are collected in digital formats and stored on local computers. • Staff manually access and integrate data. • It is difficult for staff to create data visualizations and analytics • Data are not standarized • Data quality is documented in an unstandarized way that is not legible to those outside the division or agency • It is difficult for staff to integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies.	• Most data are collected in digital formats and stored in a shared database/s. • Staff access data through one or more databases and manually integrate data. • It is difficult for staff to create data visualizations and analytics • Data may not be standarized across divisions or agencies • Data quality is well documented • It is difficult for staff to integrate their data with data from other divisions or agencies • It may be difficult to share data across or between agencies.	• Data are collected in digital, machine-readable formats and stored in a shared database. • Staff access and integrate data through APIs. • Staff can easily create data visualizations and analytics • Data are standarized across divisions and agencies • Data quality is high and is well documented • Staff can easily integrate their data with data from other divisions or agencies • It is easy to share data across or between agencies.

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Technology Adoption at Public Agencies

Identifying Challenges and Building Opportunities to Modernize Public Water Data Infrastructure

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Summary

Modernizing public agency water data infrastructure depends not only on technology adoption, but also an organizational and cultural evolution in how data are managed, shared, and deployed for decision-making. The Duke Internet of Water (IoW) Technology Adoption Program (TAP) was designed to address both aspects of water data modernization for public agencies. The program includes introduction to and training on available technologies and close engagement with public agency staff and leadership to facilitate the organizational transformation needed to adopt modern technologies and approaches. This report details efforts by the Duke IoW team to identify the challenges public agencies face when modernizing their water data infrastructure and recommends a roadmap for technology adoption at public agencies based on nationwide surveys and interviews, best practices identified by public interest technologists, and the principles of modern data infrastructure. The report also includes a pilot case study from the New Mexico Water Data Initiative and resources for public agencies to pursue their own initiatives.

INTRODUCTION

In the United States, water data are collected by a variety of public agencies, each with their own data standards, formats, platforms, and sharing protocols. There is variability not only among different states, but also among public agencies within the same state, and even departments within the same public agency. This data fragmentation makes it difficult for potential users to find the data sets they need, and once they've been found, to standardize them so they can integrate with other data sets. As a result, decision-makers are often forced to make judgments without the benefit of a complete picture of their water resources (The Aspen Institute 2017).

To build an accurate water picture, public agencies need to modernize their water data infrastructure. **Modern water data infrastructure is an integrated system of information technologies, which includes common standards, formats, and tools designed to make water data easy to find, access, and use.** Modern water data infrastructure does not necessarily have to be *new*, nor does it have to be *open*. Rather, modern data infrastructure is optimized to meet the needs of all users. In some cases, the newest technology may not be the most accessible. The rapid pace of digital innovation and environmental change causes users' needs to change rapidly as well. Modern water data infrastructure is designed to adapt to these evolving needs.

The following is the result of Technology Adoption Research Project conducted by the Internet of Water (IoW) team, part of the Water Policy Program (WPP) at Duke University's Nicholas Institute for Energy, Environment & Sustainability. The project follows 18 months (2019–2021) of pilot engagements and focus groups conducted by the Duke IoW team. The project was developed to improve understanding of the current state of public agencies' water data infrastructure and how modern technology is adopted at those agencies. Targeted research about technology adoption at public agencies is needed given their unique characteristics, structures, and processes.

Over the course of the project, the Duke IoW team conducted a survey and follow-up interviews with the following goals:

- Assess the current state of water data infrastructure at public agencies
- Learn more about the process of technology adoption within public water agencies
- Document the successes and challenges of technology adoption
- Develop an adoption curve to visualize the technology adoption transition in public agencies

In collaboration with the Water Data Exchange of the Western States Water Council, the American Water Resources Association, the American Water Works Association, the Association of Clean Water Administrators, the Association of State Drinking Water Administrators, and the Environmental Council of States, the Duke IoW team administered a 23-question survey via listservs and social media outlets, followed by in-person interviews of participants. The results revealed technology adoption challenges unique to public agencies and highlighted the need to develop clear, actionable solutions to those challenges and targeted initiatives to help public agencies implement those solutions.

Notable Terms

Digital or data transformation: A fundamental change in how organizations think about, collect, and manage data, resulting in the modernization of data into a service rather than a single-use product.

Technology adoption: The implementation of the technological systems necessary to modernize an organization's data systems.

Modernization: To bring a process, organizational structure, regulation, or mission up to a current standard. While standards evolve over time, modernization does not necessarily mean *new*. Modernization also does not mean *digital*, as there are some processes that are not accessible or improved by digital formats (for example, services for populations without easy access to the internet). It is also important not to equate modern with *permanent*, as truly modern systems are those that resilient to contextual changes. A modern system should constantly reassess how well it responds to the changing context around it. This adaptability makes modern systems simple, usable, useful, reliable, and resilient.

PROJECT SUMMARY

The Duke IoW team has ongoing collaborative projects with partners in four states: California, New Mexico, North Carolina, and Texas. This collaborative work provided an opportunity for us to observe how public agencies in these states adopt new technology and, in particular, the challenges they face when doing so. We also conducted several focus groups to talk directly with a diverse range of public agency employees from across the U.S. about their experiences working with data in their agencies, challenges or barriers to improving water data infrastructure, the benefits and successes of modernization efforts, and their recommendations for how their agencies can modernize.

To date, there has been little research exploring technology adoption by public agencies, and even less about those agencies that work in water management. This often contributes to misunderstandings and potentially ineffective proposals for solutions. An informal literature review conducted for this project in 2021 located few articles associated with technology adoption for public agencies in the water sector. Of 75,572 articles on technology adoption, 3,615 were specific to the water sector and 524 were specific to public agencies. Ultimately, only 23 articles addressed technology adoption among public agencies in the water sector. In many of those articles "technology adoption" focused on issues such as technical equipment and laboratory procedures. In addition, most articles on technology adoption for public agencies were international in scope, limiting their relevance to challenges faced by public agencies in the United States. The few articles that focused on the United States. were regionally specific and, therefore, not representative of national demographic distributions (see the Recommended Reading and Bibliography sections).

While there is a wealth of information on technology adoption across sectors and geographic scales, there has been very little work to understand how technology adoption in public agencies in the United States can improve the data infrastructure for water management. Given the dependence of effective water resource management on reliable, accessible, and usable data, more effort is needed to (1) understand the status of data infrastructure in public agencies, (2) document the specific challenges public agencies face when modernizing data infrastructure, and (3) develop proposed solutions and policy interventions to support such efforts.

CHALLENGES FOR PUBLIC AGENCIES

The COVID-19 pandemic has exposed many challenges regarding public agency technology adoption and modernization that the emerging field of public interest technology is addressing. Research into public interest technology provides important lessons learned and insights that can be applied to the water sector (see the Recommended Reading section).

Through the IoW start-up period (2017–2020), the Duke IoW team's engagement with public agency leaders and staff, as well as scholars in the field of public interest technology, revealed challenges associated with technology adoption in public agencies. These are rooted in four causes:

(1) **Lack of demand:** In the private sector, a demand signal, powered by the market, indicates a desire for modernization. In the public sector, no such demand signal exists to drive action. Instead, the driver of action is the need to deliver the "public good" in a manner that is effective and efficient.

(2) **Necessary transparency:** The private sector is not necessarily better at technology development. When the private sector makes a mistake or fails at technology development, it is not public knowledge. However, in the public sector, transparency requires that attempts and failures are public knowledge, often leading to questions surrounding the appropriate use of public funds. Therefore, public agencies and the people who lead them are often risk-averse and incentivized to maintain the status quo.

(3) **Competing priorities:** Private organizations can identify and focus on a priority based on a market-driven mission. This mission can change over time in response to changing conditions or the intention of donors. In contrast, the missions of public agencies are often established in law and frequently more expansive than those of private organizations. This can create competing priorities that make cross-agency coordination and efforts to centralize data management difficult.

(4) **Generational conflict:** Public agencies often have multiple generations of technology under one roof. This causes cultural conflicts and often results in resistance to technology adoption and modernization within and between agencies. Today's systems are not only built upon legacy technologies, but also the thinking that created them.

For data infrastructure modernization efforts to be successful at public agencies, it is critical that technical frameworks and implementation plans are developed within the contexts, capacities, and capabilities of the agencies involved. Modernization efforts require coordination across the divisions of the public agency and should be carried out in accordance with typical organizational structures.

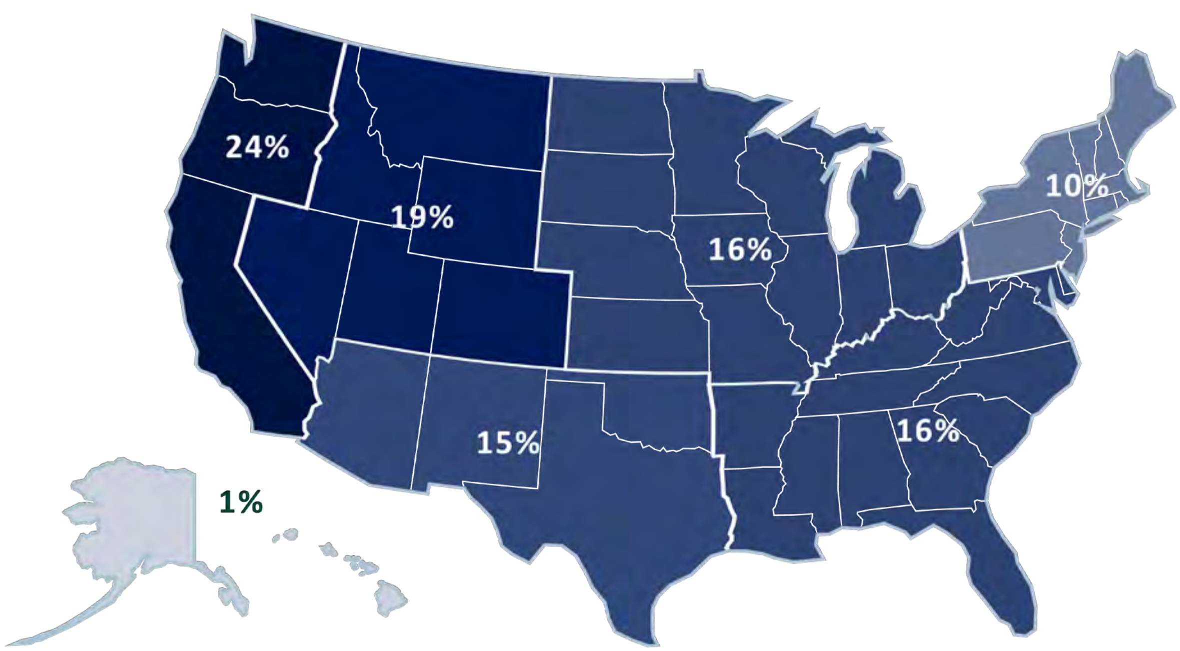
SURVEY RESULTS

The Duke IoW team and collaborating partners administered a 23-question survey (See Appendix B for survey questions) via listservs and social media outlets. The survey received 143 responses from public agency employees (federal, state, local, and tribal) representing each of seven broad geographic regions within the United States (Figure 1).

The survey captured responses from a variety of agency types, including water quality, water quantity, water planning, water rights and permitting, water pricing, water conservation, and others (e.g., water supply, enforcement, fish and wildlife), with the majority from water quality agencies (Figure 2).

Respondents also identified their role in working with data within their agency. These roles included data collection, modeling and visualization, decision-making based on water data, data management, and data requests. Within these roles, respondents were asked to categorize their experience working with data in their agency. Relatively few described their working experience with data as "excellent;" however, experiences with data collection as well as modeling and visualization were largely described as "good." Decision-making using data was described by roughly 60% of respondents as somewhat difficult, while nearly 90% of respondents described requesting water data as "somewhat difficult" or "difficult" (Figure 3). Difficulties with data-driven decision-making and requesting water data (particularly in cross-agency circumstances) also surfaced in the follow-up interviews as key areas for improvement.

Figure 1. Percent of respondents by region



Note: In this graphic we show the percentage of participants located in each U.S. census region. The number of respondents per region are as follows: Northeast: 13, Southeast: 22, Midwest: 21, Southwest: 20, Rocky Mountains: 25, Pacific: 32, Noncontiguous: 2.

Figure 2. Agency roles

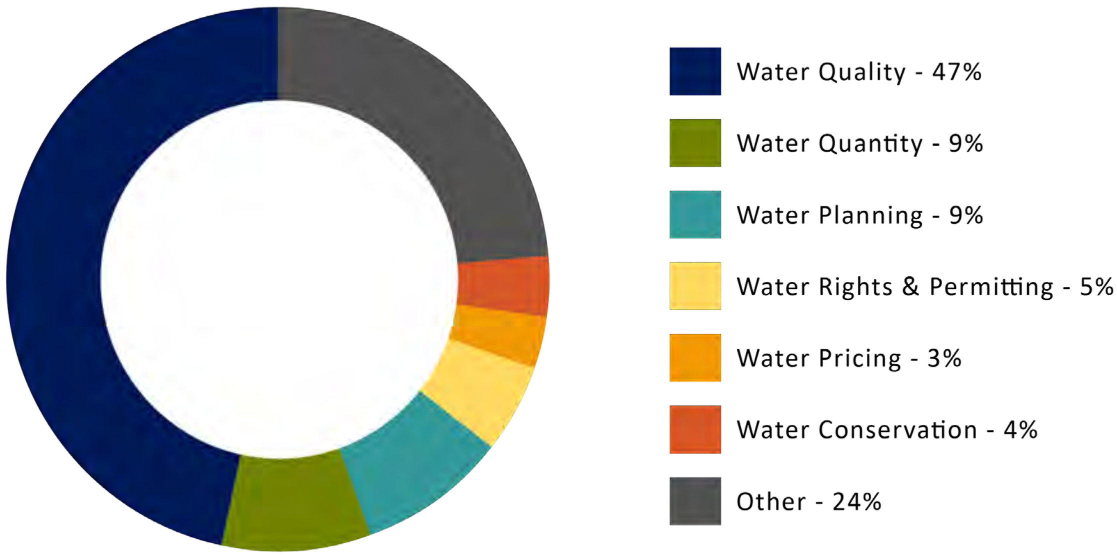
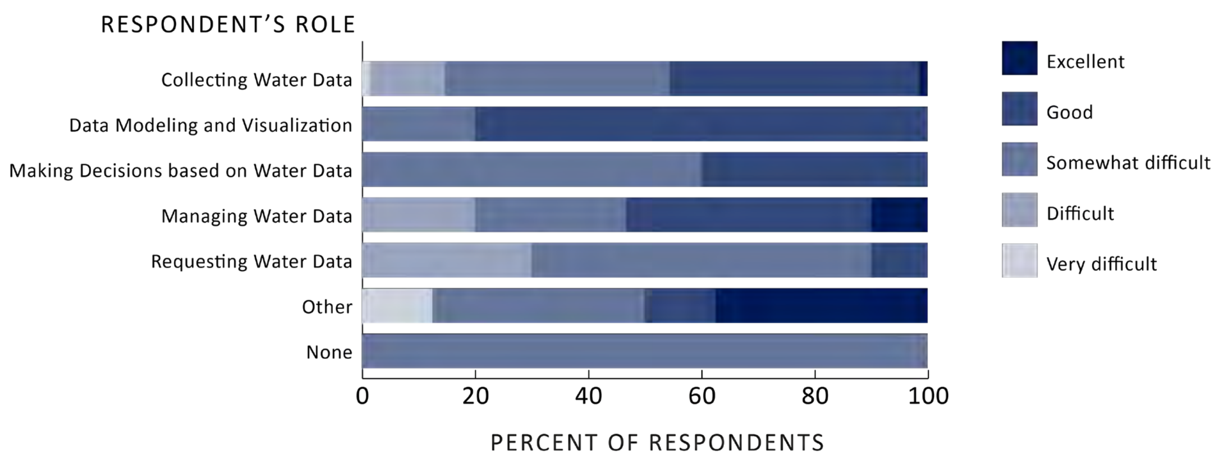


Figure 3. Described experience working with water data

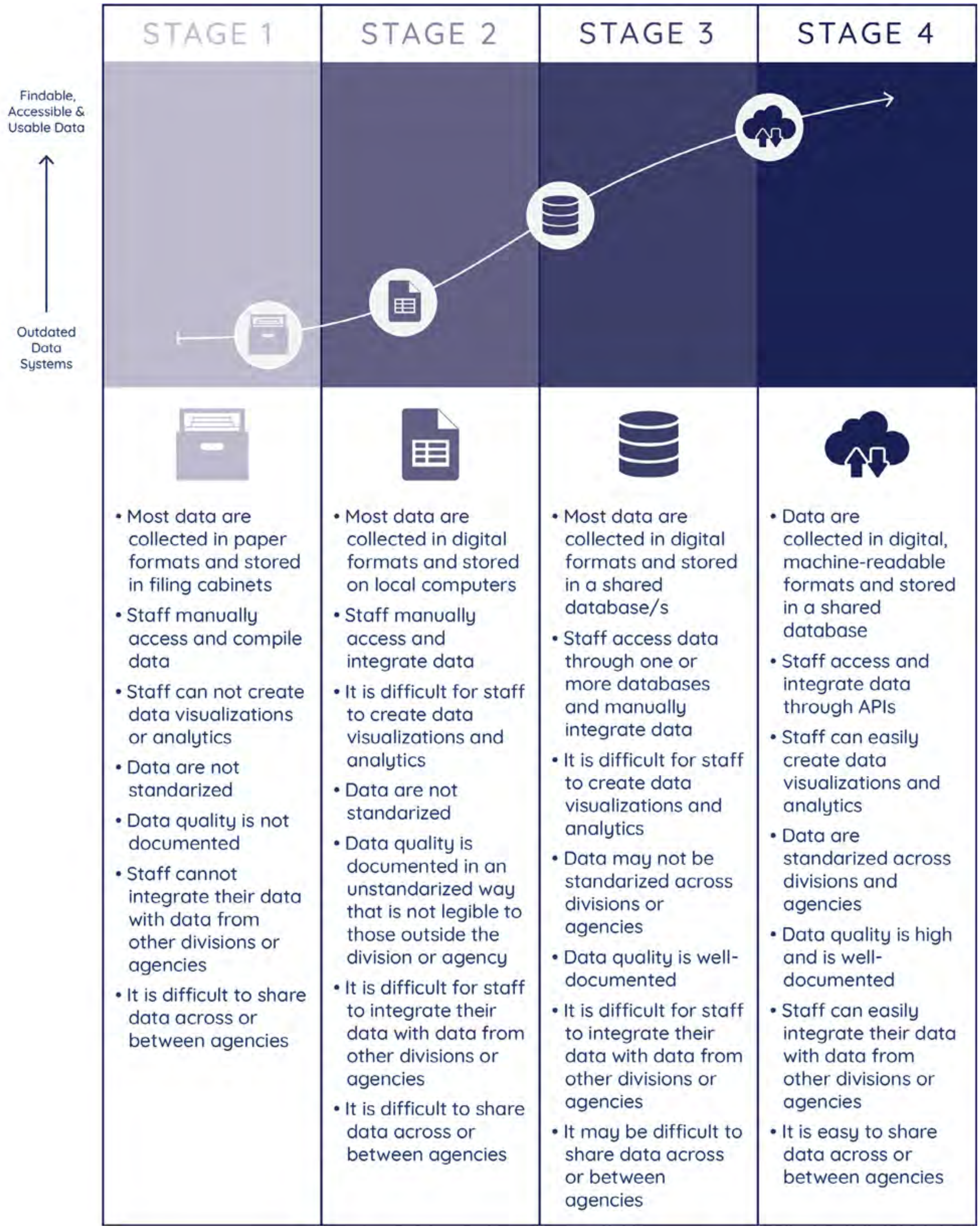


Note: We have broken out participants' self-described experience working with water data at their agencies by their job roles as related to data collection, management, or use.

Survey respondents were asked to consider their agency's water data infrastructure within a technology adoption curve (Figure 4).

This curve was developed initially by the Duke IoW team and later evaluated for accuracy using survey responses that compared how respondents classified their agency on the curve versus how they described the characteristics of their agency's water data infrastructure. For these survey questions, to comply with best practices in survey design, respondents were given seven choices:

Figure 4. Technology adoption curve



(a) Stage 1: Most reports and data are collected using paper formats and stored in file cabinets. Agency staff manually access and compile data upon request. Data are fragmented. Data are collected across many divisions within an agency and there is little ability to share data between divisions or agencies, and little knowledge of data collected by other divisions or other agencies.

(b) Somewhere between Stage 1 and Stage 2.

(c) Stage 2: Outdated data infrastructure and software exist, including local data servers that must be maintained by local staff. Data are not accessible from outside the agency. Data are fragmented and nonstandardized (e.g., variation of units, data names, etc. used within the agency).

(d) Somewhere between Stage 2 and Stage 3.

(e) Stage 3: A data infrastructure exists that allows for data sharing; however, the data are not always standardized or machine-readable. There is no easy method for creating visualizations and analytics. There may be duplicative systems across agencies, but they are not linked to each other.

(f) Somewhere between Stage 3 and Stage 4.

(g) Stage 4: A modern data management system exists that includes the ability to extract data from the system and conduct data visualization and analytics.

The curve was evaluated for how well the stages represent levels of data infrastructure at public agencies by comparing how respondents ranked their agency versus how they described the characteristics of their agency's water data infrastructure. Using this guideline, the responses matched the categories as defined in the technology adoption curve. Overall, most respondents placed their agency between Stages 2 and 3 on the technology adoption curve with minimal variation across geographic regions (see Figure 5).

Respondents were also asked to consider barriers to movement along the technology adoption curve. Respondents were asked to select from the following categories:

(a) Funding

(b) Legal barriers

(c) Agency leadership

(d) Lack of capacity

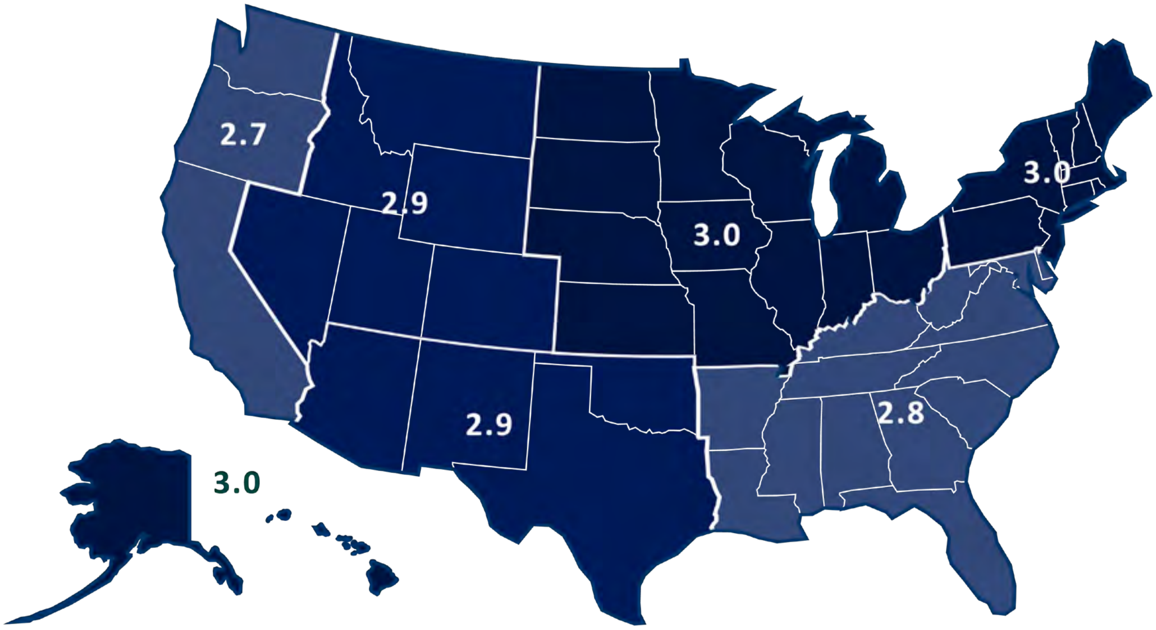
(e) Access to resources

(f) Lack of understanding of available technologies

(g) Lack of clarity about the value created by deploying improved data solutions

(h) Data security

Figure 5. Average stage on technology adoption curve by region



Note: The number of respondents per region are as follows: Northeast: 13, Southeast: 22, Midwest: 21, Southwest: 20, Rocky Mountains: 25, Pacific: 32, Noncontiguous: 2.

The overwhelming barrier to data infrastructure modernization, according to respondents, is funding (75%). Interviews with respondents were able to examine this finding in more detail, revealing that not only is lack of funding the root of most capacity issues, but the promise of funding can also serve as an important incentive to pursue data modernization efforts. Respondents also commented on additional barriers not indicated among the choices provided in the survey (responses a–h above). These included:

- Cross-agency collaboration, particularly across counties, states, or other administrative boundaries
- The need to support old applications while moving to modern technology
- Difficult bureaucratic processes, such as requests from IT departments, to adopt modern software
- High turnover among agency employees
- Inefficient existing technologies
- Resistance to the adoption of modern technologies

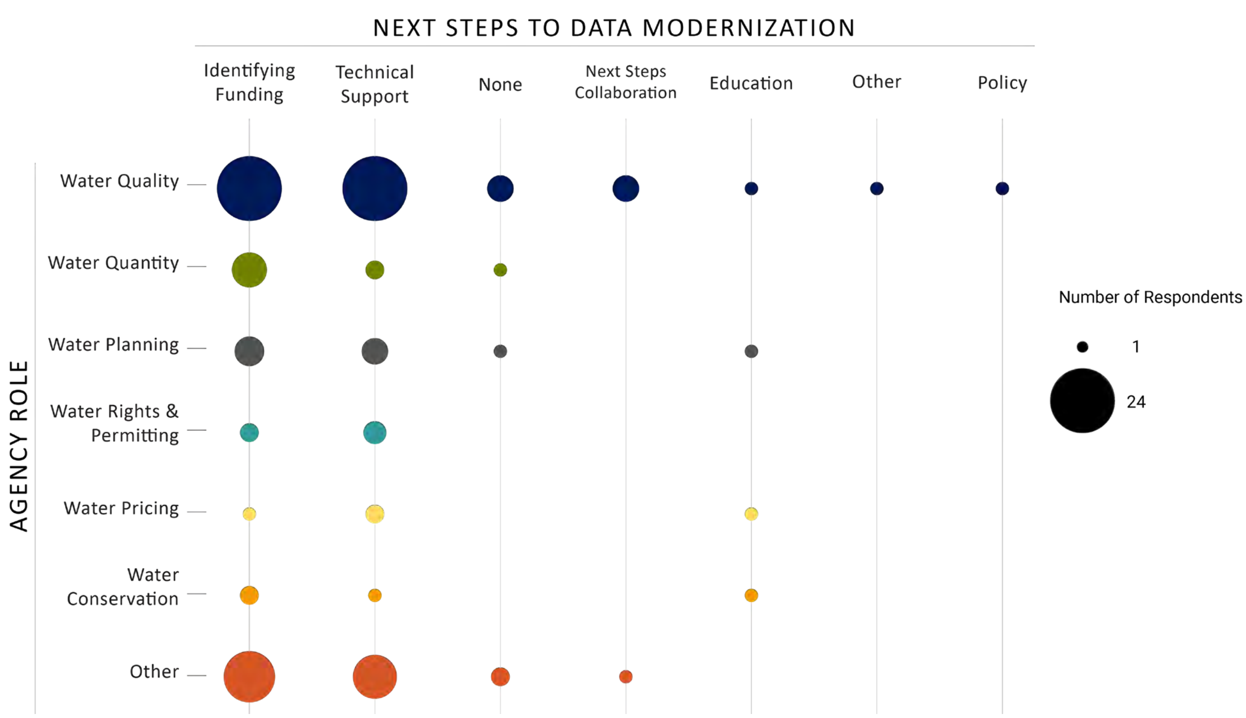
Topics such as resistance to change, lack of capacity, and high learning curves also surfaced in the interviews and were classified as cultural barriers, such as:

- Interviewee 1: *"I think it's probably more change resistance. I think there's a couple of people who understand it and care to see a change, but a lot of the people are just not eager to see change."*

- Interviewee 2: "*…it's hard when the benefits aren't tangible to them, you know what I mean? Like, here's all this extra work you have to do, or doing things, maybe not extra work, it gets harder or it's different. You have to learn, you know, it's out of your comfort zone and there's not really a, like, they don't see a benefit to that. So, I guess that's trying to like find ways to point to like, hey, this will make your job easier. And here's how.*"
- Interviewee 3: "*When I talk about, you know, data management strategies or best practices in-house, I think that the people who aren't necessarily familiar with that world, you know, they might get a little bit intimidated and say, okay, well, that's going to be a whole other skill set I have to learn. They automatically, I think their head jumps to coding. They jump to language learning. They say I don't have time for this. Like, I know Excel, I know my data processing. This works for me. They think they don't have time to invest in a learning curve. And I think maybe this is what I need to learn to communicate better, and, I think, the people who are working on this might need to communicate better is: you don't need to learn anything necessarily like in the command line or anything like that in order to manage your data more effectively.*"

When asked about helpful "next steps" to aid their agency in moving along the technology adoption curve, responses were concentrated primarily in two categories: identifying funding and technical support (Figure 6).

Figure 6. Respondents' recommendations for next steps for data modernization at their agencies



Note: Respondents' recommendations have been broken out by their agency's role.

INTERVIEWS

In addition to the survey, members of the Duke IoW team conducted interviews with 16 volunteer participants from the survey (see Appendix C). A content analysis of these interviews revealed themes of inefficient systems and cross-agency challenges, exacerbated by procurement processes, but also illuminated the benefits of increased efficiency within agencies that have invested in modernization efforts.

Interviewees cited five technology tools commonly deployed in their agencies: Oracle, SQL, Microsoft Excel, Microsoft Access, and Esri's ArcGIS. In many cases, these systems have been in place for 10 to 20 years and are frequently the source of many inefficiencies in their work with data. Outside of these legacy systems, interviewees cited poor procurement procedures via contractors that put structures in place that agencies are either unable to upgrade or to change systems that were never configured to meet their data needs.

- Interviewee 4: *"And so they recognize the need to build up this capacity … And I think our direct managers are aware that's critical as well. But I think historically there has absolutely been this tradition of, okay, you need a database, we don't have time to build it for you. So, hire a consultant to do it, but then only the consultant knows how to manage it. And so, then the database dies after, you know, three or four years. And either way, building these little databases, whether it's internally or externally, you're not getting the cross-agency function or consistency that you need for this to be kind of a long-lasting culture change or really effective."*

In addition to procurement issues, barriers to cross-agency collaboration were a common theme throughout the interviews.

- Interviewee 5: *"You don't necessarily know where to go to get the data you're looking for. You kind of have to ask around and find who's the steward of that data and then ask them for it. And then you get emailed an Excel file. And, so, there's, like I said, there's not version control because you're not necessarily pulling data from a database. You know, you're asking someone for this data set and that might be a different person than my colleague asked three weeks ago for the same data."*
- Interviewee 6: *"One of the challenges is there's just a real lack of interagency communication. I'll go a step further, not just electronically, but verbally. Communication as a whole is a real challenge. People are always talking, but it's sometimes you're not even sure that you have the right people involved, so it would be nice to have a network of databases as reference."*

Ad hoc systems were often described by interviewees as a mechanism to deal with the lack of investment in data infrastructure. These systems were often developed in-house by an employee with coding skills; however, these ad hoc systems contribute to systemic fragmentation and limit cross-agency interoperability, producing wide disparities in agency infrastructure. While a few "lucky" agencies had an employee who could code, many others lacked that internal capacity.

- Interviewee 7: *"I would describe it as a free-for-all of everyone just kind of making what they need to make the wheels go round."*
- Interviewee 8: *"I think that it's just a really hodgepodge approach and that, you know, that makes things difficult for us. It makes things difficult for the state. It makes things difficult for the public. You know, there are the inconsistencies, that's not great, you know, it hampers decision-making, you know, like if we're trying to make really big decisions, how can you do that?"*

But for those agencies who have implemented modernized data infrastructure, even for only a few, specific projects, the benefits are clear. The benefits most often cited by interviewees related to employee efficiency, which translated to dollars saved. For example, one interviewee described his agency's struggles to fulfill Freedom of Information Act (FOIA) requests. Initially, the agency received 200 to 300 FOIA requests per year. After implementing a public-facing tool for data delivery that allows the public to directly access the requested data requested, the agency now only fields about five FOIA requests per year, for a savings of 400 to 600 staff hours annually. Another agency employee described the impact of her agency's modernization: *"We have not ever undertaken an audit to, to like, quantify that time savings. But data reporting is so much smoother now … And then when you need to dig deeper, it's so much easier to be able to pull out exactly what you need … I would say that it's probably cut the time for report prep by maybe a third to a half."*

The following observations and lessons learned emerged from synthesizing the survey, interviews, and readings.

OBSERVATIONS AND LESSONS LEARNED

(1) ***"You can't bring knowledge, products, or services to a fight over incentives"* (Andrew Do).** Incentives remain a critical barrier to modernization efforts. Regulatory measures, while effective in the short term, can be limited in their effectiveness for sustained, long-term change. Incentives provide the necessary resources to establish modernization programs, ensure their sustainability by building internal capacity, and provide tangible examples of the benefits of modernized water data infrastructure (often measured by more efficient use of employee time). Sharing these examples within and across agencies can inspire cultural change among both agency staff and leadership.

(2) **Ad hoc solutions increase data fragmentation across agencies.** Cross-agency interoperability is a critical barrier that prevents agencies from "seizing the moment," particularly in response to crises. An overreliance on single files that are held by individuals and individually requested, with little version control across agencies and little or no agreement on data and metadata standards, creates difficult or near-impossible circumstances for cross-agency data sharing and integration. This often leads to the development of ad hoc solutions for individual agencies and divisions that do not integrate with other systems, increasing the fragmentation of both data and resources.

(3) **Agencies need less innovation and more operationalization.** There is less need for innovation and more need to operationalize technologies that currently exist. An emphasis on innovation has meant fewer resources focused on implementing systemic change through improved processes as compared to single-platform solutions. It is important to distinguish the meaning of *modern* in these contexts. *Modern* means to bring current standards, processes, and organizational structure to the management of an organization and its data. It does not mean *new* or *digital*. Modern systems evolve over time and are responsive to changes in agency needs, mission, and context; therefore, as needs change the technology changes, and these criteria must be regularly reassessed. An emphasis on process means asking questions about what kind of data collection, management, and integration processes exist, what kind of processes are needed, and what technologies are appropriate to address these needs.

(4) **Not all legacy systems are bad.** Some systems are not improved with data modernization; therefore, it is important to preserve what is working and make efforts to integrate these systems into a modern workflow. Additionally, digitization of paper records (commonly considered a major component of legacy systems) should occur in a measured, strategic manner that focuses on prioritized documents of high use or need.

(5) **Integrated data requires leadership and accountability.** There must be an "owner" (a single decision-maker/traffic controller) that ensures cross-agency compliance and the establishment of standards. Examples include a chief data officer or a compliance officer that oversees data modernization across agencies and divisions and ensures external contracts adhere to established principles. Too often, public agencies rely on contractors to make critical decisions around data infrastructure, divorcing technological development from the agency context, and resulting in technologies that are less responsive to the changing needs of the agency. Investment in expertise and management not only enhances coordination, but also reduces inefficiencies by eliminating unintegrated ad hoc solutions, allows for resource sharing where appropriate, and supports a holistic approach to systems management.

(6) **Effective policy and procurement practices are key.** The United States spends an estimated $200 billion per year for federal and state IT services; many describe the results as old, difficult-to-access systems that often fail when needed. However, technology, or the lack of it, is not the issue. The problems arise from people, policy, and procurement issues. This requires (a) addressing the challenges with cultural conflicts across agencies and between leadership and staff, (b) implementing meaningful policy that supports modernization and the sustainable maintenance of data infrastructure, and (c) creating procurement processes that are responsive to the challenges of data infrastructure and technology adoption. These three issues are often intertwined. For example, an overreliance on contractors has meant software and existing infrastructure cannot be easily upgraded or refined with existing agency resources. This reduces human capacity, in terms of new technology expertise, within the agency to respond to needs as they arise and evolve. Effective procurement processes respond to the often rapidly changing nature of technology adoption and support agency capability while avoiding over hiring at the agency staff level.

RECOMMENDATIONS

Best practices in the fields of digital transformation and public interest technology, lessons learned from community and public agency engagement during the start-up period of the IoW project, and the survey and interviews conducted during the Technology Adoption Research Project provide the basis for the following recommendations. These recommendations are for public agencies at all levels who wish to undergo modernization of their water data infrastructure.

- **Identify and provide incentives for data modernization.** Because human capacity, digital infrastructure, and financial resources are limited at public agencies, an important mechanism for water data infrastructure modernization is to tie grant or other funds to the development of and compliance with standards for improved accessibility, interoperability, and modernization of public agency water data infrastructure. This includes grant programs offered by federal agencies but should also incorporate grants provided through philanthropic and other nonprofit organizations. Documentation of standards and best practices for data modernization should be provided to grantors as guidance for award requirements. While cultural barriers will not be resolved with incentives alone, the application of funds toward modernization can provide in-house demonstrations that can be persuasive to resistant leadership, particularly when they result in improved employee efficiency. Agency leadership can also use these demonstrations to champion water data modernization and urge policy-makers to develop sustainable funding sources for these initiatives.

- **Connect information delivery with policy outcomes.** While leaders often tout "data-driven decision-making," participants in the study and start-up period engagements struggled to provide evidence of decisions directly informed by data. This may be the result of cultural or behavioral processes in which decision-makers, who have historically not had access to information delivered in meaningful ways, continue to fall back on their traditional decision-making methods. To understand how data inform decision-making, agencies need to make clear avenues of information delivery accessible to decision- and policy-makers, then seek out and compile evidence about how their data modernization efforts have directly improved or informed decisions. These findings will promote further support of data modernization, as those tasked with resource allocation will also directly benefit from the modernization process.

- **Resolve issues with procurement processes.** Guidelines should be developed for agency procurement contracts to ensure that contractors follow modern data principles, meet agency needs for sharing and interoperability, and build in plans for sustained maintenance and maturity of systems.

- **Identify leaders for cross-agency compliance and establishment of standards.** Executed contracts should be overseen by a project lead, as described in the Observations and Lessons Learned section. Invest in modernization and technology adoption training for water leaders. Communication and training programs designed to inform decision and policy-makers about how to interpret and understand data, apply data to decision-making, and appreciate the need for and power of modern data infrastructure will narrow the cultural divide between different generations of technology, equip leaders with the knowledge they need to engage with their agency staff about modernized data infrastructure, and remove much of the resistance and fear over technology adoption. Modeled after the Harvard Evidence for Policy Design program (EPoD 2022), the IoW Technology Adoption Program (TAP) deploys teams to states for in situ training on water data modernization and technology adoption training. Funding for this program comes from a combination of public grants and philanthropic funds.

OPERATIONALIZING TAP

The challenges outlined are not insurmountable. This assessment does not mean that public agencies need to be more like private organizations. Instead, public agencies can approach technology adoption with a greater level of intentionality to overcome the barriers and develop data infrastructure systems that are sustainable over time.

The goal of the IoW TAP is to provide education and training for both management and staff to implement technology adoption in their public agency. In situ training for public agencies

- facilitates agency-wide consensus on the need for modernization,
- identifies obstacles and challenges to modernization, and
- enables the high-impact behavioral and cultural change necessary to improve data use for water resources management.

More broadly, the adoption of modern water data infrastructure will make it easier for local governments and water users to report their data with minimal effort, enable state governments to manage and integrate those data, and empower water managing entities across sectors and scales to use public data to make informed, evidence-based decisions.

Recommended Criteria for Successful Partnerships

Partnership with the IoW Coalition[1] will be most effective when public agency or state partners achieve the following:

- Identify a project lead or chief technology officer
- Determine three to five agencies or agency divisions (in larger states) willing to participate in the TAP process
- Adhere to IoW Principles (IoW 2021b; Appendix A)
- Maintain a sufficient baseline of digital water data holdings (i.e., not requiring digitization)

[1] The IoW Coalition is a group of organizations working together with federal, state, and local government partners to build foundational water data infrastructure across the United States and create a community of people and organizations using water data to make better decisions. The IoW Coalition is coled by five nonprofit organizations: the Lincoln Institute of Land Policy's Center for Geospatial Solutions, Duke University's Nicholas Institute for Energy, Environment & Sustainability, the Consortium of Universities for the Advancement of Hydrologic Sciences, Inc., the Water Data Collaborative, and the Western States Water Council's Water Data Exchange.

While all of these criteria are not required to be in place, such efforts from public agency partners are a good indicator of interest and commitment to modernization and, as such, an indicator of long-term success and sustainability.

IMPLEMENTING TAP

The IoW TAP process is best considered as a two-phase process. Phase 1 focuses on broad organizational cultural and behavioral transitions for adopting modern data infrastructure. The result of Phase 1 is an implementation plan that considers the current organizational data infrastructure, capacity and capability needs and limitations, end goals, and potential funding requirements and sources. Phase 2 focuses on the transition from the implementation of the plan as outlined in Phase 1 to the adoption of modern water data technologies and infrastructure and includes ongoing support.

Along the technology adoption roadmap (see Figure 7), Phase 1 consists of steps 1–6 with a transition period during steps 7–8. Phase 2 consists of steps 9–12.[2]

Roadmap for TAP

To initiate a partnership with the IoW Coalition and begin the TAP process, public agencies should contact the IoW Coalition via internetofwater.org. Once the U.S. Environmental Protection Agency pilot program for data sharing projects is established, authorized by the 2021 Infrastructure Investment and Jobs Act (IIJA), states will also be able to express interest in participating in TAP through an application to their state pilot program. The IoW Coalition will provide agency partners with information on TAP to review and discuss during an initial consult.

Phase 1

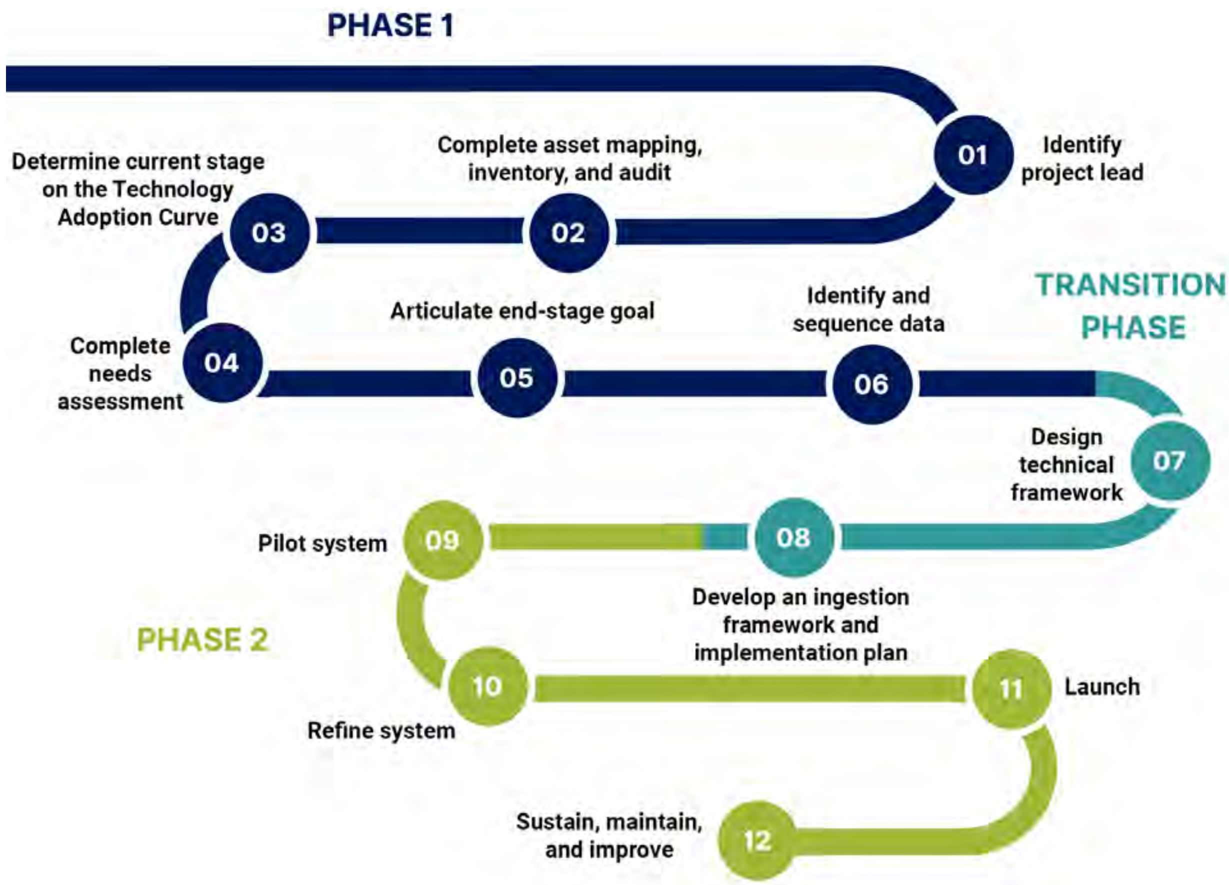
Methods for In Situ Engagement: Using Open Space Technology to Empower Change

The philosophy that guides the IoW TAP in-person engagement sessions is Open Space Technology (OST), a self-managed, participatory process specifically designed to address organizational change and one that "thrives in situations in which there is a diverse group of people who must deal with complex and potentially conflicting material in innovative and productive ways" (Owen 2008). Because of its ability to empower all participants, OST is an ideal philosophy for IoW TAP.

In OST engagements, participants identify the topics to be addressed, then self-select to work in small groups with the flexibility of moving from one group to another. The purpose of the small working groups is not necessarily to provide solutions, though suggestions for solutions are welcome, but instead to gain a better, more nuanced understanding of the topic and suggest a path to a solution. As groups report out, it becomes easier to prioritize and identify who should be responsible for taking the topic further.

[2] The roadmap incorporates best practices for data ingestion, adapted from private industry (See Snowflake [2022], Striim [Kutay 2021], and Qlik [2022]), and incorporates agile development guidance from the U.S. Digital Services Playbook (CIO Council n.d.). Additionally, the roadmap outlined in this report represents public agency–specific guidance developed during the IoW's pilot studies and the observations and lessons learned from this report, all in accordance with the IoW Principles.

Figure 7. Technology adoption roadmap



Note: A step-by-by roadmap for technology adoption at public agencies. The phases shown on the roadmap are described in more detail in following paragraphs.

The information gained during the in situ engagement will form the basis of the implementation strategy. This is a critical step in creating strategies that both address the appropriate challenges and do so within the organization's context and capacity (see Appendix D, Planning and Conducting Open Space Technology Engagements).

Phase 1 Steps (Approximately 12 Months, Including Transition Phase)

(1) Step 1: Identify project lead

(a) Assign project lead(s) responsible for the implementation of the water data modernization effort. The person(s) should have technical project management experience and appropriate knowledge of water data to navigate engagements with users and stakeholders.

(2) Step 2: Complete asset mapping, inventory, and audit

(a) Conduct asset mapping to understand the different skills, capacities, and capabilities of different teams across agencies or agency divisions. Understanding in-house capacity is important to create an efficient, effective, and sustainable modern data infrastructure. As part of this process, the IoW TAP team[3] will meet with state or agency executives and IT staff separately to discuss the status of data infrastructure, barriers, and needs, and to assess willingness to modernize.

(b) Conduct an inventory of current systems and platforms. (See the IoW's Water Data Inventory guidance [IoW 2022a]). The inventory will help the state or agency to determine data availability, location, status of existing data (digital or nondigital), and agency assets for modernization (software and hardware requirements). The time commitment for the data inventory is dependent upon designated employee time, fragmentation of the current system, and the size of the participating state or agency.

(c) Fundamental questions during this process are: What does the existing system look like? What technical skills currently exist within the agency? What capacity do those with technical skills have to devote to modernization efforts?

(3) Step 3: Determine current stage on the technology adoption curve

(a) Determine current agency or state location along the technology adoption curve (Figure 4).

(4) Step 4: Complete needs assessment

(a) Conduct internal engagement regarding barriers or challenges to movement along the technology adoption curve and identify internal and external resources that could be allocated to the modernization effort. This assessment will include a survey distributed to agency leadership and staff by the IoW TAP team to gather foundational information about state or agencies needs in preparation for the in-person engagement session.

(b) Meet to review the results of the survey and design the in-person engagement session. This meeting should include the state or agency lead, the IoW TAP team, and key representatives from participating agencies or agency divisions.

(5) Step 5: Articulate end-stage goal

(a) Set an end-stage goal on the technology adoption curve. This determination should be based on the starting point, needs assessment, and agency capacity and capability, as identified in previous steps of the roadmap. For example, not every agency will move directly to Stage 4. It is important to identify a realistic end-stage goal for data modernization.

(6) Step 6: Identify and sequence data

(a) Engage with agency or division leadership and IT staff. The IoW TAP team will travel to the participating state or agency to facilitate a one-day, in-person

[3] The IoW TAP team includes staff from both Duke University's Nicholas Institute for Energy, Environment & Sustainability and the Lincoln Institute of Land Policy's Center for Geospatial Solutions. The IoW TAP team's work in Phase 1 is led by team members at Duke, while Phase 2 is led by team members at Lincoln.

engagement session. The evening prior to the engagement, there will be an informal meet and greet with the IoW TAP team, project lead(s), and identified agency or division leadership and IT staff. The engagement session will use an OST format to facilitate open and honest discussion (see Appendix D). The IoW TAP team will administer surveys to participants before, during, and after the in-person engagement to evaluate the stakeholder process.

(b) Develop a strategic plan to identify and sequence data to be incorporated into a newly modernized data infrastructure, considering digital and nondigital legacy data.[4]

Transition Phase Steps

(7) Step 7: Design technical framework

(a) Follow the IoW technical framework, which defines specifications and implementation for data modernization.[5]

(b) Develop a technical framework informed by the engagement and needs assessment (Step 4), responsive to the current location on the technology adoption curve as well as desired end stage (Step 5), and in line with data standards, metadata standards, and the software needs and acquisition plan (Step 6a).

(8) Step 8: Develop an ingestion framework[6] and implementation plan

(a) Develop a data ingestion process based on the data architecture, the volume of data to be ingested, and the frequency of data ingestion. A data ingestion framework articulates these processes, as well as any integration challenges (such as data compatibility and standardization), required for successful data modernization.

(b) Generate an implementation plan based on issues identified, solutions presented, and priorities set during the in-person engagement session that articulates an organizational strategy for the execution and sustainability of the data

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[4] Not all legacy data need be digitized; therefore, data sets of most need should be prioritized. In addition, data sets that are commonly shared internally or externally should be prioritized for incorporation into a newly modernized infrastructure to address issues of version control and challenges with cross-agency collaboration.

[5] IoW technical framework: (1) Metadata is published on the web, ideally in compliance with best practices for data on the web from W3C (2017). (2) Data is available for download in bulk and/or application programming interface (API) in open, nonproprietary formats. (3) To the extent possible, bulk download data formats and/or APIs will follow community-standard patterns (e.g., OGC standards [OGC 2022]), metadata will be included with data and of sufficient quality for users to make judgments as to what purposes the data is fit for use, and data content will reference publicly available definitions, controlled vocabularies, and data standards appropriate to the data's subject matter. (4) Data will be published and identified with version records and made available (to authorized users) so that workflows can be reproduced. (5) Open-format data content standards and data exchange or API standards for similar kinds of data should reference community, national, or international standards where practicable (see *IoW Data 101 Guidebook* [IoW 2021a]).

[6] A *data ingestion framework* is a process for transporting data from various sources to a storage repository or data processing tool. See Snowflake (2022).

modernization effort.[7] In collaboration with project lead(s), the IoW TAP team will develop the implementation plan, including a roadmap, and potential funding mechanisms.

(c) Incorporate state or agency feedback. This period is a cycle of feedback and revisions between the IoW TAP team, project lead(s), and other participating partners. The IoW TAP team will administer a survey to participants after delivery of the final implementation plan to evaluate the process.

Phase 2

Methods for Technology Development and Adoption: The IoW Service Center

The U.S. Digital Services (USDS) Playbook provides a general framework and best practices for the implementation of a technology adoption program once the first phase of social-behavioral change is complete (CIO Council n.d.). In addition to the generalized USDS framework, however, long-term and sustained adoption relies on individualized technical assistance to help public agencies implement new technologies within the context of their legacy systems. Person-to-person, ongoing support is critical to address the evolving needs of public agencies and sustain employee engagement during the transition phase.

Specifically, direct technical assistance is needed to (a) introduce and explain specific data standards and (b) assist in the implementation of those standards within state agencies to fully realize the goal of digital transformation. This step is also essential to ensure that technologies adopted by states use common standards and approaches and result in data sets that are interoperable with others from state and federal agencies.

Finally, states require technical assistance to ensure their water data sets are accessible to authorized users, including the general public for public data sets. In each state, technical assistance for implementation is generally needed for a period of one to three years. The IoW Initiative at the Center for Geospatial Solutions at the Lincoln Institute of Land Policy is designed to provide this service. Beyond that, the IoW Coalition will provide ongoing webinars, trainings, and best practices through the IoW Peer-to-Peer Network.

Phase 2 Steps (approximately 12–24 months)

(9) Step 9: Pilot system

(a) Engage with users and stakeholders to assess the usability, functionality, and efficiency of the modernized system.[8]

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[7] An implementation plan consists of an engagement strategy, long-term care and maintenance plan for the resulting systems or products, privacy restrictions and guidelines, funding requirements, associated staffing needs, and monitoring and evaluation strategy for impact assessment.

[8] This recommendation is in accordance with agile development best practices (see *U.S. Digital Services Playbook* [CIO Council n.d.]).

(10) Step 10: Refine system[9]

(a) Refine the system based on feedback and lessons learned from the engagement in Step 9.

(b) Return to Step 9 to further refine.

(11) Step 11: Launch

(a) Promote the system through internal and/or external communications and trainings to ensure that it is widely adopted by agency staff.

(12) Step 12: Sustain, maintain, and improve

(a) Perform routine maintenance to ensure the system is sustained over time.

(b) Evaluate the newly modernized system, measuring and articulating impact and identifying opportunities for improvement at intervals defined in the implementation strategy.

CASE STUDY: NEW MEXICO WATER DATA INITIATIVE

New Mexico Water Data Act

With the passage of the Water Data Act in 2019, New Mexico became a national leader in addressing water and climate challenges by prioritizing a statewide collaborative approach to modernizing water data.[10] The goal of the Water Data Act is to make finding water data simple by coordinating data integration efforts across multiple state agencies and working with regional and federal data providers. The Act established the New Mexico Water Data Initiative (NMWDI), which refers to the collaborating team effort and project convened by the New Mexico Bureau of Geology and Mineral Resources and involves state directing agencies, including the New Mexico Office of the State Engineer, New Mexico Interstate Stream Commission, New Mexico Environment Department, and New Mexico Energy, Minerals and Natural Resources Department.

The legislation requires communication and collaboration among these agencies and others collecting or managing water data for the state. Other key partners and supporters currently include the Healy Foundation, the Internet of Water Coalition, Sandia National Laboratories, the U.S. Bureau of Reclamation (WaterSMART program), and the Thornburg Foundation. The NMWDI is a reliable model for other, similar initiatives because it required cross-agency collaboration, funded a lead agency, incorporated stakeholder engagement, and resulted in a public-facing platform to facilitate data integration and interoperability.

[9] Steps 9 and 10 articulate an iterative process for engagement and refinement. These steps should be repeated until the new system or product meets user expectations.
[10] NMSA 1978, § 72-4B

Budgeting for Water Data Modernization in New Mexico

The initial state funding provided for the NMWDI was $110,000 for years one and two of the initiative. This funding was supplemented by philanthropic contributions and federal grant programs. The estimated cost for years three to five is an additional $500,000 annually to fully support an IT and operations team with up to four full-time dedicated staff who will develop and maintain the cyberinfrastructure and connections to data producers and users. The six other agencies named in the Water Data Act also requested funding. Their funding requests varied significantly depending on existing agency capacity, existing data infrastructure, and the volume of data managed by the agency. Initial investments to modernize data infrastructure for these agencies averaged $410,000, and recurring annual costs averaged $421,330.

In September, 2022 the NMWDI released a new plan for the continued implementation of the New Mexico Water Data Act entitled *2022 Plan: New Mexico Water Data Initiative* (NMWDI 2022). The plan states that they "estimate that state agencies will require a combined annually recurring budget of $2.65 million, with other non-recurring costs of approximately $6.5 million over the next 5 years, to fully implement the Water Data Act. Additional state funding may be addressed through an IT special appropriation (C2 request), while state agencies are also working to build funding through grants and programs related to water data." Updates can be found on the NMWDI website.

Introducing TAP

Since 2019, the NMWDI has made substantial progress—building collaborations, working groups, and data catalogs and implementing data standards. And yet, there is significant work ahead to complete the digital transformation of New Mexico water data. Currently, the efforts of the NMWDI focus on communications between and within agencies, implementing water data plans at each agency, developing success stories, offering a range of support for agency-specific needs, improving data literacy, building a water data community, and providing opportunities for data users to share feedback. As part of these efforts, the NMWDI partnered with the Duke IoW team to launch a TAP pilot in September 2022, focused on identifying and addressing organizational barriers to data modernization.

The goal of the IoW TAP engagement with the NMWDI was to provide in situ training for participating agencies to:

- Promote meaningful dialogue across New Mexico water agency leaders related to modernizing data collection, storage, access, and security
- Identify key issues and obstacles related to data infrastructure modernization
- Establish prioritized data modernization strategies for each agency
- Learn lessons from the New Mexico pilot program that can be applied to other states' modernization initiatives

More broadly, facilitating the final stages of adoption of modern water data infrastructure will make it easier for New Mexico's local governments and water users to report their data with minimal effort, enable state governments to manage and integrate those data, and empower water managing entities across sectors and scales to use public data to make informed, evidence-based decisions. The information gained during the in situ engagement establishes the basis for future planning and next steps for the statewide initiative. This is a critical step to create strategies that both address the appropriate challenges and do so within the participating agencies' context and capacity.

Sample Meeting Agenda

Morning Agenda (begin 9 a.m.)

- Kick-off—why we are here
- Survey feedback and discussion
- Introductions and overview of Open Space Technology methodology
    - Theme identified: How do we modernize data infrastructure to serve both our citizens and our agencies?
    - Participants identify and display topics, for example:
        - What specific data sets need to be prioritized for digitization and/or standard practice
        - How to make it easier to fulfill FOIA requests
        - How to digitize water rights so people know who owns water, and where
        - What is needed to create a data dashboard for easier visualization and decision-making
        - What data security issues need to be managed
        - Data transparency—issues and concerns
    - Participants select concurrent sessions to attend
    - Meetings are organized and held

Afternoon Agenda (conclude 5 p.m.)

- Report-outs of morning meetings
- Intra-agency meetings to synthesize insights from the morning session and prioritize commitments
- Agency report-outs
- Next steps and meeting end

Preengagement Survey

A 20-question survey was distributed to all staff of the five New Mexico water agencies, as outlined in the 2019 New Mexico Water Data Act (see Appendix E). Before the TAP engagement, 165 participants completed the survey. Survey respondents represented a diversity of agency roles, with the majority representing water rights and permitting, water quality, and water quantity (Figure 8).

The majority of individual respondents were responsible for managing water data, making decisions based on water data, and replying to public requests for data and information (Figure 9).

While the majority of respondents indicated that employees carry out much of the data collection for their agency (52%), a significant number indicated that consultants (26%), or certified, trained community members (10%) carry out data collection. Much of this data is stored in structured tabular form, such as in Excel spreadsheets or an Access database (39%), while nearly as much is stored in unstructured formats, such as Word documents or PDF files (31%).

Data sharing methods are somewhat varied, but largely consist of direct communication (25%), online website applications or web forms (24%), interactive web maps (16%), or public repositories, such as the Water Quality Exchange (WQX) (12%) (Figure 10) with the primary audience being the public, followed closely by regulators and decision-makers (Figure 11).

To determine their agency's current location on the technology adoption curve (see Figure 4), respondents were asked a series of questions regarding the ease of working with data in their agency and asked to place their agency's status along the curve. The survey measured respondent perceptions of working with data in their division as well as within their agency. More than 60% of respondents indicated that working with data in their agency is either "difficult" or "somewhat difficult" while only 46% indicated difficulty in working with data within their own division. Overall, respondents placed their division and agency on the technology adoption curve either between Stages 2 and 3 or in Stage 3.

Figure 8. Agency role

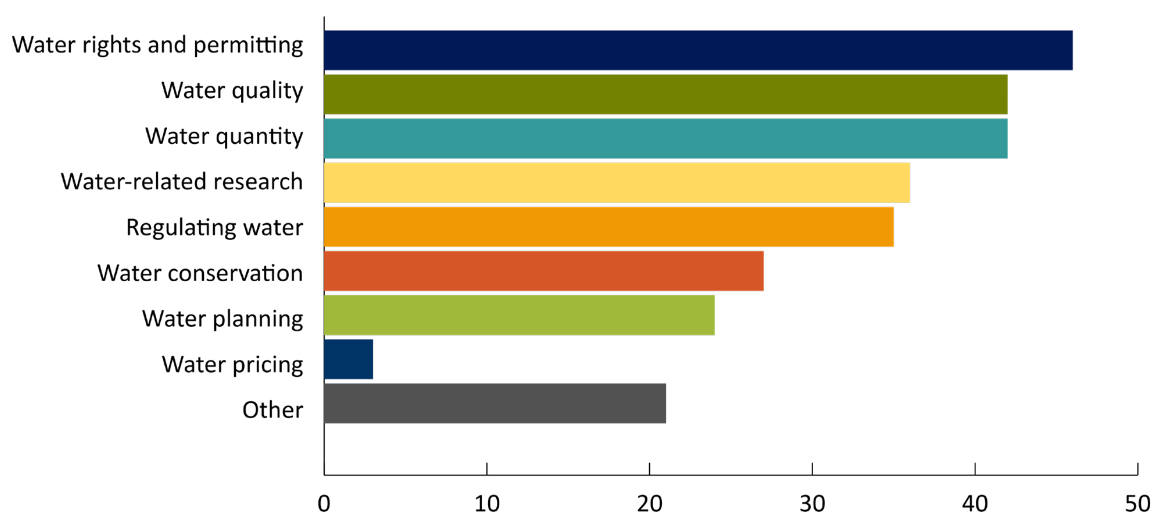


Figure 9. Participants' roles related to data collection, management, and use at their agencies

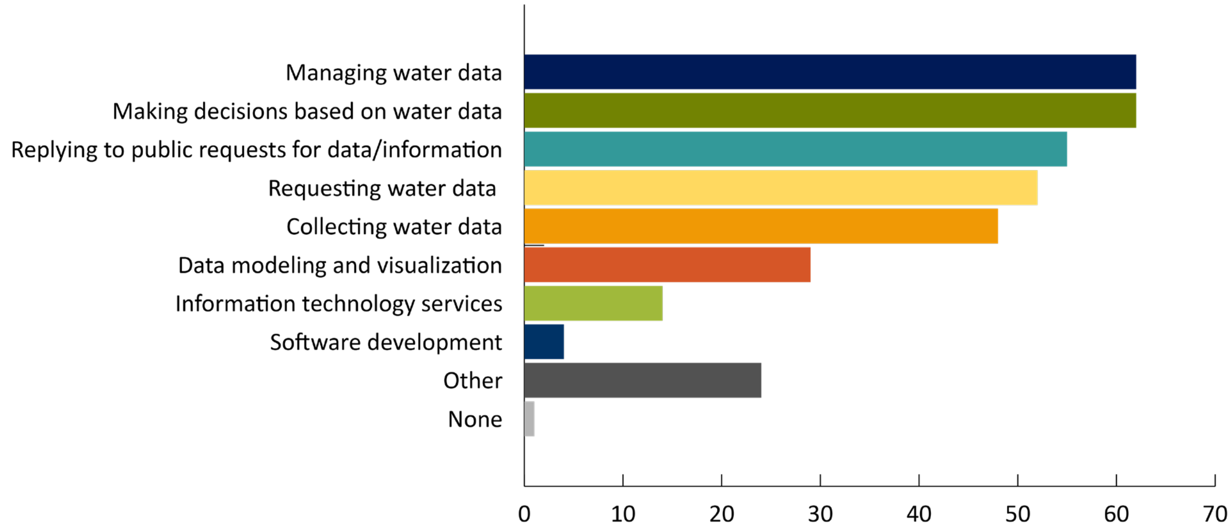
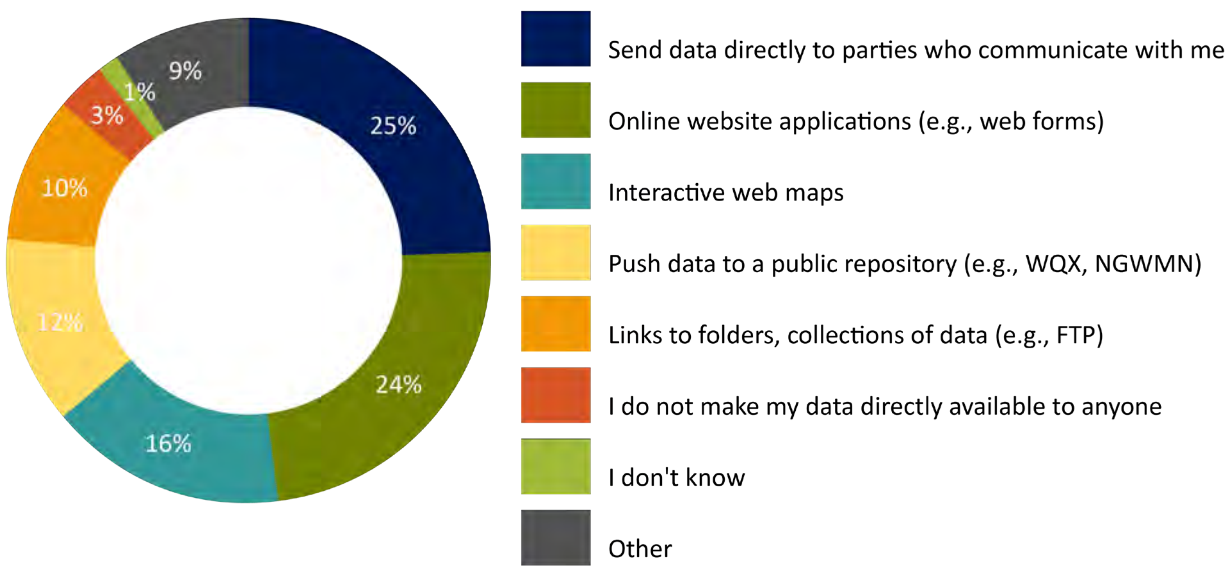


Figure 10. Data sharing methods



Funding and organizational capacity consisted of half, or nearly half, of respondents' noted barriers to modernization as well as their priorities for next steps (Figure 12).

Finally, participants were asked to comment on what they would change about how their agency or division manages water data. These comments were classified into 11 categories, as follows:

- Centralization: Combining multiple data platforms or management systems into a single system

Figure 11. Intended audience for data

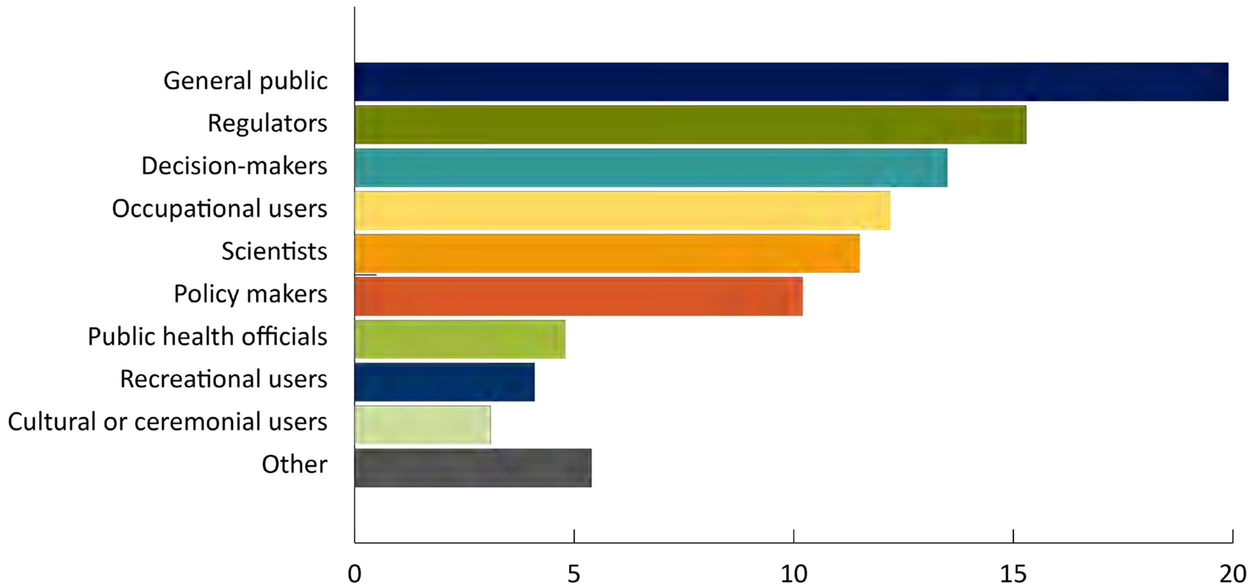
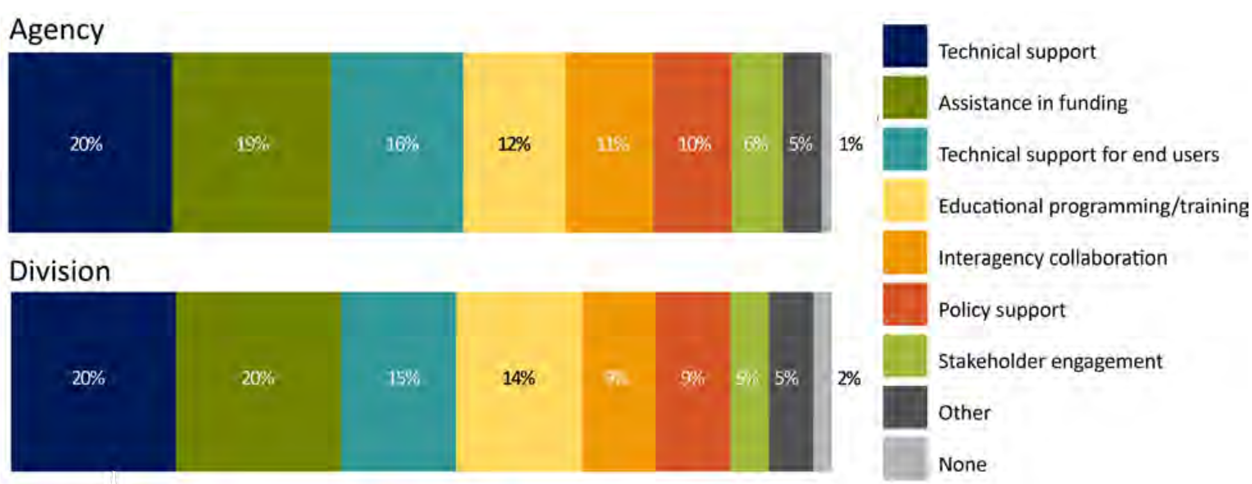


Figure 12. Participant recommendations for future work for their agency and their agency division



- Legacy data or systems: Updating legacy data systems
- Standardization: Standardizing data across divisions or agencies
- Capacity: More staff time or training
- Discoverability: Making it easier to find data
- Data entry: Improving data entry systems
- Collaboration: Increasing interagency or inter-division collaboration

- Data extraction: Improving data extraction systems
- Funding: More funding to implement data infrastructure modernization
- Data visualization/analytics: Enabling data visualization and analytics
- Other

Based on the categorization of responses, participants would prefer an agency-wide centralized system for data, division and agency-wide attention to updating legacy data systems, division and agency-wide attention to data and metadata standards, and an increase in capacity across both agency and division (Figure 13).

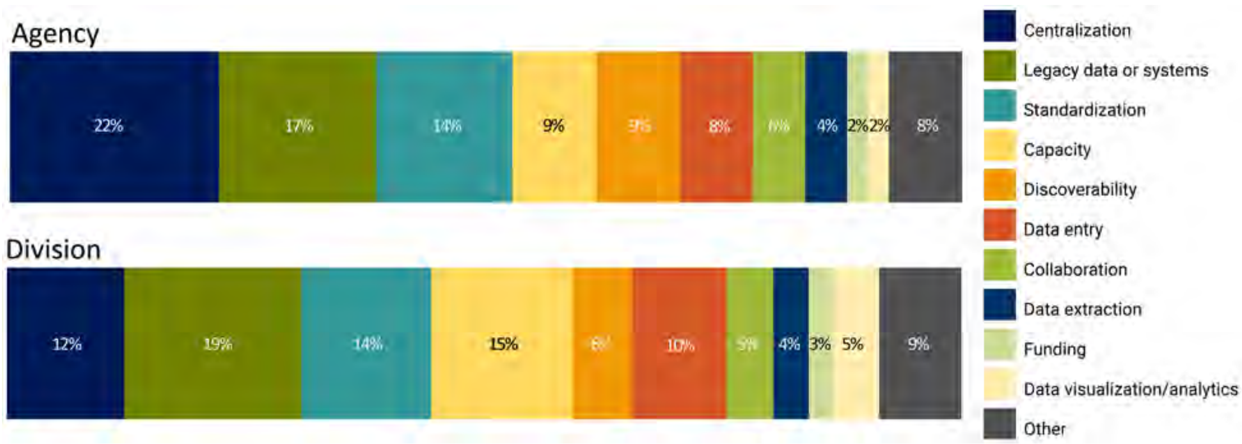
The survey responses provided valuable information entering the in-situ engagement. During the engagement, participants introduced six topics for discussion: the development of “killer apps;” data integration; data integrity, management, and standardization; vision and leadership; turning data into information, knowledge, and wisdom; and legacy data. Participants self-organized into cross-agency working groups based on these identified topics, and produced a report-out that outlined the following:

- Problem or opportunity statement
- Why the topic is important
- Various perspectives and differing opinions on the topic
- Recommendations or conclusion (it is important that participants be specific [i.e., “collaborate more” is conceptual, not specific])
- People or agencies who may take the topic further (if appropriate)

Participants were then asked to convene based on their affiliated agency to reflect on the lessons learned from the cross-agency collaboration and establish next steps for their agency in modernizing their water data infrastructure. Based on the cross-agency report-outs and the agency-specific report-outs, the following recommendations were made:

- **End reliance on paper data.** Cease acceptance and production of paper data to reduce the growing burden of legacy data through the adoption of electronic data collection and management requirements for electronic data submission, electronic forms, and the requirement for third-party vendors to submit data in electronic formats.
- **Diversify funding mechanisms for water data modernization.** Use mechanisms such as updating and increasing fees; reduce agency reliance on the legislature for funds to support water data modernization.
- **Review and update procurement and hiring practices.** Review and update practices that trap agency resources in proprietary software, refine contracting requirements to reflect overall data modernization efforts, and recruit and retain a workforce with the appropriate data skills.

Figure 13. Participant comments about recommended changes at their agency and within their agency division



- **Focus on API development.** Prioritize building services, like APIs, that facilitate the accessibility and integration of data across agencies.
- **Increase education and guidance from NMWDI.** Provide guidance on appropriate data and metadata standards as well as education on how divisions and agencies can connect with the NMWDI catalog and services.

Evaluation of Pilot

To conclude the in situ engagement, each participant was asked to name a single word or phrase that described their experience with the engagement. Figure 15 is a representation of these closing thoughts and demonstrates an overall positive view of the engagement.

Additionally, the in situ engagement was followed by a survey distributed to all participants. Most of the workshop participants, 21 of the 31 in total, completed the survey. Overwhelmingly the feedback was positive, with 100% of responding participants satisfied with the communications and preparations leading up to the workshop and feeling that they could talk openly and honestly about the issues facing their agency or division. All respondents reported that they felt the workshop was a good use of time. Furthermore, all but one respondent said they would not only use the information from the workshop to inform planning and activities in their agency or division, but also that they could have a positive effect on their agency or division's water data modernization efforts because of their participation in the workshop.

Participant confidence in their agency or division's ability to fulfill the recommendations generated in the workshop was overall positive but varied. Sample comments included:

- *"Our agency can move forward as long as it has the financial and human resources to support the effort."*
- *"I believe we will get there, but competing priorities slow the process."*
- *"I am confident my group is on the right path, and this gave us great ideas on how to proceed."*

- *"9/10 because we discussed realistic recommendations like improving data collection with electronic forms which help toward larger goals like reducing the use of paper."*
- *"Our team was able to arrive at a common understanding as to the functions of our respective divisions in relation to water data services. We are not as siloed as we thought, and we have both producers and consumers of data products in our department. Having our Deputy involved was a great help in understanding the issues and how the data modernization effort fits into operations going forwards."*

Overwhelmingly, the need to be able to implement the recommendations outlined during the engagement focused on acquiring increased financial and human resources. However, there were several who indicated a need for increased education and staff buy-in: *"We need more education on what the water data act means for the rank and file. Leaders will come and go, but how the movement forward needs to be conducted by informed people."*

Next Steps

Participating agencies were provided the opportunity to review the engagement summaries as well as the agency commitments and recommendations, and to provide corrections or feedback. This feedback has been incorporated into a report submitted to the NMWDI leadership.

At the time of this report's publication, it was recommended that a six-month follow-up meeting among participants be convened to capture post-workshop reflections and progress-to-date from each agency toward their stated commitments and recommendations. It was also recommended that a one-year follow-up meeting be convened.

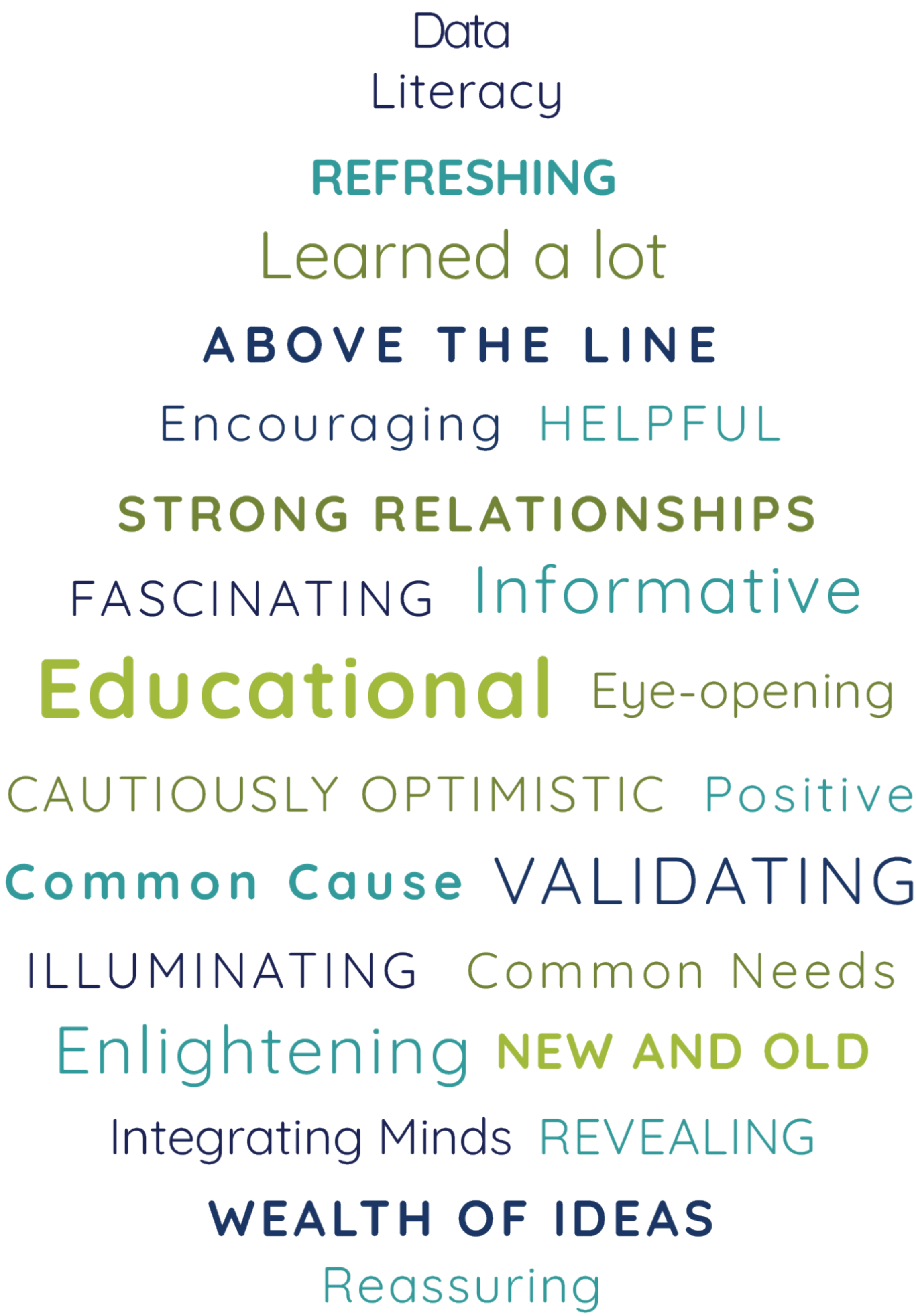
MOVING FORWARD: IMPLEMENTING IOW TAP UNDER THE IIJA

The Technology Adoption Research Project revealed a strong desire for data infrastructure modernization within state agencies that manage water resources across the United States. It also illuminated significant barriers that have prevented many of these agencies from implementing large-scale data modernization projects in the past. The IIJA, signed into law on November 15, 2021, commits $55 billion to modernize America's water infrastructure. As part of that investment, the federal government authorized funds for the U.S. Environmental Protection Agency to provide grants to pilot projects aimed at more easily sharing information on water quality, water infrastructure needs, and water technology between state and local agencies. The law states that the "Internet of Water Principles developed by the Nicholas Institute for Environmental Policy Solutions"[11] should guide these efforts. This funding would help state agencies overcome one of their most substantial barriers to data infrastructure modernization: a lack of funding.

The IoW TAP aims to help state agencies overcome the other barriers revealed by this research through individualized engagement and guidance. The IoW Coalition also supports state agencies as they work towards modernization through a variety of resources and tools (IoW 2022b, 2022c). Our goal is a future where decision-makers at all levels can access the data and information they need to adapt to water challenges and ensure sustainable, equitable, and resilient management of our nation's water resources. We believe that to achieve better water management, you must first have better water *data* management.

[11] Now called the Nicholas Institute for Energy, Environment & Sustainability.

Figure 14. Participants' closing thoughts



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APPENDIX A: IOW PRINCIPLES

(1) Water data are essential for efficient, equitable, sustainable, and resilient water planning, management, and stewardship.

(2) Modern data infrastructure increases the usefulness of water data and enables its broadest possible application.

(3) All water data produced for the public good should, by default, be findable, accessible, interoperable, and reusable (FAIR) for public use or authorized users.[12]

(4) Security and privacy risks associated with sharing data can be mitigated using mechanisms for tiered access for authorized users.

(5) Commonly accepted data, metadata, and exchange standards should be adopted by water data producers to promote interoperability, efficiency, sharing, and secondary uses of data.

(6) Control and responsibility over data are best maintained by data producers.

(7) Data producers are responsible for sharing data of known quality and documenting essential metadata; data users are responsible for determining whether data are appropriate for specific purposes and uses.

(8) Federated, distributed systems of interoperable public water data generally provide scalability and flexibility to meet the diverse needs of data producers and users.

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APPENDIX B: SURVEY QUESTIONS

Name: ____

Email Address: ____

(1) Can we contact you for an interview to further discuss data technology at your agency?

(a) Yes

(b) No

(2) Do you work at a state agency?

(a) Yes

(b) No

(3) In which geographic region is your state/agency located?

(a) Northeast (Pennsylvania, New York, New Jersey, Connecticut, Massachusetts, New Hampshire, Vermont, Rhode Island, Maine)

(b) Southeast (Maryland; Delaware; Washington, DC; Virginia; West Virginia; Kentucky; Tennessee; North Carolina; South Carolina; Georgia, Florida; Alabama; Mississippi; Louisiana; Arkansas)

(c) Midwest (Ohio, Indiana, Michigan, Illinois, Iowa, Wisconsin, Minnesota, North Dakota, South Dakota, Missouri, Nebraska, Kansas)

(d) Southwest (Oklahoma, Texas, New Mexico, Arizona)

(e) Rocky Mountains (Montana, Idaho, Wyoming, Colorado, Utah, Nevada)

(f) Pacific (Washington, Oregon, California)

(g) Noncontiguous (Alaska, Hawaii)

(4) My agency's primary role regarding water resources is focused on:

(a) Water quality

(b) Water quantity

(c) Water rights

(d) Water planning

(e) Water conservation

(f) Water pricing

(g) Other (please specify)________________________________

(5) At my agency, my role involves the following (select all that apply):

(a) Collecting water data

(b) Managing water data

(c) Requesting water data (from within my agency or from other agencies)

(d) Making decisions based on water data

(e) None

(f) Other (please specify)____

(6) At my agency, working with data is best described as:

(a) Very difficult (data is highly fragmented and not digitized, located mostly in paper format)

(b) Difficult (data is highly fragmented and often digitized but is located in reports or PDFs that are difficult to access)

(c) Somewhat difficult (data is somewhat fragmented and/or somewhat digitized but not standardized; data is available in Excel or CSV formats)

(d) Good (data is mostly or completely digitized, minimally or not fragmented, and is either standardized or stored in a central repository)

(e) Excellent (data is fully digitized, not fragmented, standardized, easily accessible, machine-readable, and stored in a central repository)

(7) Which statement best describes your agency's current position on water data? Please explain.

(a) My agency is comfortable with its current data tools and infrastructure

(b) My agency is interested in pursuing tools and technology to improve data management, access, and use

(c) My agency currently or has recently implemented projects and new technology to improve data management, access, and use

(d) Please explain____

(8) What was the catalyst behind starting data improvement projects? Select all that apply.

(a) Internal demand (e.g., rising need for improved data infrastructure from within the agency)

(b) Legislative demand (e.g., state policy determines data standards, legislators require improved quality of or access to data, etc.)

(c) Constituent demand (e.g., pressure from constituents for improved access to or quality of water data)

(d) Demand from other agencies (e.g., other agencies required access to or use of my agency's data, increased need or demand for collaboration between agencies)

(e) Other (please specify)____

(9) What challenges or barriers does your agency face regarding improving data infrastructure and management? Select all that apply.

(a) Funding

(b) Legal barriers

(c) Agency/leadership approval

(d) Lack of organizational capabilities to deploy improved data solutions

(e) Access to resources (e.g., training, technology)

(f) Lack of understanding of available technologies

(g) Lack of clarity on value created by deploying improved data solutions

(h) Data security concerns

(i) None

(j) Other (please specify) ____

(10) What next steps would be most relevant to your agency? Select all that apply.

(a) Assistance identifying funding

(b) Technical support (setting up databases/systems, data digitization/standardization)

(c) Technical support for end users (dashboards and visualizations)

(d) Educational programming or training

(e) Policy support

(f) Interagency collaboration

(g) Stakeholder engagement

(h) None

(i) Other (please specify)____

Technology adoption curve

STAGE 1	STAGE 2	STAGE 3	STAGE 4
• Most data are collected in paper formats and stored in filing cabinets • Staff manually access and compile data • Staff can not create data visualizations or analytics • Data are not standarized • Data quality is not documented • Staff cannot integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies	• Most data are collected in digital formats and stored on local computers • Staff manually access and integrate data • It is difficult for staff to create data visualizations and analytics • Data are not standarized • Data quality is documented in an unstandarized way that is not legible to those outside the division or agency • It is difficult for staff to integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies	• Most data are collected in digital formats and stored in a shared database/s • Staff access data through one or more databases and manually integrate data • It is difficult for staff to create data visualizations and analytics • Data may not be standarized across divisions or agencies • Data quality is well-documented • It is difficult for staff to integrate their data with data from other divisions or agencies • It may be difficult to share data across or between agencies	• Data are collected in digital, machine-readable formats and stored in a shared database • Staff access and integrate data through APIs • Staff can easily create data visualizations and analytics • Data are standarized across divisions and agencies • Data quality is high and is well-documented • Staff can easily integrate their data with data from other divisions or agencies • It is easy to share data across or between agencies

(11) Using the above chart, please identify which stage best represents your agency.

(a) Stage 1: Most reports and data are collected using paper formats and stored in file cabinets. Agency staff manually access and compile data upon request. Data are fragmented. Data are collected across many divisions within an agency and there is little ability to share data between divisions or agencies, and little knowledge of data collected by other divisions or other agencies.

(b) Somewhere between Stage 1 and Stage 2.

(c) Stage 2: Outdated data infrastructure and software exist, including local data servers that must be maintained by local staff. Data are not accessible from outside the agency. Data are fragmented and nonstandardized (e.g., variation of units, data names, etc. used within the agency).

(d) Somewhere between Stage 2 and Stage 3.

(e) Stage 3: A data infrastructure exists that allows for data sharing; however, the data are not always standardized or machine-readable. There is no easy method for creating visualizations and analytics. There may be duplicative systems across agencies, but they are not linked to each other.

(f) Somewhere between Stage 3 and Stage 4.

(g) Stage 4: A modern data management system exists that includes the ability to extract data from the system and conduct data visualization and analytics.

(12) Please select the benefits of your agency's investment in a modern water data infrastructure. Select all that apply.

(a) Reduced employee time on data requests

(b) Reduced employee time on data processing

(c) Improved operations and decision-making to achieve agency mission (effective identification of challenges and solutions)

(d) Decreased costs (associated with data storage or software)

(e) Increased interagency collaboration and/or communication

(f) Better public communication and stakeholder engagement

(g) Reduced employee time on reporting

(h) Better ability to advocate for agency mission support

(i) None

(j) Other (please specify)____

(13) Which of the following best describes how data are collected and stored at your agency?

(a) Most data are collected in paper formats and stored in filing cabinets

(b) Most data are collected in digital formats and stored on local computers

(c) Most data are collected in digital formats and stored in a shared database(s)

(d) All data are collected in digital, machine-readable formats and stored in a shared database(s)

(14) Which of the following best describes how staff access data at your agency?

(a) Staff manually access and compile data

(b) Staff access data through one or more databases and manually integrate data

(c) Staff access and integrate data through APIs

(15) Which of the following best describes data visualization and analytics at your agency?

(a) Staff cannot create data visualizations or analytics

(b) It is difficult for staff to create data visualizations and analytics

(c) Staff can easily create data visualizations and analytics

(16) Which of the following best describes data standardization at your agency?

(a) Data are not standardized

(b) Data may be somewhat standardized across divisions or agencies

(c) Data are standardized across divisions and agencies

(17) Which of the following best describes data quality at your agency?

(a) Data quality is not documented

(b) Data quality is documented in an unstandardized way that may not be legible to those outside the division or agency

(c) Data quality is well-documented

(d) Data quality is high and is well-documented

(18) Which of the following best describes how data are integrated at your agency?

(a) Staff cannot integrate their data with data from other divisions or agencies

(b) It is difficult for staff to integrate their data with data from other divisions or agencies

(c) Staff can easily integrate their data with data from other divisions or agencies

(19) Which of the following best describes how data are shared at your agency?

(a) It is difficult to share data across divisions or agencies

(b) It may be somewhat difficult to share data across divisions or agencies

(c) It is easy to share data across divisions or agencies

APPENDIX C: INTERVIEW GUIDE

Interview Details

Project: Internet of Water Agency Technology Adoption Curve	**Date:**
Interviewer(s):	
Interviewee:	

Interview Guide

Validate the Interviewee Profile

- We would like to record this interview, with your permission. We will not share this recording—this is only for our internal purposes. Do I have your permission to record?
- Can you quickly walk us through your background and experience?
- What is your agency's primary role regarding water resources? Water quality, water quantity, water rights, water planning, etc.?
- What are your direct experiences working with data at your agency?

Explore their Data and Technology Experience

- Describe a typical project for you or your agency that involves data management.
- What kind of technologies, frameworks, or other methods has your agency implemented for working with data? Note: get to the workflow—follow step-by-step data process.
- For these technologies, did your agency purchase the technologies or do you develop and maintain them in-house?
- How standard are these processes across different departments? Is it the same across different data types, such as groundwater versus water quality?
- How would you describe the ease or difficulty of working with data in your agency?
- What do you believe are the barriers or challenges to water data modernization in your agency? When there have been improvements, what were you able to do and why?
- Where, if applicable, has ambition for improving data infrastructure come from? Pressure from external data users (e.g., constituents or legislators)? Internal data users or managers? Department chairs?
- If your agency has implemented new technologies or processes, what was the benefit to the agency or to outside users?

- Do you have a sense of how other people perceive the data you share? Its quality, standardization, how easy it is to work with, etc.? Who generally asks for data from your agency or department?
- In the survey, you were asked to place your agency along the technology curve. Do you access data from other agencies? What's wrong with it? Why is it difficult to integrate with your agency's data—where would you put those agencies on this curve?
- You indicated your agency was at *X* stage. What do you think it would take to move your agency to the next stage?

Lessons Learned

- What lessons or advice do you have for your agency peers on the topic of working with or managing water data?
- Are there resources that would be helpful for your agency in improving and modernizing your water data infrastructure?

APPENDIX D: PLANNING AND CONDUCTING OPEN SPACE TECHNOLOGY ENGAGEMENTS

Open Space Technology Engagement Planning

Because Open Space Technology (OST) is fully participatory and does not impose a structure on the meeting, there is very little preparation needed to develop a formal agenda. Instead, preparations focus on securing the appropriate space and supplies and encouraging participation from those who are interested and engaged in the overall topic.

Creating an invitation for participation should follow a simple format. It is important to keep the invitation brief but provide enough information to encourage participation. As there is no formal agenda created in the OST format prior to the engagement, there will be no attachments necessary. Consider the following format for an invitation:

- Theme (issue): Stated in ten words or less
- Background: Brief highlights and questions to be addressed
- Logistics: When, where, and how including information on meals provided and/or transportation, if needed
- Promises: Summary of expected outputs from the meeting

To successfully carry out OST engagements, it is important to locate a space large enough to facilitate participants sitting in circles, both for the kickoff session of identifying topics and for the concurrent meetings that will occur afterward. Additionally, supplies such as easels with pads and markers will be required for each concurrent session and the general participation kickoff meeting.

Getting Started

Participants may not be familiar with the OST process. Therefore, it is important to lay the groundwork at the outset of the meeting. Typically, this consists of the following:

(1) Welcome. The lead person or a trusted voice should welcome participants to the engagement and introduce any outside facilitators.

(2) Focus the group. The facilitator should take this time to actively focus the group. For example, instead of immediately joining the group, walk around and encourage everyone to take note of who is present, draw their focus on what is set to be accomplished.

(3) State the theme. Clearly state the purpose of the meeting. Avoid long histories or any kind of presentations. Think of this step as a "destination check" and use it as a moment to inspire participation. Remember that empowerment messaging has more impact than consequences (catastrophic) messaging. Something like: "By the end of this process we will have…."

(4) Describe the process. Now that the audience is curious about what is happening, describe the process: "In case you are curious about how we are going to get from here to there, it is called Open Space Technology. It has been developed over many years, starting in 1985, and has been used all over the world with groups large and small. You will be surprised by how simple it is and how it always seems to work! You might be wondering how we are going to accomplish our goals today. It is quite simple. In just a little while, I'm going to ask each one of you who cares to—and not everyone has to—identify the issues or opportunities related to our theme for which you all have an interest and passion in addressing. Don't just consider ideas that you think others are interested in. This is your chance for anything goes that is important to you and pie-in-the-sky ideas."

(5) Open the marketplace. Topics of discussion are recorded for concurrent meetings.

(6) Get out of the way!

OST is driven by four principles and one law. The four principles are: (1) whoever comes are the right people, (2) whatever happens is the only thing that could have, (3) whenever it starts is the right time, and (4) when it's over, it's over. The only law is the law of two feet. This means that if at any time during the concurrent meetings, participants find they are neither learning nor contributing, they can move to another concurrent meeting.

While the lack of structure of the meeting may be intimidating, the positive outcomes and results of unstructured, participatory engagement have been long referenced in research and are especially useful in potentially contentious situations or in situations in which difficult change is required. For these reasons, TAP will be modeled after the OST approach and philosophy.

For more information, see Owen (2008).

APPENDIX E: NEW MEXICO TAP PREENGAGEMENT SURVEY QUESTIONS

(1) Please select your agency:

(a) New Mexico Bureau of Geology and Mineral Resources

(b) New Mexico Environment Department

(c) New Mexico Office of the State Engineer

(d) New Mexico Energy, Minerals, and Natural Resources Department

(e) New Mexico Interstate Stream Commission

(2) Which division, bureau, or group do you work in within your state agency?

(3) My agency's primary role regarding water resources is focused on (select all that apply):

(a) Water quality

(b) Water quantity

(c) Water rights and permitting

(d) Water planning

(e) Water conservation

(f) Water pricing

(g) Water-related research

(h) Regulating water

(i) Other (specify) ____

(4) At my agency, my role involves the following (select all that apply):

(a) Collecting water data

(b) Managing water data (databases, data entry)

(c) Requesting water data (from within my agency or from other agencies or data providers)

(d) Making decisions based on water data

(e) Data modeling and visualization

(f) Information technology services

(g) Software development

(h) Replying to public requests for data or information

(i) None

(j) Other (specify) ______________________________

(5) Who collects data for your agency (select all that apply)?

(a) Employees

(b) Interns

(c) Certified, trained community members unaffiliated with your agency (e.g., crowdsourced, NGOs)

(d) Data is submitted or reported by consultants or industry

(e) Other (specify) ______________________________

(6) What is the frequency at which the data you use are collected?

(a) Daily

(b) Weekly

(c) 2–3 times per month

(d) Monthly

(e) Annually

(f) Irregular

(g) All of the above

(h) Other (specify) ______________________________

(7) What is the format of the data your agency collects?

(a) Unstructured text: Word, PDF

(b) Unstructured media: Images, video

(c) Structured tabular: Excel, Access

(d) Flat file: comma (CSV) or tab-delimited file

(e) Other (specify) ______________________________

(8) What is the format of the data you use:

(a) Unstructured text: Word, PDF

(b) Unstructured media: Images, video

(c) Structured tabular: Excel, Access

(d) Flat file: comma (CSV) or tab-delimited file

(e) Other (specify) ______________________________

(9) How do you or your agency currently make data available to other parties?

(a) I do not make my data directly available to anyone

(b) Send data directly to parties who communicate with me, such as by IPRA or email

(c) Links to folders, collections of data (e.g., FTP)

(d) Push data to a public repository (e.g., WQX, NGWMN)

(e) Interactive web maps

(f) Online website applications (e.g., web forms)

(g) I don't know

(h) Other (specify) ____

(10) Who do you believe owns the data collected by your agency, division, bureau, or group?

(a) The individuals or agency who collects the data

(b) The individuals or agency that finances data collection

(c) The individuals or agency that manages and stores the data

(d) The public whose tax dollars pay for the collection, storage, and maintenance of data

(e) Other (specify) ____

(11) Who is the primary audience for the data you use or the data that your agency collects? (select all that apply)?

(a) General public

(b) Recreational users

(c) Occupational users (industry, agriculture, etc.)

(d) Cultural or ceremonial uses

(e) Public health officials/regulators

(f) Decision-makers

(g) Policy-makers

(h) Scientists

(i) Other (specify) ____

(12) For what purpose does your agency or division collect data (select all that apply)?

(a) To inform decision-making

(b) To comply with regulations

(c) To respond to requests by constituencies

(d) To respond to requests by elected officials (nonregulatory)

(e) To be eligible for certain types of funding, unique opportunities (e.g., disaster response funding)

(f) Other (specify) ____________________

(13) At my agency, working with data is best described as:

(a) Very difficult (data are highly fragmented and not digitized, located mostly in paper format)

(b) Difficult (data are highly fragmented and often digitized but located in reports or PDFs that are difficult to access)

(c) Somewhat difficult (data are somewhat fragmented and/or somewhat digitized but not standardized. Data are available in Excel or CSV formats)

(d) Good (data are mostly or completely digitized, minimally or not fragmented, and are either standardized or stored in a central repository)

(e) Excellent (data are fully digitized, not fragmented, standardized, easily accessible, machine-readable, and stored in a central repository)

(14) What challenges or barriers does your AGENCY face regarding improving data infrastructure and management (select all that apply)?

(a) Funding

(b) Legal barriers

(c) Agency leadership approval

(d) Lack of organization capacity to deploy improved data solutions (e.g., staff time or skill)

(e) Access to resources (e.g., training or technology)

(f) Lack of understanding of available technologies

(g) Lack of clarity on value created by deploying improved data solutions

(h) Data security concerns

(i) None

(j) Other (specify) ____________________

(15) What next steps would be most relevant to your AGENCY? (select all that apply)?

(a) Assistance in funding

(b) Technical support (setting up databases/systems, data digitization and standardization)

(c) Technical support for end users (dashboards and visualizations)

(d) Educational programming or training

(e) Policy support

(f) Interagency collaboration

(g) Stakeholder engagement

(h) None

(i) Other (specify) ____

(16) What challenges or barriers does your DIVISION, BUREAU, or GROUP face regarding improving data infrastructure and management (select all that apply)?

(a) Funding

(b) Legal barriers

(c) Agency leadership approval

(d) Lack of organization capacity to deploy improved data solutions (e.g., staff time or skill)

(e) Access to resources (e.g., training or technology)

(f) Lack of understanding of available technologies

(g) Lack of clarity on value created by deploying improved data solutions

(h) Data security concerns

(i) None

(j) Other (specify) ____

(17) What next steps would be most relevant to your DIVISION, BUREAU, or GROUP (select all that apply)?

(a) Assistance in funding

(b) Technical support (setting up databases/systems, data digitization and standardization)

(c) Technical support for end users (dashboards and visualizations)

(d) Educational programming or training

(e) Policy support

(f) Interagency collaboration

(g) Stakeholder engagement

(h) None

(i) Other (specify) ______________________________

Use the diagram below [p. 52] to answer the questions that follow about your agency AND your division, bureau, or group within your agency.

(18) Using the chart, please identify which best represents your AGENCY:

(a) Stage 1: Most reports and data are collected using paper formats and stored in file cabinets. Agency staff manually access and compile data upon request. Data are fragmented. Data are collected across many divisions within an agency and there is little ability to share data between divisions or agencies, and little knowledge of data collected by other divisions or other agencies.

(b) Somewhere between Stage 1 and Stage 2.

(c) Stage 2: Outdated data infrastructure and software exist, including local data servers that must be maintained by local staff. Data are not accessible from outside the agency. Data are fragmented and nonstandardized (e.g., variation of units, data names, etc. used within the agency).

(d) Somewhere between Stage 2 and Stage 3.

(e) Stage 3: A data infrastructure exists that allows for data sharing; however, the data are not always standardized or machine-readable. There is no easy method for creating visualizations and analytics. There may be duplicative systems across agencies, but they are not linked to each other.

(f) Somewhere between Stage 3 and Stage 4.

(g) Stage 4: A modern data management system exists that includes the ability to extract data from the system, data visualization and analytics capabilities for decision-making, and is machine-readable.

Technology adoption curve

STAGE 1	STAGE 2	STAGE 3	STAGE 4
• Most data are collected in paper formats and stored in filing cabinets • Staff manually access and compile data • Staff can not create data visualizations or analytics • Data are not standarized • Data quality is not documented • Staff cannot integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies	• Most data are collected in digital formats and stored on local computers • Staff manually access and integrate data • It is difficult for staff to create data visualizations and analytics • Data are not standarized • Data quality is documented in an unstandarized way that is not legible to those outside the division or agency • It is difficult for staff to integrate their data with data from other divisions or agencies • It is difficult to share data across or between agencies	• Most data are collected in digital formats and stored in a shared database/s • Staff access data through one or more databases and manually integrate data • It is difficult for staff to create data visualizations and analytics • Data may not be standarized across divisions or agencies • Data quality is well-documented • It is difficult for staff to integrate their data with data from other divisions or agencies • It may be difficult to share data across or between agencies	• Data are collected in digital, machine-readable formats and stored in a shared database • Staff access and integrate data through APIs • Staff can easily create data visualizations and analytics • Data are standarized across divisions and agencies • Data quality is high and is well-documented • Staff can easily integrate their data with data from other divisions or agencies • It is easy to share data across or between agencies

(19) Using the above chart, please identify which best represents your DIVISION, BUREAU, OR GROUP:

(a) Stage 1: Most reports and data are collected using paper formats and stored in file cabinets. Agency staff manually access and compile data upon request. Data is fragmented, collected across many divisions within an agency with little ability to share data across the agency, little knowledge of data collected by other divisions, or from other agencies.

(b) Somewhere between Stage 1 and Stage 2.

(c) Stage 2: Outdated data infrastructure and software exist, including local data servers that must be maintained by local staff. Data are not accessible from outside the agency. Data are fragmented and nonstandardized (e.g., variation of units, data names, etc. used within the agency).

(d) Somewhere between Stage 2 and Stage 3.

(e) Stage 3: A data infrastructure exists that allows for data sharing; however, the data are not always standardized or machine-readable. There is no easy method for creating visualizations and analytics. There may be duplicative systems across agencies, but they are not linked to each other.

(f) Stage 4: A modern data management system exists that includes the ability to extract data from the system, data visualization and analytics capabilities for decision-making, and is machine-readable.

(20) If you could change one thing about how your AGENCY collects, stores, or uses data, what would it be?

(21) If you could change one thing about how your DIVISION, BUREAU, or GROUP collects, stores, or uses data, what would it be?

Author Affiliations

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Citation

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Review

This report was reviewed by state agency leaders with experience in water data infrastructure as well as experts in the fields of stakeholder engagement and communications.

Publication Number: NI R 23-01

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Appendix P: Capability and Maturity Model

Summary/Review of Organizational Quality Levels

Based on the Capability Maturity Model®, Crosby's book Quality is Free[10], and Hansen's book Automating Business Process Reengineering[11]

Definition

Process: the actual steps that one takes to perform tasks. For example, your high school English teacher probably gave you a procedure for writing term papers. How you actually implemented this procedure was the process you followed (i.e., You may have written a draft and then developed an outline.)

Level 1, Initial

Processes are characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on the competence and heroics of individuals. A process may have evolved among employees, but it is undocumented. Quotas may be met, but quality of the product is unpredictable. If there are quality inspections, they generally occur at the ends of processes. Level 1 companies usually don't succeed without strong management. In the United States, most government and business organizations, about 80%, are at Level 1.

Level 2, Repeatable

Processes are documented, and their results are predictable. Product quality is also predictable, although it may be good or bad. Basic management processes are established to track cost, schedule, and functionality. Throughout the organization there is a general orientation centered on processes, but each process is isolated, and there is no coherent overall strategy.

Level 3, Defined

Processes are documented, standardized, and integrated into standard processes for the organization. All processes use an approved, tailored version of the organization's standard processes. All activities are viewed from an overall "enterprise" perspective.

Level 4, Managed (Measured)

Processes, services, and products are quantitatively understood and controlled. Detailed measurements of productivity and quality are defined, collected, and reviewed. In addition, there are well-defined measurements of the behavior of the processes themselves, and these measurements are also collected and reviewed.

[10] Crosby, P. B., Quality is Free: The Art of Making Quality Certain, Penguin Books, Inc., New York, ©[undated].
[11] Hansen, G. A., Automating Business Process Reengineering: Breaking the TQM Barrier, P T R Prentice Hall, Englewood Cliffs, NJ, ©1994.

Level 5, Optimizing

The organization is oriented toward continuous process improvement. This goal is pursued by quantitative feedback from organizational processes. Innovative ideas and technologies are tried, and the successful ones are adopted.

CMM: A Process Maturity Framework

Introduction

After decades of unfulfilled promises about productivity and quality gains from applying new methodologies and technologies, organizations are realizing their fundamental problem: an inability to manage their processes. Setting sensible goals for process improvement requires an understanding of the difference between "immature" and "mature" organizations.

Immature	Mature
• Processes are generally improvised during the course of a project • If a process has been specified, it is not rigorously followed or enforced • Managers usually focus on solving immediate crises (i.e., fire fighting) • Schedules and budgets are routinely exceeded because they are not based on realistic estimates • When hard deadlines are imposed, quality is often compromised to meet the schedule • No objective basis is established for judging product quality • Quality assurance activities are often curtailed or eliminated when a project falls behind schedule	• Employees at every level of the organization are trained in techniques of process management • Processes are accurately communicated to existing staff and new employees • Work activities are carried out according to planned processes • The processes mandated are fit for use and consistent with actual work methods • Defined processes are updated when necessary • Process improvements are developed through controlled pilot tests and/or cost benefit analyses • Staff roles and responsibilities within the defined process are clear, throughout the project and across the organization • Managers monitor product quality and customer satisfaction • There is an objective, quantitative basis for judging product quality • Schedules and budgets are based on historical performance and are realistic • Expected results for cost, schedule, functionality, and product quality are usually achieved • A disciplined process is consistently followed because all of the participants understand the value of process management

- ***Process capability*** describes a range of expected results that can be achieved by following a process.
- ***Process performance*** represents the actual results achieved by following a process.
- ***Process maturity*** is the extent to which a specific process is explicitly defined, managed, measured, controlled, and deemed effective.

As an organization gains in process maturity, it institutionalizes its processes via policies, standards, and organizational structures. ***Institutionalization*** entails building an infrastructure and a organizational culture that supports the methods, practices, and procedures of the business, so that they can endure after those who originally defined them have gone.

The Capability Maturity Model (CMM) was designed to guide organizations in selecting process improvement strategies by determine current process maturity, and identifying the few issues most critical to product quality and process improvement. The staged structure of the CMM is based on principles of product quality that have existed for the last 60 years.

The Five Levels of Process Maturity

Continuous process improvement is based on many small, evolutionary steps rather than on revolutionary innovations. The CMM provides a framework for organizing these evolutionary steps into five maturity levels that lay successive foundations for continuous process improvement.

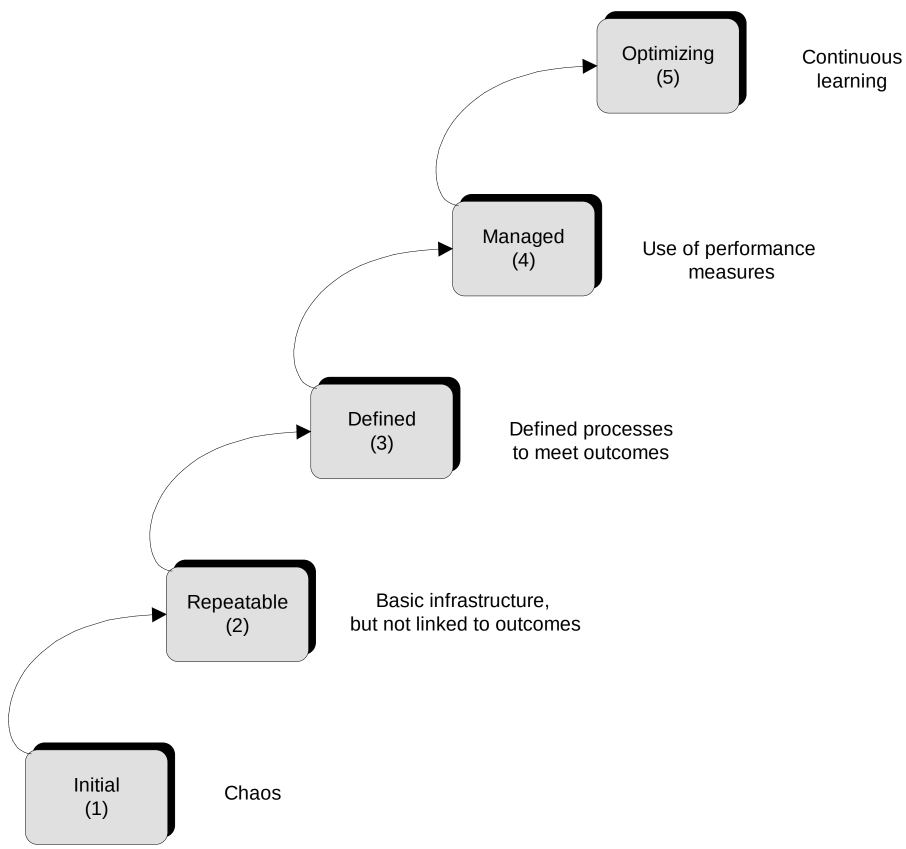

Figure 1: The Five Levels of Organizational Process Maturity

1. Initial

Processes are characterized as ad hod, and occasionally even chaotic. Few processes are defined, and success depends on the competence and heroics of individuals.

Example:

Consider a new fast-food restaurant. When the first customer drives up, employees look at each other and say, “What do we do now?” As successive customers drive-up, each is handled differently depending on what is ordered and who takes the order. The lunch rush creates a crisis, but a few outstanding employees are able to pull it off by their heroic efforts. When the heroes leave the restaurant, however, the ability to handle the lunch rush leaves with them.

2. Repeatable

Basic project management process are established to track cost, and functionality. The necessary process discipline is in place to ably repeat earlier successes on projects with similar applications.

Example:

Consider an established fast-food restaurant. Seasoned employees have learned from practices that have worked, and have adopted those proven practices. When a customer drives up, these employees know what to do, and they do the same thing every time. When the seasoned employees leave the restaurant, the business looses any gains realized from their experience.

3. Defined

Processes for both management and engineering activities is documented, standardized, and integrated into standard processes for the organization. All projects use an approved, tailored version of the organization's standard processes.

Example:

Consider an established fast-food restaurant that has implemented standard processes that are based on proven practices. When a customer drives up, all employees know what to do, and they do the same thing every time. Processes for operating the restaurant are documented, and new employees are trained on the processes.

4. Managed

Detailed measures of processes and product quality are collected. Both the process and products are quantitatively understood and controlled.

Example:

Consider an established fast-food restaurant that has implemented performance measures for its standard processes. When a customer drives up, the time that it takes to respond to the customer, take the order, prepare the order, check-out for the order, and send the customer on his or her way is captured. The speed (i.e., a quantity) of the customer service is, thus, measured.

5. Optimizing

Continuous process improvement is enabled by quantitative feedback from the process, and from piloting innovative ideas and technologies.

Example:

Consider an established fast-food restaurant that has implemented quality measures for its standard processes. The restaurant has quantified measures of customer satisfaction, product, and service quality. Drive-through service is continuously improving both through incremental advances in processes, and through new technologies (e.g., intercom systems, touch screen cash registers, computer order-tracking, etc.).

Internal Structure of the Maturity Levels

In the CMM framework, each maturity level is decomposed into constituent parts. Figure 2, below, shows that with the exception of Level 1, the decomposition of each maturity level ranges from abstract summaries of each level down to its basic operational definition in the key practices. Each maturity level is composed of several key process areas. Each key process area is organized into sections called common features. The common features specify the key practices that, when collectively addressed, accomplish the goals of the key process area.

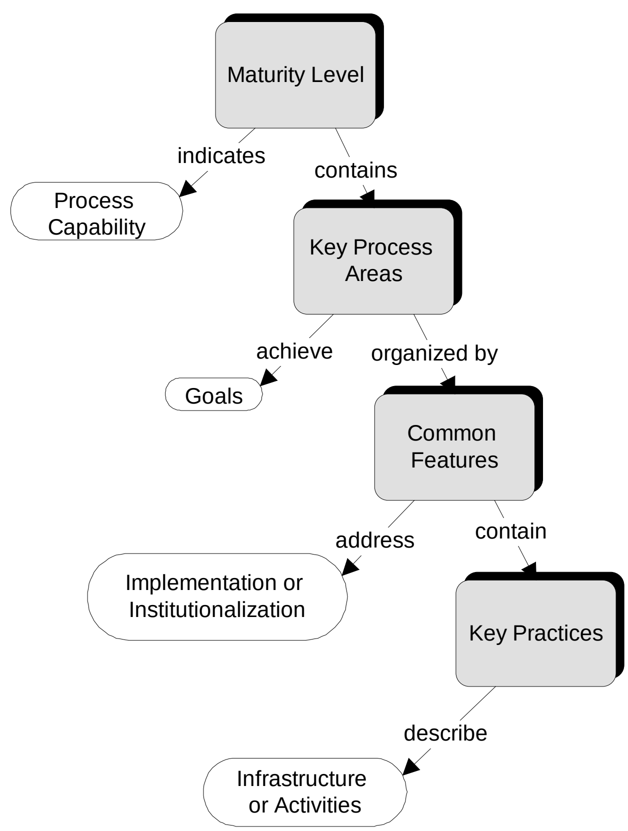

Figure 2: The CMM Structure

- A ***maturity level*** is a well-defined evolutionary plateau toward achieving a mature process.
- Each ***key process area*** identifies a cluster of related activities that, when performed collectively, achieve a set of goals considered important for enhancing process capability.
- The ***common features*** are attributes that indicate whether the implementation and institutionalization of a key process is effective, repeatable, and lasting.

- The ***key practices*** describe the infrastructure and activities that contribute most to the effective implementation and institutionalization of the key process area.

References

This document is primarily composed of statements and figures that are explanations of, paraphrasing of, or a direct quote from: Mark C. Paulk, et al. *Capability Maturity Model for Software, Version 1.1.* Carnegie Mellon University Technical Report CMU/SEI-93-TR-024, February 1993.

Appendix Q: 2021-2023 Project Documents

This appendix includes project documents for the 2021-2023 project work:

- Project Charter
- Project Management Plan
- OWDP Wish List Management
- Project Questions/Issues & Risks

Oregon Water Data Portal Project Charter

V1.0 6/6/2022

PROJECT TITLE	Oregon Water Data Portal (OWDP) Stage 1
SPONSOR	Jennifer Wigal, Water Quality Administrator – Oregon Department of Environmental Quality (DEQ)
PROJECT MANAGER & PROJECT LEADS	Project Lead: Joshua Weber, DEQ Project Manager: Carrie Hertel, OSU Center for Applied Systems & Software (CASS)
PROBLEM STATEMENT	Decision-makers, communities and regular users of water-related data do not have easy access to the necessary data and information upon which to base long-term strategic water-related decisions, including planning and investment.
PROJECT PURPOSE	This stage 1 project will lay the necessary groundwork for the successful implementation of an Oregon Water Data Portal. Given the size and complexity of the solution, this planning for the long-term project is crucial.

SCOPE	Much of the guidance for the scope of work in this project stems from the considerable efforts to develop and implement the Oregon 2017 Integrated Water Resources Strategy (IWRS), as well as subsequent efforts to bring about investments in water-related natural resources via the Oregon 100-year Water Vision.
	
	1. Administrative Work
	    a. Identify a Steering Committee
	    b. Identify a Subject Matter Expert (SME) team representing water-related programs across Oregon's agencies
	    c. Identify a Technical team
	    d. Other administrative and project management responsibilities
	2. Establish design of the data "Platform" and "Framework"
	    a. Platform: single point of access for water data with various data ingestion mechanisms
	    b. Framework: agreements and standards on the data and associated procedures
	3. Evaluate state agency water data and infrastructure
	4. Answer general questions (i.e., What data should be available and to whom?)

EXPECTED OUTCOMES	• Project Teams:
	    o Project Steering Committee
	    o Water Data Subject Matter Expert (SME) Team
	        ▪ To include some Information & Technology (I&T) SME expertise in anticipation of the I&T projects that will result
	    o Technical Team

	• Project structure and planning to continue work, assuming funding approval by Oregon Legislature
	• Analysis of state agency data sets and supporting I&T infrastructure
	• Proposal for the "Platform" and "Framework" that reflects water data users' and decision-makers' needs
	• Deliverables to the Oregon Legislature
	  o Comprehensive project status report
	  o Request for resource needs in the next biennium required to continue the project

TIMELINES	**Stage 1 – Second half of the 2021-2023 biennium** • Plan and define the project and its outputs • Determine what data and information state agencies should be able to make available • Plan the central data portal, including technologies and the way users will interact with it • Engage with water data users and decision-makers to identify critical uses and decision needs • Devise a plan for subsequent interactions with Special Service Districts, Counties and Municipalities and other relevant entities that are identified to receive and offer water decision data • Report to the Oregon Legislature on project discoveries, recommended plans and resource needs for the next biennium (January 2023) While this charter is targeted for Stage 1, future Stages are expected to include: **Stage 2 – 2023-25 Biennium** • Implement the central data portal • Conduct a pilot project using prepared, ready-to-go data and information • Engage with special service districts and local governments and any other relevant entities that are identified as part of Stage 1 • Draft Policy Option Packages for state agencies needing operational or IT infrastructure changes to support data responsibilities • Report to the Oregon Legislature on project discoveries, recommended plans and resource needs for the next biennium (January 2025) **Stage 3 – 2025-2027 Biennium** • Ameliorate state agency data and information system gaps • Continue to engage with special service districts and local governments and any other relevant entities • Implement processes to maintain and continue to improve the Oregon Water Data Portal

KEY STAKEHOLDERS	• Legislature
	  o Representative Mark Owens
	  o Representative Ken Helm
	• Sponsor
	  o Jennifer Wigal, DEQ
	• Water Core Team
	• Oregon State Chief Information Office (CIO)
	• Institute for Natural Resources (INR)
	• Oregon Water Agencies

	o Business Oregon (BizOR) o Department of Environmental Quality (DEQ) - Lead Agency o Department of Land Conservation and Development (DLCD) o Department of State Lands (DSL) o Office of Emergency Management (OEM) o Oregon Department of Agriculture (ODA) o Oregon Department of Energy (DOE) o Oregon Department of Fisheries and Wildlife (ODFW) o Oregon Department of Forestry (ODF) o Oregon Department of Geology and Mineral Industries (DOGAMI) o Oregon Department of Transportation (ODOT) o Oregon Health Authority (OHA) o Oregon Parks and Recreation Department (OPRD) o Oregon State Marine Board (OSMB) o Oregon Watershed Enhancement Board (OWEB) o Water Resources Department (WRD) • Water Managers/Decision-Makers (state-wide)
FUNDING & RESOURCES	The authorizing language from HB 5006 (2021) is as follows: "SECTION 112. In addition to and not in lieu of any other appropriation, there is appropriated to the Department of Environmental Quality, for the biennium beginning July 1, 2021, out of the General Fund, the amount of $350,000, to begin initial scoping and design of a database framework of water and infrastructure data." The Legislative Fiscal Office (LFO) budget report contains the following additional verbiage that provides some indication of legislative intent: "…. as part of an overall statewide investment in water-related priorities, $350,000 General Fund was provided to begin initial scoping and design of a database framework of water and infrastructure data. While this is provided as a one-time appropriation, this is likely to become a significant information technology project, which will need to be reviewed by the Legislative Fiscal Office and the State Chief Information Office as part of the Stage Gate process. DEQ will need to develop a funding request for further development of this database framework." Resources needed for this project include: • Project Contractors (approximate amounts below funded by the $350K from the Legislature) o $100K: Project Management (Oregon State University – CASS) o $125K: Project Support (Internet of Water) o $35K: Project Support (Institute for Natural Resources) o $30K - $50K: I&T Researcher from State Price Agreement Vendors • Staff Teams (funded by representative agencies) o Agency (SME) Team o Technical Team o Other State Participants (EIS, Data Coordination)
MAJOR PROJECT RISKS	• Stakeholders may not agree on the implementation details of this project. • The scope as laid out in the 100-year Water Vision and expectations expressed by project stakeholders may be not achievable in a reasonable timeframe.

	• Key agencies may not participate at the level necessary for success.
SPONSOR APPROVAL	Jennifer Wigal Jennifer Wigal (Jun 8, 2022 21:15 PDT) Jun 8, 2022

OWDP Project Charter_final

Final Audit Report 2022-06-09

Created:	2022-06-08
By:	Bill Moore (bill.l.moore@deq.state.or.us)
Status:	Signed
Transaction ID:	CBJCHBCAABAAd33fanM9TNJpVuKaCcyMXmlJ9pmcqiKU

"OWDP Project Charter_final" History

Document created by Bill Moore (bill.l.moore@deq.state.or.us)
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2022-06-08 - 10:58:22 PM GMT

Email viewed by Jennifer Wigal (jennifer.wigal@deq.oregon.gov)
2022-06-08 - 10:58:30 PM GMT- IP address: 40.94.28.254

Document e-signed by Jennifer Wigal (jennifer.wigal@deq.oregon.gov)
Signature Date: 2022-06-09 - 4:15:24 AM GMT - Time Source: server- IP address: 67.189.104.237

Agreement completed.
2022-06-09 - 4:15:24 AM GMT

Project Management Plan

Oregon Water Data Portal – Stage 1

Project Management Plan

Version 3.0 – January 27, 2023

The Oregon Water Data Portal (OWDP) Project Management Plan serves to outline the project governance structure for Stage 1. This stage of the project is not to build the portal, but rather to plan it and determine resources and asks to the Legislature to continue into Stage 2.

This document works in conjunction with other project management documents:

- Project Charter
- Project Concept
- Project Plan
- Stakeholder Register
- Risk Register
- Issues List
- Glossary/Acronyms List
- Lessons Learned
- Project Status Reports

Project documents will reside in a central shared location. This is currently a DEQ created Google Drive instance.

Governing Bodies

The Oregon Water Data Portal project has several groups providing decision making as well as advice in managing this project and its goals. Below outlines the various groups and their authority.

Committee Name	Responsibilities	Committee Type (Decision-Making, Advisory, Informational)	Meeting Frequency	Comments and Assignments
Oregon Legislature	• Project funding and approval	Decision-Making	Annual legislative sessions	• Via HB 5006 (2021) approved funding for project • Decides on continued project funding and scope

Project Sponsor & Steering Committee	• Project Oversight • Change Control Board (CCB)	Decision-Making	Monthly	• Governance of the project representing the interest of stakeholders • Change Control: Approve or reject change requests • Steering committee is to be comprised of executive level staff from water related agencies
Subject Matter Expert (SME) Team	• Advise and participate in water data specific tasks	Advisory	Bi-weekly	• Primary Data Inventory participants • Represent respective agencies' needs around water data and information • Provide insight into water manager needs
Technical Team	• Advise and participate in technical specific water data portal needs	Advisory	Bi-weekly	• Review and advise technical needs for water data portal • Deliver technical report for Legislative and Final reports.

Project Leadership

In conjunction with the Project Governance bodies the project leadership as outlined below provide important structure and guidance in the project activities.

Name	Role	Responsibility
Jennifer Wigal, DEQ	Project Sponsor	• Oversee project governance and serve as final arbiter on disputes among project participants • Approve changes in scope, schedule, or budget working with Steering Committee as needed • Ensure that external governing entities are properly consulted and engaged to provide timely approval of changes where required • Ensure that Stakeholders and Tribes who need to provide perspectives about decisions have opportunity for meaningful input • Maintain a shared vision among steering committee members inside and outside the meetings • Monitor risks and issues to make sure that matters are appropriately referred for decision promptly • Remove obstacles • Chair the Steering Committee
Steering Committee Members	Steering Committee	• Recommend to the Project Sponsor any changes in scope, schedule, or budget • Simultaneously provide global governance of the project and represent the interest of internal and external stakeholders • Identify and resolve conflicts between project objectives/activities and other factors, such as organizational policies, business practices, standards, or relevant requirements • Ensure compliance with relevant regulatory and contractual requirements and organizational policies
Joshua Weber, DEQ	Project Lead	• Make daily decisions based on direction provided by the Project Sponsor or when changes are within the agreed upon by delegated authority • Recommend to the Steering Committee any changes in scope, schedule, or budget • Communicate with the Project Sponsor regarding decisions made • Oversee communications related to scope, schedule, or budget to the greater project team • Ensure that decision items are properly analyzed before presenting them for decision • Simultaneously provide governance of the project and represent the interest of internal and external stakeholders • Lead development of the Legislative and Final reports

Carrie Hertel, OSU-CASS	Project Manager	● Make daily recommendations based on direction provided by the Project Sponsor or Project Lead or when changes are within the agreed upon delegated authority ● Ensure that other Stakeholders and Tribes have opportunities and information necessary to provide advice regarding pending decisions ● Communicate with the Project Lead regarding decisions made ● Escalate issues for resolution to the Project Lead ● Provide project deliverables, as needed ● Compile and track requested changes to scope, requirements, or design details ● Setup, participate and sometimes lead various project team meetings ● Work with Project Lead to develop agendas ● Assist with development of the Legislative and Final reports

Scope

Scope is managed by the Project Lead with guidance from the Project Sponsor and Steering Committee. The planned scope is outlined in the Project Charter and in more detail in the Project Concept. The scope, as given by the legislature, was a bit vague. The Project Lead worked with many constituents to shape the scope of this project approved in the Project Charter.

1. Administrative Work
    a. Identify a Steering Committee
    b. Identify a Subject Matter Expert (SME) team representing water related programs across Oregon's agencies
    c. Identify a Technical team
    d. Other administrative and project management responsibilities
2. Establish design of the data "Platform" and "Framework"
    a. Platform: single point of access for water data with various data ingestion mechanisms
    b. Framework: agreements and standards on the data and associated procedures
3. Evaluate state agency water data and infrastructure
4. Answer general questions (i.e., What data should be available and to whom?)
5. Deliver Legislative Update and Final Reports
6. Plan Stage 2 scope and effort

Change Management

Any changes in scope will be brought to the Project Sponsor and depending up on their advice, the Steering Committee, for review and guidance.

Schedule

A Microsoft Project plan will be utilized to track project schedule. The Project Manager is responsible for updating the project plan.

At a high level:

- February 1, 2023 – deliver draft Legislative report
- February 13, 2023 – deliver vetted Legislative report
- June 30, 2023 – deliver Final report

Any deviations from the major schedule milestones will be reported to the Project Sponsor.

Resource Management

The Legislature allocated $350,000 towards this project as administered by DEQ. Other than these funds, any agency staff is "donated" to the project out of agency budgets.

Contractors

Contract management is provided by the Project Lead in conjunction with DEQ contracting services. There are three contractors:

- **CASS/OSU** – Center for Applied Systems and Software, Oregon State University. This group provides the Project Manager and assistant to work with Project Lead on all project management activities.
- **INR** – Institute for Natural Resources. This group developed and maintains the Oregon Explorer, a water tool with similarity to the planned OWDP. The INR staff are considered subject matter experts in working with water data, both from a technical and water subject matter expert perspective. While this group works extensively with Oregon state agencies, they are not a funded executive agency and thus needs support to participate in this project.
- **IoW** – Internet of Water. IoW provides expertise in working with states and water data to successfully launch a portal for water data. They have had success with New Mexico, Texas, California and North Carolina. Their nationwide perspective and experience navigating the state systems is valuable.

Project Lead assists in recruiting agency staff and other resources as needed for this project. The goal is to have all water related state agencies, as listed in the Project Charter, participating in some capacity.

OWDP Project Teams

- **Subject Matter Experts (SME) Team** – this team is comprised of water data experts representing their respective agencies. This team will evaluate the data sets and assist with prioritization of work to be included into the pilot project proposed to start in Stage 2.
- **Technical Team** – this team is comprised of technical expertise including working with data, to evaluate technologies and provide a high-level estimate for what would be needed to build out the OWDP from a technical implementation and platform perspective.

- **Tribal and Stakeholder Engagement sub-committee** – this team was formed as a need to reach out to tribes and stakeholders was escalated. This effort was led by an engagement expert, Michele Martin of DEQ.

Communication

The project communication will occur primarily in email and meetings with the project teams. Virtual meetings are a major source of information sharing amongst the various project teams.

Group	Meeting Frequency
Steering Committee	Monthly
Project Sponsor & Administrative Team	Bi-Weekly
SME Team	Bi-Weekly
Technical Team	Bi-Weekly
Internet of Water	Weekly
Project Lead & Project Manager	Twice a week
Rep. Helm and Rep. Owens	Quarterly

For all groups, email communications will be used as-needed with the intention to share relevant information gleaned with the appropriate groups in one of the scheduled meetings.

Written project reports will be made available upon request.

Risks

The Project Manager will be responsible for maintaining a Risk Register. Risks will be assessed on a monthly basis, including evaluation of any mitigation strategies. Any realized risks with medium or high impact will be reported ASAP to the Project Sponsor who will determine course of action which may include the Steering Committee.

Issues

An Issues list will be the responsibility of the Project Manager to maintain. Issues will be added to the project as discovered. Issues will be reviewed on a monthly basis at a minimum.

Lessons Learned

A Lessons Learned log will be utilized throughout the project. A lessons learned debrief will be completed towards the end of the project and included in the Final Report.

OWDP Wish List Management

The following project summary and notes are provided from a Steering Committee Discussion held on August 17, 2022. The information presented here is provided to demonstrate discussions and information sharing approaches used in development of the recommendations provided in the Legislative Report.

To: OWDP Steering Committee

From: Josh Weber

August 17th, 2022

Draft 1.1

The legislature requires the project to "begin initial scoping and design" of the Oregon Water Data Portal (OWDP). This is currently styled as "Stage 1" of the project. In addition to designing the portal itself, this stage includes discovering what data and information we should make available. The assembled material for the project, which inspired the legislative allotment includes a list of at least 40 data gaps (100-Year water Vision, pp. 207-210), a spreadsheet of data needs from the Oregon Water Core Team and a very long strategic discussion including yet other data needs. We anticipate learning of additional data needs from Tribal and Stakeholder engagements and from the various teams' project work.

Note that the OWDP includes other features that are not data, including information and data tools and processing features.

Makeup of the Wish List

We have the components of a "wish list" of Oregon water decision making data which we would like to eventually make available on the portal. This wish list is not yet assembled, but currently consists of data inventories for all 16 Oregon water agencies, a number of federal agency data sets, 40 gaps in needed Oregon agency water data identified in the 100-Year Water Vision and various data sets from local Oregon agencies. We will certainly add to the wish list as we take tribal and stakeholder input and have agency Subject Matter Experts work through project requirements. This will be a very long list!

The wish list will be based on data that the state needs for water decision makers, rather than on data which the state currently has available. For those listed data sets for which state agencies have responsibility, there are often substantive gaps in the current handling and management. Unseen to the casual observer of the wish list are the substantive tasks of determining publishing suitability, completeness, quality, IP rights, agency database infrastructure, etc.

There are also some wish list items for which we have no data, do not have the data in a form which we can rely upon, or do not have the data in a form which can be easily published. Some wish list items require software tools and processes which we do not yet have. We may not have authority to collect or publish some data at any Oregon agency.

Some of the wish list data are currently available at state or federal agencies however and can be posted to the portal approximately immediately once it is implemented. These are the “low hanging fruit” of the project.

There are a variety of project events that will directly address the Wish List:

Stage 1

Pilot List

The SME team will be using the existing Oregon Open Data Standards Project agency data inventories (Water Data). These inventories are exclusively composed of existing agency data sets. We will examine every state agency water data set to determine if it is complete, meets all of our pre-established criteria, and can be published on the OWDP. Those data sets that are ready to go will be prioritized for the OWDP Pilot Project. The pilot project will be implemented during the 2023-2025 biennium using these existing data sets. We anticipate a substantive portion of existing agency data to be ready to go.

Those data not included on the ready-to-go list will be entered onto the Wish List.

Tribal and Stakeholder engagement

Tribes and Stakeholders may add additional items to the wish list. They will be asked to help provide prioritization to the wish list.

Assembling the wish list

The components and inventories we have identified will be assembled into the draft project Wish List.

Stage 2

Wish List Prioritization (and)

Policy Option Package Drafting

Near the beginning of Stage 2, the SME team will analyze the Wish List and prioritize data sets according to decision making value and ease of availability. Certain high priority data sets which need additional work in order to be made available will be identified to pursue essentially immediately. If the selected data sets require a significant project to produce, the agency may need to draft a POP to do so. The working level and decision-making level for such a project is generally the state agency, not the OWDP project. There may be some coordination or prioritization of these projects at the state level. The OWDP project may have resources which the agencies can call on to complete projects.

Pilot portal project

The pilot portal will be implemented at around the same time as the portal infrastructure. The selected data sets from Stage 1 will be prepared and made available on the pilot portal. Data sets added to the portal, including those added during the pilot project, we be removed from the Wish List.

IoW work with Oregon local agencies

Oregon special service districts, counties, municipalities and other local governmental and organizations make water and water infrastructure decisions, and generate water data useable by other water decision makers. Our current plan, subject to approval by all the powers that be, is for the state to methodically pursue engagement with these organizations during project stage 2. Internet of Water has experience and methodology for this. This effort could potentially be funded by a federal grant. Local Oregon agency data appears in or makes up numerous items on the Wish List.

Obtaining data toolsets

Some data sets and Wish List issues would be produced by analysis of other data sets. Foundry Spatial, makers of the British Columbia and Alberta water portals, and one of the organizations that presented their portal projects to us, makes a set of analysis tools that appear to be very useful to Oregon. We will look into making our own and/or obtaining their toolsets, probably during project stage 2. Either action will handle some of our Wish List items.

Stage 3

Water DOGS, governance and maintenance

Stage 3 will need to include a mechanism for governing and maintaining the portal, and for continuing to improve the portal's data handling ability. An output of project stage 2 which would begin operating during this period would be "WaterDOGs" (The Water Data Organization Group). Continuing maintenance, governance and improvement procedure for the portal must include a method for managing and handling items from the Wish List and putting them on the portal.

Project Questions, Issues & Risks

Open Questions

These questions came from the OWDP Project Concept (see Appendix A) and some additional have been added over the life of the project thus far. Below is the open questions and an assessment of the status of resolving them as of June, 2023.

Question	Status
What data should be available to whom? (e.g., Are some data available only to agency-level partners? On what criteria do we base such determinations?)	Further analysis is needed. We have learned that there is a need for some data to have limited access based on source and need.
What tribal, special service district, county and municipal, etc. data should be available on the platform, and what is the best way for us to engage potential data-providing entities?	The project has a list and has plans to move forward, considering that different data providers have different capacities and concerns with how their data are shared. We are pursuing a grant to assist with outreach and engagement in addition to project staff.
Are there other water data organizations we should potentially engage?	Yes, however a determination on how to evaluate data when coming from private or citizen scientists is pending.
What federal agency data are key to this project, and are they available to us?	We know there are federal data available but have not yet evaluated which data sets will be most useful. Many major federal data sources, such as stream gage data from the U.S. Geological Survey, are already available via data services, and we assume that all major necessary federal data sources will be accessible.
How shall we handle potentially duplicative data sets from different agencies?	The project will need to provide analysis and identify which data sets are in this category. For any such data sets, a primary source will need to be identified, as well as a process for incorporating any novel or conflicting data from duplicate sources.
What are the rough setup and maintenance costs for each of the features?	See this report's resource request for the rough setup and maintenance costs. The Technical Team report contains staffing estimates which can be found in Appendix J.
How shall the OWDP be maintained and staffed, and how shall it be governed?	We anticipate a similar project structure with the same three teams as we have today. There has been a suggestion to draft a Memorandum of Understanding (MOU) to formalize the process between agencies. This still needs further exploration.
What level of data processing and integrating should the platform be capable of doing at various stages, and what level of investment is justified to produce each? What data analysis and processing tools are necessary to make the data most useful to water decision makers?	There is further analysis needed to answer these questions in detail, but it is clear that supporting some critical water decisions will require data processing and integration. The project has engaged with water data users and decision makers to start to better understand their needs. The project Technical Team will assist with this as the selected platform makes an impact on the capabilities of the OWDP.
How do we manage expectations of agencies' data which may take large amounts of resources and many years to develop? Are there needs for which Oregon state agencies do not have the data or possibly even the authority to answer?	Managing expectations is an ongoing process. To start, the OWDP team held listening sessions with water users and associations with a focus on what the OWDP can be capable doing in the short and long terms. Yes, there are Oregon agencies that do not have data or authority to collect it.
Does Oregon have the legal ability to share data?	Most data held by Oregon Agencies are public record, though there are restrictions to sharing due to considerations of privacy, security, or other privileged information associated with regulatory actions.
How do we interoperate the data to allow for integration of data across agencies?	Once the state's data framework is developed, there is expected to be a translation as data is brought into the

	portal. The Technical team is also developing data standards that will inform and support agencies in sharing their data in ways that support interoperability.
How is return on investment determined and shared? State agency ROI is often providing information and customer service instead of profits as in private industry.	Further analysis is needed, especially in terms of "what is the value of data?"
What are the questions that water decision makers are trying to answer? What data is needed to support those needs and how do we get it?	Further analysis is needed. The project started identifying questions during Tribal and Stakeholder listening sessions in October 2022, and during Spring 2023 we will be compiling and developing use cases that support agency staff. These combined lists will be compared with the current data inventories in order to identify data gaps.
How do we get data that we don't have such as data on paper or not collected?	Processes will need to be developed and will likely be pursued through future agency-specific Policy Option Packages. For some draft examples of long-term projects to assist with this effort, see Appendix L.
Should the OWDP integrate data from open data platforms, such as Open ET or Google Earth Engine?	Further analysis is needed. The project team is aware of the need to balance availability of remotely sensed water use data with potential privacy concerns. There will be on-going discussions across agencies and stakeholders to identify an appropriate approach to provide detail suitable for planning but respecting appropriate limitations.

Issues

Included here is a list of issues being tracked in this project.

1. There is no centralized document access across agencies and contractors
2. The project needs to incorporate Diversity, Equity and Inclusion(DEI) as well as Environmental Justice practices.
3. Data gaps/needs analysis has started but a crosswalk and deeper dive needs to be completed.
4. The project needs to incorporate agency staff as a stakeholder in subsequent planning efforts
5. Personas and Use Cases need development
6. Determine how to best apply the prioritization work completed with IoW
7. Concerned we do not have sufficient built water infrastructure (e.g., dams, pipes) expertise in the core project teams
8. Need to develop MOU between agencies for project support
9. Need to determine any potential redundancies the OWDP may create (Oregon Explorer, GeoHub, Open Data, etc.)
10. Determine the relationship (as needed) between this project team and the Regional Water Planning and Management Workgroup
11. Expectation Management. Continue to educate and inform users of the possibilities and what is not currently possible.
12. Determine Legal Framework to approach local governments and special service districts

Risks

The list below does not incorporate all project risks but identifies some major ones.

Risk	Description	Probability	Impact	Mitigation or Avoidance Plans	Update – June 2023
Lack of support from Legislature, Agencies and/or Users	Without support, this project will not be funded and will be shelved for at least a biennium, if not longer. This directly impacts the ability to provide water data to decision makers in an increasingly complex environment.	Medium	Very High	Continue to work with State Representatives, agencies, tribes, water decision makers and other stakeholders to inform the project activities. Provide opportunities for feedback and input for all levels.	OWDP Project has been funded for the 2023-2025 biennium. The funding delivered is below the level requested. The team will reduce the scope a bit to accommodate and will be looking at utilizing grants for some additional project work.
Political Impact	There are some sensitive topics around water data that may derail the project, including negative press or halting the work.	Medium	High	Continue to work with agencies and State Representatives to provide the needed level of care around these topics.	
Consistent project resources not provided	If this project is funded in the 2023-2025 biennium but not subsequent biennium progress will be stalled.	Medium	High		
Agencies being the working level of the project, but the project is responsible	If agencies are unable or unwilling to provide services to help the project be successful, the project may be in jeopardy.	Low	Medium	Work closely with agencies on what projects need to be achieved to participate in the OWDP. Secure MOU between agencies. This project is also working to provide resources (grants and/or staff) to assist agencies and others in their engagement.	Agencies continue to be collaborative. With the project being funded the team should review the MOU and/or governance structures to help ensure the support by the various agencies.
State licenses for Socrata and/or ESRI tools are insufficient	Currently the project recommendation is to use Socrata and ESRI tools for the OWDP. If the licensing is unavailable for project staff or cannot support the project needs, another tool may need to be selected. After the start of implementation, the project would be delayed for redesign.	Medium	Medium	Work with Oregon State Department of Administrative Services (DAS) to ensure the proper licensing is available. Outreach early and assist agencies that may need help with the stage gate project process and their data governance plans to ensure they are able to receive licenses.	Since the February 2023 report, the OWDP Tech Team has been working on solidifying the options. It does appear the Tyler Technologies Data & Insights tool (previously Socrata) has licensing support for the pilot project needs. The OWDP Tech Team has been engaging DAS to work on available options and support. This does not mean re-design may not be needed, but that is the nature of a pilot. The OWDP will try a technology route and adjust if needed.

Evaluation of Oregon Water Data Portal Project: Stage 1

June 30, 2023

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Oregon Water Data Portal Stage 1 Evaluation: Executive Summary

The state of Oregon has a diverse and complex landscape of water resources, with many different water interests and challenges including drought, flooding, aging infrastructure, and climate change. Making informed decisions about how to allocate, protect, and plan for water resources in the present and into the future requires a modern data system to serve decision makers, agency staff, and the public. The goal of the Oregon Water Data Portal (OWDP) is to use modern data management practices and technologies to make water data more accessible and usable. Ultimately the goal is to develop a single point of access data system that will better inform water management decisions across the state, to improve data-driven decision making and infrastructure planning.

This report is an evaluation of the OWDP Stage 1, which took place from 2021-2023. The OWDP Stage 1 activities have been evaluated on the basis of three criteria: stakeholder engagement; governance considerations; and technical considerations. The evaluation incorporates interviews with OWDP project staff members and evaluation of the written materials produced for the project.

Summary of evaluation findings

The initial legislative mandate was to conduct “initial scoping and design” and to “develop a funding request for further development” for a water and infrastructure database. **Overall, the evaluation finds that these tasks have been completed successfully.** Further findings include:

Stakeholder engagement evaluation summary:

According to evaluation criteria, effective stakeholder engagement involves meaningfully engaging data users at key points in data system development. Stakeholder engagement should be an ongoing process to ensure a data system based on an understanding of decision-making contexts and user needs. The evaluation finds that prospective users of the OWDP have had several chances to meaningfully engage with the project, and this engagement has informed OWDP progress so far. However, engagement with some groups and communities, particularly environmental justice communities and Tribes, has been limited so far. The evaluation recommends ensuring that stakeholder engagement is built into the project as an ongoing, iterative core component, and that timelines and budgets for Stage 2 reflect this commitment. The evaluation also recommends ensuring that diversity, equity, and inclusion are centered by strengthening engagement with underrepresented communities.

Governance evaluation summary:

According to evaluation criteria, good governance of a water data system includes institutional commitment by key organizations, along with incentives to participate and sufficient resources for long-term maintenance and financial stability. The evaluation finds that the OWDP project team has been thoughtfully assembled to be inclusive of different agencies and encourage institutional collaboration, and the progress to date has resulted in a budget request to secure resources for financial stability. Additionally, the OWDP team has built strong relationships with organizations within and beyond Oregon to help reach the project's goals. One main challenge is that while water is a core concern for several of the agencies leading the OWDP project, some of Oregon's 17 may not view water data as important for their agency and only participated in a limited way. Moreover, having a regulatory agency leading the data portal may lead to public perceptions that the purpose of the OWDP is to enact further regulation. The evaluation recommends incentivizing and/or requiring agency participation and ensuring shared decision making. The evaluation also recommends continuing to frame the project as an interagency effort, and considering having an outside group host the OWDP to avoid perceptions that it is a regulatory effort.

Technical evaluation summary

According to evaluation criteria, technical aspects of a successful water data system include adequate documentation, clear standards for metadata, data quality, and technical requirements, effective support of synthesis and analysis for problem solving and decision making, and regular maintenance and updates of systems. Many of these criteria apply to finalized data systems and are thus not possible to evaluate at this early stage. However, some notable areas of progress so far include inventorying the current state of data across state agencies, beginning assessment of data needs, and beginning data prioritization. The evaluation recognizes that the project is still in its early stages, with many of the technical aspects still to be worked out, and recommends continuing this work.

Overall recommendations

In addition to the five existing recommendations developed by the OWDP Project Team for Stage 2 (2023-2025), this evaluation proposes the addition of a sixth recommendation: **Develop an ongoing, meaningful process for incorporating stakeholder feedback and ensuring diversity, equity, and inclusion (DEI).** Specific tasks include: 6.1: Create structures that focus on stakeholder engagement: for example, a staff position specifically focused on public engagement, a public advisory group, or both; 6.2: Ensure the project's budget and timeline reflect ongoing stakeholder engagement processes; and 6.3: Address DEI by increasing quantity and quality of engagement with underrepresented communities, in particular Tribal communities and EJ communities.

Incorporating these recommendations will help ensure that a data system is useful, accessible, and used in practice. These recommendations will also help ensure that the data portal serves the diverse communities within Oregon. To conclude, a modern water data system for the State of Oregon will be key to ensuring the state is able to serve its diverse constituency and meet its long-term water and infrastructure planning goals. The OWDP team is well on its way to developing a data system that will be useful, usable, accessible, and used in practice to support informed decision making.

Oregon Water Data Portal Stage 1 Evaluation: Full Report

1. Commentary on the general conduct and operation of the project

The state of Oregon has a diverse and complex landscape of water resources, with many different water users and interests, ranging from agriculture to urban areas to fish and wildlife habitat. The state faces many water-related challenges including drought, flooding, aging infrastructure, and climate change. Making informed decisions about how to allocate, protect, and plan for water resources in the present and into the future requires a modernized water data system (Cantor et al 2021; Josset et al 2019). Currently, data about water, or data impacting water management, is spread across 17 different Oregon state agencies. There is no integrated system to access or synthesize data from these many different sources, which presents a challenge to decision makers, agency staff, and the public.

The goal of the Oregon Water Data Portal (OWDP) is to use modern data management practices and technologies to make water data more accessible and usable. Ultimately the goal is to develop a single point of access data system that will better inform water management decisions across the state, to improve data-driven decision making and infrastructure planning.

This report is an evaluation of the OWDP Stage 1. In 2021, based on directions from the Oregon Legislature, the Oregon Department of Environmental Quality (DEQ) and other state water agencies began working together to scope and plan for a statewide water data platform with the goal of modernizing Oregon's water data infrastructure. Over the past two years, DEQ and project partners have developed a multi-stage approach to plan and implement the data portal. This evaluation focuses on Stage 1, the first of three stages in the development of the water data portal. The goals of Stage 1 were to plan the project and create a plan for developing the OWDP; to set up a framework of standards; inventory water data needs; evaluate existing data sets and information infrastructure; and to draft a resource request to Oregon Legislature.

The evaluation first describes the legislative direction and the evaluation criteria, then evaluates the OWDP's progress through June 2023, focusing on three categories: Stakeholder engagement; governance considerations; and technical considerations.

The initial legislative mandate was to conduct "initial scoping and design" and to "develop a funding request for further development" for a water and infrastructure database. ***Overall, the evaluation finds that these tasks have been completed successfully.*** In addition to this overall finding, the evaluation outlines specific successes and challenges, and provides suggestions and recommendations for improvements in Stage 2 of the OWDP project.

2. Requirements to fulfill the legislative direction

In 2021, the Oregon Legislature directed DEQ and state water agencies to begin scoping and planning for a statewide water data platform with the goal of modernizing Oregon's water data infrastructure. HB 5006 (Section 112) directed DEQ to "begin initial scoping and design of a database framework of water and infrastructure data."

The mandate from the legislature was broad: what was required to be done was "initial scoping and design" and "develop a funding request for further development" for a water and infrastructure database. It was left up to DEQ and other state water agencies to determine exactly what this initial scoping and design would entail and how it would be completed. The task is a challenging one, given that Oregon's water data is housed across 17 public agencies with a diverse range of data management procedures and standards.

In response to the legislative mandate, DEQ and partner agencies articulated a main goal of the Oregon Water Data Portal (OWDP): to support informed decision making around water resources and planning by providing a single point of access for the public to access water and infrastructure data. To accomplish this, DEQ and partners planned a three-stage Project Concept for the OWDP (Oregon Water Data Portal):

- **Stage 1: 2021-2023 (the focus of this evaluation):** Plan project; develop a plan for a state water data portal; set up a framework of standards; inventory water data needs; evaluate existing data sets and information infrastructure; draft a resource request to Oregon Legislature.
- **Stage 2: 2023-2025:** Implement initial Data Portal; draft SOPs and quality standards; draft Policy Option Packages; pilot OWDP.
- **Stage 3: 2025 and beyond:** Fully implement OWDP; implement Policy Option Packages to address identified gaps; enable regular maintenance; implement continuous improvement processes.

This evaluation report focuses on the outcomes of Stage 1, the planning stages of the OWDP.

3. Sources for standards of evaluation of OWDP

Evaluation criteria

Previous research on open water data systems has identified a set of criteria for evaluation of success and excellence (Cantor et al 2018, 2021). These criteria focus broadly on usability of the data system for solving problems and supporting decision making, with success defined as a water data system that is sufficient, accessible, useful, and actually used. This area of research acknowledges that in order to successfully support decision making, a data system must take into account not only technical considerations, but also governance and stakeholder engagement considerations. This report utilizes these criteria to evaluate the Stage 1 OWDP progress and outcomes.

There are four main categories of evaluation criteria, which include:

1. **Stakeholder engagement:** Engagement of data users at key points and as an ongoing process; understanding of data user needs and decision-making contexts; legitimacy of data system according to stakeholders; use in practice.
2. **Governance considerations:** Institutional commitment and participation by partner agencies; sufficient resources; financial sustainability; plans and resources for system maintenance.
3. **Technical considerations:** Documentation of data; standards for metadata and data quality; effectiveness; maintenance.
4. **Addressing data limitations:** How well the data system actually functions by addressing data limitations and making data available, accessible, interoperable, and available at appropriate resolution.

These are elaborated upon in the table below, adapted from Cantor et al 2021.

Table 1: Criteria for evaluating success of a water data system.

	Evaluation criteria
Stakeholder engagement	Are data users engaged meaningfully at key points in data system development? Is involvement of stakeholders an ongoing process? Is the system based on an understanding of decision-making contexts and user needs? Do users believe the system is useful and usable? Is the system used in practice to inform decision making?
Governance considerations	Is there institutional commitment by key organizations to use and maintain the system? Do incentives exist to ensure participation by data providers and users? Are data providers participating, in practice? Are sufficient resources allocated to long-term maintenance? Is there a plan to ensure financial stability over time?

Technical considerations	Is documentation adequate? Are standards for metadata, data quality, and technical requirements clear to data managers? Does the data system effectively support synthesis and analysis? Are systems regularly updated?
Addressing data limitations	Are appropriate data readily available? Are data accessible in open, transparent, and usable formats? Are data from multiple sources interoperable? Are data available at appropriate spatial and temporal resolution?

Other related and overlapping data system evaluation criteria exist: for example the "FAIR" (Findable, Accessible, Interoperable, Reusable) Guiding Principles (Wilkinson et al 2016) focus on ensuring data are usable and accessible. However, the criteria used for the present evaluation focus more directly on governance and stakeholder engagement, which are especially crucial to data system success in early stages of development.

Given that this evaluation focuses on initial planning stages of a water data portal, the focus of the evaluation is primarily on the aspects of stakeholder engagement, governance, and technical considerations. The category of "addressing data limitations" is more outcome-oriented and thus is not addressed in this evaluation; addressing data limitations should be considered a key overall goal of the OWDP as it is implemented and improved over time.

Evaluation methodology

The evaluation process included conducting interviews with key personnel involved in the OWDP planning process, as well as examination of documents produced through the OWDP Stage 1 process. A total of six key staff members involved in the project from across five different agencies were interviewed and gave feedback. The interviews focused on the planning process, successes and challenges, public stakeholder engagement processes, inter-agency engagement, and ideas for improvement. Documents reviewed included the OWDP Stage 1 Final Report, the Legislative Report and appendices, and other planning documents produced as part of the Stage 1 process.

Information from the interviews and analysis of the reports was synthesized and is discussed below in terms of strengths, weaknesses, and suggestions for improvement moving forward. Within each section, the topics of stakeholder engagement, governance, and technical considerations are discussed.

4. Strengths and successes of OWDP Stage 1

The OWDP had the challenging task of defining and implementing a very broad mandate to scope and design a water data framework integrating data from 17 different state agencies. Given the broadly defined mandate, the limited time frame, and the considerable scope of the task, the OWDP project team has done a commendable job of envisioning and carrying out Stage 1 planning tasks.

Overall, the legislative mandate was to conduct "initial scoping and design" and to "develop a funding request for further development" for a water and infrastructure database. ***These initial tasks have clearly been accomplished successfully.*** Initial scoping has been completed, with next steps identified. A funding request has been developed and submitted to the Oregon Legislature. Specific strengths of the Stage 1 process are discussed in more detail below.

Stakeholder engagement

According to evaluation criteria, effective stakeholder engagement involves *meaningfully engaging data users at key points in data system development.* Stakeholder engagement should be an *ongoing process* to ensure a data system based on an *understanding of decision-making contexts and user needs.*

Prospective users of the OWDP, including state agency data providers and users, and members of the public, had several chances to meaningfully engage with the OWDP project and share their concerns and challenges around data. The OWDP has successfully begun to develop a understanding of decision-making contexts and the data needs of users. Specific strengths include:

- **Holding multiple public engagement sessions.** In Fall of 2022, the team successfully hosted two online public engagement sessions to engage with state and local agencies, community organizations, industry groups, and NGOs, as well as a meeting with Tribal agency staff. Over 40 state, local, and Tribal agencies and community organizations were represented. According to the project report, a total of 68 participants attended these three meetings. Through these meetings, participants learned about the OWDP, then had a chance to share about their data needs and data gaps, challenges in accessing data, concerns about the data portal, and prioritization of use case themes. The meetings were followed up with a survey to gather further information on these topics. It was useful and beneficial to hold multiple public engagement and listening sessions to help maximize attendance by various stakeholders. Reaching out directly to stakeholders beyond simply emailing standard government distribution lists was a fruitful approach that generated more diverse attendance at the stakeholder engagement sessions.

- **Reaching out directly to tribes within Oregon.** In addition to the stakeholder engagement meetings, in Fall of 2022 the OWDP team sent formal consultation letters to 9 federally recognized tribes within Oregon. The Cow Creek Band of Umpqua Tribe responded and two tribal members participated in a meeting with OWDP. They discussed how Tribes are being engaged and discussed questions around data use, data availability, and data privacy.
- **Preliminary development of use cases.** The OWDP team has completed preliminary research on use cases and has developed a set of user personas meant to represent different target audiences for the data portal. This work, which will be continued in Stage 2, is a helpful approach to ensuring a data portal is useful in supporting real-world decision making.

Governance

According to evaluation criteria, good governance of a water data system includes *institutional commitment by key organizations*, along with *incentives to participate* and *sufficient resources for long-term maintenance and financial stability*.

The OWDP project team was thoughtfully organized to be inclusive of different agencies and to build capacity and institutional collaboration. The progress to date has sought to determine what resources are needed for financial stability, and has resulted in a budget request to secure those resources. Some of the governance strengths of the project so far include:

- **Successful completion of initial scoping and funding request.** The working groups successfully developed a plan going forward, and a budget to support the plan, successfully meeting the legislative mandate for Stage 1 of the OWDP. The OWDP project team developed recommendations for next steps to be completed in Stage 2, and has developed a budget estimating necessary resources for sustainable project development and implementation over the course of the 2023-2025 biennium.
- **Development of interagency working groups.** The development of three interagency groups to guide different aspects of the project was an effective way to make progress on the OWDP while also building relationships across agencies. The three working groups included a Steering Committee; a Subject Matter Expert Team; and a Technical Team. Each of these teams included members from multiple different agencies, bringing knowledge of each agency's processes and increasing institutional buy-in and commitment from different agencies.
- **Learning from other states and organizations.** Numerous states across the US are working to improve their water data systems (Josset et al 2019, Rosen & Mace 2019). Working with the Internet of Water Coalition, a project run by Duke University's

Nicholas Institute and other collaborators, was a helpful way to understand best practices and learn from other states who have embarked upon similar projects. The Internet of Water's Peer-to-Peer Network is a useful resource for learning from other states conducting similar efforts. The OWDP project team also worked with Oregon State University's Applied Systems and Software (CASS) and Oregon State University's Institute for Natural Resources (INR), drawing from the strengths of these organizations which bring expertise in public data, information technology, and geospatial data in the Oregon context.

- **Building on previous efforts within Oregon.** The OWDP project builds upon previous and existing efforts conducted by the State of Oregon, rather than starting from scratch. These efforts include the 2017 Integrated Water Resources Strategy (IRWS), the 2020 100-Year Water Vision, and the 2023 Secretary of State's Water Security Advisory Report. Several of these efforts, in particular the IRWS and the 100-Year Water Vision, involved significant public outreach and input. The OWDP project team draws from and builds upon these previous efforts in order to understand Oregonians' water data priorities and needs. This was a good way to inform an understanding of what is needed by data users and decision makers, and avoid duplication of efforts.

Technical aspects

According to evaluation criteria, technical aspects of a successful water data system include *adequate documentation*, *clear standards for metadata, data quality, and technical requirements*, *effective support of synthesis and analysis* for problem solving and decision making, and *regular maintenance and updates of systems*. Many of these criteria apply to finalized data systems and are thus not possible to evaluate at this early stage. However, some strengths and notable points of progress so far include:

- **Inventorying current state of data across state agencies.** The OWDP team has conducted an initial inventory of over 500 existing water data sets across the 17 state agencies, noting what agency holds the data, data type, and current need and condition. This work is to be continued in Stage 2.
- **Beginning assessment of data needs.** The OWDP team began a data needs assessment to identify data sets that are essential for informed decision making, but are not yet readily available. This work is to be continued in Stage 2.
- **Beginning data prioritization.** In Stage 1, the OWDP team focused on identifying data sets that are high priority for publication in an initial pilot of a data portal. High priority data sets were considered those that met two criteria: they were both important for meeting data needs and serving decision makers, and they already existed in usable forms with adequate quality so that they could be considered publishable or nearly publishable.

Identifying these data sets will help ensure early success of a pilot data portal. Creating a menu of use cases that are attainable using currently-publishable data sets will help with success of the pilot. This work is to be continued in Stage 2.

5. Challenges and shortcomings of OWDP Stage 1

Stakeholder engagement

While the project team did a commendable job reaching out to and engaging a variety of public stakeholders, there were some groups and communities that were less engaged than others through this process. In particular, Tribal engagement was limited, as only two individuals representing Tribal agencies participated in response to the request from the OWDP team. In addition, participation and engagement with environmental justice communities was notably limited. Research has shown that water data is crucial for attaining environmental justice outcomes, and maximizing data usability through participatory engagement with communities is a key component of EJ (Dosemagen & Williams 2022). Additionally, the planning, timeline, and budget for Stage 2 of OWDP development should make clear that stakeholder engagement is an iterative and ongoing process. In the next section, this evaluation report recommends specific steps to improve ongoing and equitable stakeholder engagement in further stages of the OWDP.

Governance

The Stage 1 OWDP project was primarily led by DEQ with several other agencies playing lead roles, but institutional commitment is not evident across all state agencies. Many of Oregon's 17 agencies did not participate or only participated in a very limited way. Agencies other than DEQ did not always recognize or prioritize OWDP and the staff time needed to support the data portal project. Some agencies may not (yet) view water data as important for their agency, even though their agency may hold data that is important for water decision making. Agencies face resource and staffing constraints and may not view water data as a priority. Moreover, having a regulatory agency leading the data portal may lead to public perceptions that the purpose of the OWDP is to enact further regulation. In the next section, this evaluation provides governance recommendations to address these issues.

Technical aspects

Given the early stages of the OWDP process and development, many of the technical aspects have yet to be worked out. For example, detailed use cases have yet to be developed, and the process of identifying likely data user categories and work flows (including public data users as well as work flows of state agency staff) has only just begun. Because of this, OWDP has not yet fully completed the task of evaluating readiness of existing data sets to connect to a data portal. Only data from state agencies has been inventoried so far; federal and local data remains to be addressed. The OWDP team has yet to identify the data sets that should be developed to support priority use cases, all of which are key pieces for developing a useful and usable pilot data portal. Requirements for data sets (e.g., quality control, formats, etc.) still need to be developed and may result in rework once they are more fully developed. This is less a critique and more a recognition that the project is still in its early stages, with many of the technical aspects still to be worked out. In the next section, the evaluation provides recommendations to address these issues, recognizing that many of the technical decisions will be made in Stage 2.

6. Recommendations, suggestions for improvement, and next steps for OWDP Stage 2

Stakeholder engagement

A successful water data system should engage water data users meaningfully on an ongoing basis in order to ensure a water data system that is useful and usable to inform decision making in practice. Moreover, diversity, equity, and inclusion (DEI) are extremely important issues for state agencies to incorporate in all programs, and the data portal presents many opportunities to do so. In order to do so, the OWDP should consider the following recommendations, which are divided into two categories around iterative stakeholder engagement and equitable stakeholder engagement.

Ongoing and iterative stakeholder engagement

- **Center ongoing and iterative stakeholder engagement processes within project governance through a focused staff team, a public advisory group, or both.** Stakeholder engagement should not be considered as a "one and done" event, but rather as an ongoing process. Recognizing that stakeholder engagement is itself an area of expertise that requires experience, expertise, and skill, there may be benefit in fostering a fourth team (in addition to the SME, Steering, and Technical teams) to lead public stakeholder engagement efforts, consisting of staff from different agencies with specific expertise in this area. This team may overlap in composition with the existing three teams, but should center staff with specific expertise in stakeholder engagement with the public, and with tribal and underrepresented communities in particular. OWDP may also consider forming an advisory group made of members of the public who would use a data system, including members of underrepresented communities.

- **Ensure ongoing public engagement is supported in the budget and timeline.** Additionally, it is important to remember that stakeholder engagement takes time and resources. Specific resources should be budgeted for ongoing stakeholder engagement. It is also important to build in time and budget to test drive data portal pilots and solicit feedback at multiple stages, including at early stages when it is possible to actually implement feedback.

Equitable stakeholder engagement

- **Identify different types of stakeholder perspectives and ensure that use cases represent a range of interests.** For example, previous researchers have identified five types of data users, including public sector water resource managers; public sector water resource data analysts; industry and private companies; Tribal Nations; and nonprofit organizations (Restrepo-Osorio et al 2022). The OWDP could consider whether these same categories apply within Oregon or whether additional categories would be helpful. The OWDP should consider a conceptual map of all potential stakeholders who could benefit from using water data, then ensuring that these various communities and stakeholders are engaged and represented. Working with different community groups on an ongoing basis, including underrepresented groups, would be crucial to ensuring full representation. Identify which specific communities have already been represented in the OWDP stakeholder engagement process, and which perspectives are missing. When the team has identified which perspectives or communities are not represented, reach out directly to those communities or stakeholder groups in particular (see below recommendations to support outreach to underrepresented communities). Work with them directly to develop use cases (e.g., Rosen & Mace 2019; Cantor et al 2018, 2021) and ensure that their data needs are represented. This has the benefit of encouraging community engagement and investment in the OWDP process, while also ensuring more equitable representation.

- **Strengthen outreach to tribal communities in particular.** Oregon is home to a wide diversity of Tribes whose members care deeply about water. However, only two people representing one Tribal agency participated in the initial Phase 1 stakeholder engagement effort. To contextualize this, it is important for OWDP to take into account that historically, statistical data has been used as a tool of colonization against Indigenous people (Lovett et al 2019). Emerging movements of Indigenous Data Sovereignty and Indigenous Data Governance strive to center Indigenous control over collection and use of data, addressing issues such as privacy and sovereignty (Carroll et al 2019; Lovett et al 2019). To increase participation, the team should work closely with the DEQ Tribal Liason or staff members with similar roles in other agencies to determine an outreach strategy that will be effective and fall within the agency's Tribal Relations Policy. OWDP should consider partnering with an organization and/or hiring a consultant who is experienced and knowledgeable, and who has specific expertise in engaging with tribal communities. Budget resources should be set aside for this purpose. For example, the Changing Currents project, led by the Affiliated Tribes of Northwest Indians (ATNI) (https://www.changingcurrents.net) is an intertribal collaboration engaged specifically in water issues that could be consulted as an expert partner to increase meaningful tribal engagement. The Oregon Senate recently passed HB 3173 to create a new Task Force on Tribal Consultation; once established, this Task Force should be used as a resource for conducting tribal consultation and outreach. In the meantime, staff members at OWDP partner agencies such as DEQ or WRD with specific expertise and experience in tribal engagement and consultation should be consulted to help guide OWDP's tribal engagement.

- **Strengthen outreach to underrepresented environmental justice communities in particular.** In 2021, the Oregon legislature passed HB 4077, establishing a state Environmental Justice (EJ) council and directing the creation of an EJ mapping tool. This presents an important opportunity for the OWDP to contribute, and also emphasizes the importance of engaging with EJ communities. Communities impacted by EJ issues are an important set of data users who could benefit from better access to and use of water data. For example, communities experiencing EJ issues could benefit from knowing more about their local water quality, including groundwater contaminants and drinking water quality. However, these communities were not strongly engaged in the Phase 1 stakeholder engagement efforts. For example, while invitations were extended directly to a wide range of organizations, a number of the state's active EJ organizations were not included on that list. The team should consider partnering with an organization and/or hiring a consultant with well-developed existing connections to underrepresented communities impacted by EJ issues. Budget resources should be set aside for this purpose. For example, the Oregon Water Futures Collaborative (https://www.oregonwaterfutures.org) has done extensive outreach on water issues to a variety of underrepresented communities within Oregon on issues related to water, and could be consulted as an expert partner to ensure equitable engagement. Specific groups to consider outreach to include Verde; PCUN; Coalition of Communities of Color; and Unite Oregon.

- **Incorporate existing research on Oregon environmental justice issues.** For example, Oregon Water Futures has recently published two reports that would be useful resources to inform the OWDP. The "State of Water Justice in Oregon" report (https://www.oregonwaterfutures.org/water-justice-report) has a section specifically identifying water justice data and information needs, which could be a useful guide to prioritization of water data that would serve underrepresented populations. The "Oregon Water Justice Framework" report (https://www.oregonwaterfutures.org/water-justice-framework) also identifies specific data needs that would help serve underrepresented communities such as renters, farmworkers, and mobile home park tenants. These two reports contain a wealth of information to help inform future data priorities and use cases.

- **Make materials available in different languages where it is most relevant.** Recognizing that Oregon is a diverse and multilingual state with many different communities who may have different priorities and needs around water, engaging with different language speakers would be an area to improve upon in future iterations. This could involve identifying a limited set of high priority use cases that would best serve target communities, then ensuring those are accessible in different languages. This would require targeted outreach and funding. This would likely be best done in collaboration with the groups identified above and other community-based groups.

Governance

A successful water data system should have institutional commitment by key organizations, incentivize participation by data providers and users, and ensure sufficient resources for financial stability over time. Ensuring that the data system is trusted by the public and perceived as useful and legitimate is also key to ensuring a data system that is used in practice. In order to do so, the OWDP should consider the following recommendations.

- **Incentivize and/or require participation by different agencies.** The OWDP project team identified 17 different state agencies that hold at least some data relevant to water decision making and infrastructure planning. Of these agencies, the OWDP is core to the mission of a few agencies, while water issues are likely perceived as more tangential to others. Moreover, the agencies are different sizes, with different capacities and different existing systems and standards for data management. All of this presents a challenge for engaging all 17 state agencies. While it is possible that viewing a pilot portal will help some agencies understand the goals and benefits of the OWDP, there may need to be more formalized structures in place to require participation. Mandates from the Legislature or the Governor's Office may be needed to require agencies to participate. It can be difficult for agency staff members to commit time to the OWDP if it is not recognized and considered as an integral part of their job by their own agency. Formal MOUs from agencies committing staff time and other needed resources may be a useful mechanism to ensure involvement. Budget requests may need to include funding for all participating agencies to fund staff time.
- **Ensure decision-making is shared between agencies.** DEQ largely took the lead on the initial Stage 1 conceptualization and implementation, with the crucial involvement of several other individuals from different agencies. For multiple agencies to share responsibilities of the OWDP, it must be written into job descriptions of staff so they can justify spending time on the project and are not hampered by having to balance competing responsibilities form their own home agencies. A formalized inter-agency project team that is supported by MOUs from different agencies would encourage shared leadership, decision making, and responsibility.
- **Develop a sustainable long-term funding structure.** The funding structure should keep in mind that a data system requires significant up-front costs as well as long-term funding for maintenance, upkeep, improvements, and incorporating new data. Data and information are important public services that deserve public investment and should be publicly accessible to all. A funding structure should focus on securing long-term, public

funding to ensure that the data system is accessible, open, transparent, and useful for the public.

- **Consider ways to maximize trust and positive public perception.** One reason it is important to share leadership across agencies centers on the issue of trust and public perception. Because DEQ is a regulatory agency, some members of the public may be reluctant to engage with or trust the OWDP if it is perceived as a DEQ-led project, as there may be a perception that the goal of the data portal is to regulate the public. To address this perception, it would be beneficial to continue to frame the OWDP effort as an interagency project, rather than a DEQ-led one. The steering committee may consider having an outside group (such as INR or a similar university-hosted entity) be the official lead or host of the OWDP, with state agencies participating as members of the steering committee. This would require MOUs or formalized agreements between different entities.

Technical aspects

A successful water data system should effectively support synthesis and analysis of data to support decision-making by ensuring adequate documentation and providing clear standards for metadata, data quality, and technical requirements. Here, the evaluation recognizes that the OWDP is in early stages and many of these aspects will be developed during Stage 2. The OWDP should consider the following recommendations.

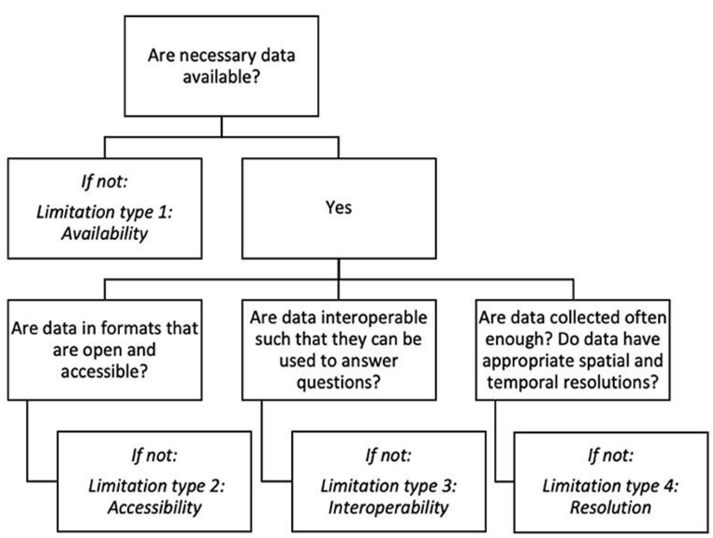
- **Continue identifying high priority data sets and use cases for early success.** High priority data sets are those that are both "low hanging fruit"- data sets that do not require huge amounts of effort to make publishable- and that are important for meeting real world needs of decision makers. The OWDP team has already focused on identifying and prioritizing data sets at this intersection, and should continue to do so in the pilot development phase in Stage 2.

- **Balance accessibility and usability with depth.** One challenge of a data portal is that it must, on the one hand, be easily accessible to members of the public seeking to find information they are interested in; and on the other hand, should make data accessible for those seeking access to full data sets to conduct their own analysis. User-friendly apps and web portals are needed, as is access to full raw data sets.

- **Consider long-term costs, including updates and maintenance, in procurement choices.** Procurement and choice of data systems is a very important decision that will ultimately impact the success of a water data portal. Choosing a system that can and will be regularly updated is key. A system that initially appears the cheapest may be more expensive in the long run if it becomes outdated quickly, or if updates and maintenance over time are not considered. Long-term costs, including maintenance and updates, must be considered as part of important procurement decisions.

- **Coordinate with information services staff across agencies and with DAS.** This will be a key part of building a sustainable data portal, and could be part of the technical team's roles and responsibilities. Developing standards for metadata and data quality across all the different agencies will be a challenge that will require working with data specialists at each agency. It is key to work with the Department of Administrative Services (DAS) on development of standards for data availability and access.
- **Wherever possible, harmonize metadata and formatting requirements.** Agencies may encounter many different requests and expectations to serve data to many different data portals and brokers (for example, the Oregon Open Data Portal, the Western States WADE system, USGS, CUAHSI, etc.). There is potential for the cumulative impact of expectations of many different organizations and data brokers to be a strain on agency resources. Harmonizing and aligning metadata and formatting requirements wherever possible could help alleviate this burden.
- **Prioritize development of important data sets and models.** While prioritizing development of "low hanging fruit" makes sense, it is also important to develop the data sets identified as highly important for public use and decision making. For example, groundwater data and climate modeling data came up in stakeholder engagement sessions as important to prioritize, but they may be difficult or less ready than other data sets. Questions related to water quality and drinking water quality also emerged as important priorities. In prioritizing data set development and publication, it is important to prioritize data that is most important to community stakeholders and decision makers, and then to determine what the limiting factor(s) are (Figure 1).

Figure 1: Types of data limitations: Availability, accessibility, interoperability, resolution.



There are multiple types of data limitations: For example, some data may not be available at all, while other data might be available but limited in its accessibility, interoperability, or not collected at a useful resolution. Identifying what type of limitation is at play is useful in determining next steps.

7. Conclusions and next steps

In conclusion, the evaluation finds that the OWDP has done a commendable job of meeting the legislative direction to conduct “initial scoping and design” and to “develop a funding request for further development” for a water and infrastructure database. The next steps taken in OWDP Stage 2 will be essential in bringing this project to fruition.

The OWDP Project Team has developed the following recommendations for OWDP Stage 2 (2023-2025):

- **Recommendation 1:** Develop a governance structure for the OWDP.
- **Recommendation 2:** Develop Standard Operating Procedures for submission, curation, and integration of data in the OWDP.
- **Recommendation 3:** Develop a pilot OWDP based on an iterative process.
- **Recommendation 4:** Based on agency- and stakeholder-identified needs, determine short- and long-term priorities for data readiness and integration.
- **Recommendation 5:** Where appropriate and possible, use existing software systems to build on staff knowledge and expertise.

This evaluation supports all of the above recommendations. Recommendation 1, developing a governance structure, has the potential to address the governance recommendations discussed in this evaluation. Recommendations 2 – 5 have the potential to address the technical recommendations and to result in a data system that is sufficient, accessible, useful, and actually used. In sum, many of the specific recommendations of this evaluation outlined in Section 6 of this report can be addressed through the existing OWDP Stage 2 recommendations.

In addition to these existing recommendations, this evaluation recommends adding the following:

- **Recommendation 6:** Develop an ongoing, meaningful process for incorporating stakeholder feedback and ensuring diversity, equity, and inclusion (DEI).
  - Task 6.1: Create structures that focus on stakeholder engagement: for example, a staff position specifically focused on public engagement, a public advisory group, or both.
  - Task 6.2: Ensure the project’s budget and timeline reflect ongoing stakeholder engagement processes.

- Task 6.3: Address DEI by increasing quantity and quality of engagement with underrepresented communities, in particular Tribal communities and EJ communities.

Incorporating these recommendations will help ensure that a data system is useful, accessible, and used in practice. These recommendations will also help ensure that the data portal serves the diverse communities within Oregon.

Finally, continuing to work with other state agencies striving to implement modernized water data systems, and engaging with coalitions and collaborative groups such as Internet of Water, will help ensure that best practices and lessons learned from other places are implemented in Oregon (for example, see Moran et al 2020 on California and others; Shukla et al 2020 on Florida; Rosen & Mace 2019 on Texas; and Cantor et al 2018 and 2021 on California).

To conclude, a modern water data system for the State of Oregon will be key to ensuring the state is able to serve its diverse constituency and meet its long-term water and infrastructure planning goals. The OWDP team is well on its way to developing a data system that will be useful, usable, accessible, and used in practice to support informed decision making.

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Other resources

Changing Currents project, led by the Affiliated Tribes of Northwest Indians (ATNI) (https://www.changingcurrents.net): This is a regional intertribal collaboration engaged specifically in water issues.

Oregon Water Futures Collaborative (https://www.oregonwaterfutures.org): This collaboration has done extensive outreach on water issues to a variety of underrepresented communities within Oregon on issues related to water.

"State of Water Justice in Oregon" report (https://www.oregonwaterfutures.org/water-justice-report): This report summarizes available data and research on water infrastructure challenges impacting frontline communities in Oregon. It has a section specifically identifying water justice data and information needs.

"Oregon Water Justice Framework" report (https://www.oregonwaterfutures.org/water-justice-framework): This report identifies specific data needs that would help serve underrepresented communities such as renters, farmworkers, and mobile home park tenants.

OWDP Lesson Learned

Stage 1
July 2023

The project team has gathered and recorded lessons learned from Stage 1. To support planning for project Stage 2, the team will examine opportunities to apply lessons learned from successes and identify opportunities to avoid or plan to address challenges encountered in Stage 1, with the goals to improve processes and the outcomes of project Stage 2.

The following material has been gathered from the project issues log and through several dedicated lessons learned meetings at or near the end of project Stage 1. Most of the material was assembled and summarized by the Internet of Water coalition, and by Project Manager Carrie Hertel.

The attachment following this lesson learned attachment was written by Alida Cantor, PhD. It is an independent, critical evaluation of the project. Dr. Cantor has written on this topic and has previous experience in planning and implementing water data efforts in California. Dr. Cantor's review contains several suggestions for project improvements for advancing work initiated in Stage 1 or likely to occur during Stage 2. The project suggestions contained therein will be addressed at the same time as the lesson learned project suggestions, near the beginning of project Stage 2.

Original meeting and log summaries are attached for the following:

1. Internet of Water Lessons Learned Summary Write Up
2. Steering Committee Lessons Learned Meeting Notes
3. Off-Site Lessons Learned Meeting Notes
4. Full Team Lessons Learned Meeting - Breakout Group #1 Notes
5. Full Team Lessons Learned Meeting - Breakout Group #2 Notes
6. Lessons Learned from the Project Issues Log

Oregon Water Data Portal (OWDP) - Stage 1 Lessons Learned

Assembled by Internet of Water

June 22, 2023

1. There is a high degree of variability in data management processes and organizational maturity across agencies.

Each agency has its own methods of organizing and managing data. As the OWDP project team develops data standards and processes for data contribution in Stage 2, agencies' existing systems and processes should be taken into account to maximize efficiency for as many agencies as possible. The OWDP project team should also consider the varying levels of organizational maturity and existing capacity at contributing agencies and identify opportunities to support agencies in modernizing their organizational processes.

2. Many key datasets for decision-making do not currently exist or require significant modernization

During stage one, the OWDP project team identified a number of long-term data development projects across several agencies that, if completed, could inform crucial water management decisions. The need for dataset development and modernization was much greater than the project team initially anticipated. As part of stage 2, the OWDP project team should identify which long-term development projects would be supported by agency legislative staff and identify grants that could offer additional funding for dataset development and modernization.

3. Agencies need access to a common platform to share documents and information relevant to the project.

In stage 1, agencies were not able to access a single platform (e.g. Teams/SharePoint, GoogleDrive, Box) to store and share documents and information relevant to the project. This stymied collaboration and lead to losses in productivity and efficiency. In stage 2, efforts should be made to establish a common document-sharing platform and, ideally, and channel where project participants can easily communicate across agencies. In addition to fostering collaboration and improving efficiency, this would increase transparency by allowing all project participant access to meeting notes and working documents.

4. In-person meetings/workshops are essential for effective interagency collaboration.

The interagency in-person workshop held in stage 1 offered participants from different agencies a unique opportunity to build camaraderie and engage in deep discussions on issues relevant to the project. While in-person meetings require a greater time investment than virtual meetings, when they are well organized and focused on timely and relevant project questions, they can yield a level of engagement and collaboration that cannot be replicated in the virtual space. However, the momentum built in these in-person meetings can only be sustained if the project team and participants understand their role in implementing the strategies developed during the meeting. In stage 2, the OWDP project team should plan to hold additional in-person interagency engagements and should ensure there is a clear post-meeting plan for communication and implementation.

5. Discomfort with uncertainty may be a barrier to project implementation.

   Most public agencies are risk-averse and uncomfortable with uncertainty. However, in developing an innovative, large-scale project like the OWDP, agencies will have to confront some degree of uncertainty. There will be missteps and course corrections along the way. These missteps will not lead to project failure in and of themselves, but a failure to recognize them and change course will. The project management plan developed for stage 2 should detail a process for regular self-evaluation and adaptive management. Having a plan in place to identify and correct missteps will make agencies more confident in the project team and more comfortable with the inevitable uncertainties that come along with large-scale data sharing and modernization projects.

6. Participating agencies have a common goal and desire to collaborate to reach that goal

   Each of the seventeen agencies who are participating in the OWDP project has a unique mission, however, they are all united in the common goal of building a modernized, single point of access for public data about water and water infrastructure in Oregon. While the participating agencies are incredibly diverse, and in many cases, have had little interaction before the OWDP project, they all have a desire to work and learn together to achieve this goal. Agreement to collaborate and share data across agencies is the first, and often, one of the largest hurdles to statewide data infrastructure modernization projects. The OWDP project has already cleared this hurdle thanks to the willingness of these agencies to engage with each other to help solve water management challenges across the state.

Oregon Water Data Portal Lessons Learned – Stage 1

June 14, 2023

Steering Committee Meeting

<u>OWDP Steering Committee – June Meeting Agenda</u>

1. Meeting overview and project updates (5 minutes)
2. Key Achievements of Stage 1 (15 minutes)
   a. What were accomplishments and successes achieved from Stage 1?
   b. What worked well that we should continue?
   c. Did you get the results you wanted?
   d. What important decisions or observations were made during this project?
3. Challenges and Obstacles Encountered (15 minutes)
   a. What were some challenges and obstacles faced during Stage 1?
   b. What was difficult, frustrating, or didn't work well?
      i. May include issues related to data quality, resource allocation, stakeholder collaboration, or technical difficulties.
   c. Are there examples of challenges that were successfully overcome during the course of Stage 1? Are there challenges that were overcome, but could have been more efficient?
   d. Are there any clear underlying causes/root cause to address for any of these challenges and obstacles?
4. Action Planning for Improvement (10 minutes)
   a. What steps could we take, or actions to avoid to address the challenges and implement lessons learned?
   b. How could we prioritize implementing potential improvement actions? Based on their impact, feasibility, cost?
5. Wrap-up and Next Steps (5 minutes)

<u>Meeting Results</u>

2. Key Achievements

- Asked for the participants to put a word in the chat about the project.
  - Results: Needed, Collaborative/Collaboration, Four, Huge!, Necessary
- Collaboration has been an achievement. The work has been consistent, and they were impressed with how this pulled together with agency cooperation. This gave the steering committee members something to talk about in terms of a great example of cross-agency collaboration.
- The steering committee was happy with the project management and structure with the 3 teams. It felt easy (when we know it was not!) to work with this project.
- The project got done what it needed to, but we were hoping to get a little further in the planning stages ahead of Stage 2. We learned a lot about different agencies and their data and the work needed to bring our own infrastructure to be able to work together. We feel we have a pretty good idea of what we need to do for the portal itself.
- The project team has been exceptional, hardworking, and collaborative.

3. Challenges

- We tried to engage some of the other agencies not currently participating and that was a bit of a challenge. Some stakeholders had some minor drama in not being invited to the engagement sessions.
- Resource challenges and scarcity didn't allow some agencies to participate as much as they would have like to.
- Those attending the steering committee meetings regularly also have staff participating in the project. There are other agencies we have not been able to bring in as much as we like. Some prioritization on which key agencies should be included and put some more effort in making sure they can join in.
- The mid-level agencies participated the best. The smallest don't have resources and the project fell through the cracks with the largest agencies.
- Contracting was challenging. It took many months to complete the IoW agreement.

4. Action Planning for Improvement

- When the time is right, we need to keep talking about "Where is this going to reside?"
- Ambiguity seems to be an underlying cause to challenges we have been facing.
- There has been some confusion about OWDP vs. OpenET. We should be very clear on what OWDP is and what it is not.

<u>Action Items to Consider in Stage 2</u>

1. Develop clear messaging and talking points that can be used.
    a. Include why this project is important.
    b. Agency communication:
        i. Clear problem statements
        ii. What is in it for your agency
        iii. What it requires from your agency
2. Continue to have engagement with staff at other agencies.
3. Implement a charter for the steering committee including a governance structure.
    a. How are decisions made and who makes them?
4. Review the need to establish a formal connection with the Water Core Team. What would that look like? Call it out in their work plan?
5. Continue to keep DAS involved including in governance planning.

OWDP Off-site Project Meeting

June 16 2023

Lessons Learned Conversation

Question: *What do we need to do differently in Stage 2?*

- Think about user interface, maybe we need a contractor to design this? Need someone thinking about the front end in the tech team. It would help INR.

Suggestion: Develop a User Experience Design Group for OWDP

We expect OWDP to be different than New Mexico, especially in terms of the infrastructure data.

Consider the User Paths.

- Consultant: Gets data then leaves the portal. They know what they are looking for.
- High School: They are learning. The water subjects need to be introduced and they get the same data set as the consultant but then the "why" for the data.
- Tools: Be able to provide some answers
    - Which uses cases do we have data for to answer those questions?
    - Different levels of data quality can still answer the questions.

Discussion around who is responsible for the project.

> Legislative obligation to participate? How to get agencies to prioritize this project with everything else going on.
>
> More formal governance. Agreements needed. Who has the power to write and sign those agreements?

We should have more brainstorming sessions in person next biennium.

Oregon Water Data Portal (OWDP)- Stage 1 Lessons Learned

June 22, 2023

Breakout group 1

Facilitator: Faith Sternlieb

1. What did you learn in Stage 1 of the OWDP project?
    - Stakeholder outreach was enlightening - broad support but still grappling on answering those questions and communicating about the use cases.
    - Learned the immense scale of the project.
    - Oregon Portal is unique - trying to serve data sets and serve up use cases. The Oregon Open Data effort is already working to serve datasets, so the thing that makes the Water Data Portal valuable is the thing that makes it harder than most existing portals
    - Support for use cases.
        - Still trying to get an understanding of how to develop use cases.
    - Saw notes and discussion on stakeholder engagement.
    - Original goal - data sharing - basic goal
    - Ensure the tool was able to answer certain questions and as it pertains to use cases - most challenging!
    - Needs that data users are seeing.
    - What is possible and not possible?
    - Not sure what the product will be.
    - Different ways to portray needs - is it able to actually come to fruition?
    - Learned about scale of the project.
    - Compared Oregon 100-Year Water Vision
        - Water infrastructure
        - Groundwater issues
    - Depth about what it is going to take to answer questions about the challenges -
    - Data portal will not necessarily address all of that but will attempt to pull existing and available data.

2. What did we do well in Stage 1?
    - Workshop in the same room was useful -
    - Stakeholder and Tribal listening sessions - Provide a broad view of what people are hoping to get out of it.
    - Learned about different levels of capacity and users.

    - Raw data users
    - Decision makers
- Got different perspectives.
- What will the portal be able to do?
- STREAM team pioneering development of use cases
- Involved all the right agencies - broad engagement - engagement in Teams worked well.
- Continued communication about the meetings

3. What do you think we need to do differently during Stage 2?
    - Be more strategic / systematic:
        - E.g. asked to indicate publication readiness in dataset inventory before we know what are the requirements for a dataset to be connected to the portal
        - Not clear about how we were going to use the inventory.
        - Be systematic with use case development: how use cases will be prioritized and developed
    - Better communication about other meetings so everyone knows what's going on and has the same information.
    - Which use case are we going to build on and how will that be decided?
    - Defining the process of developing and applying the use cases to decision-making
        - Data
        - Decision making
        - Identifying target audience
        - Prioritizing use cases
    - Figure out how to fund and carry out data development.
        - Need regular discussion with agency legislative staff to negotiate about which Policy Option Packages would be promoted by the agency.
        - Figure out how grant funding could support future development work: which work can be done by contractors hired under grants, vs. which need existing agency staff, maybe requiring hiring of additional staff through a Policy Option Package.
        - What is the timing on availability of existing, necessary staff?
    - Answer questions:
        - What is possible and not possible?
        - Not sure what the product will be.

Oregon Water Data Portal (OWDP)- Stage 1 Lessons Learned

June 22, 2023

Breakout Group 2

Facilitator: Lilli Watson

1. What did you learn in Stage 1 of the OWDP project?
    - Learned about new technologies from different factions on the team (CKAN, tool demonstrations).
    - Surprised at the variety of data repositories/formats used throughout different state agencies.
    - Surprising to see disconnect between agencies when there were not an existing connection to the data (legislative or other agreement). Siloing
    - Couldn't have access to a common document or spreadsheet across agencies.
    - Small details often hung up the project, discomfort with uncertainty/ risk.

2. What did we do well in Stage 1?
    - SME did reach out to people directly handling data and had deep knowledge.
    - Collaboration across groups, having all those people in the room together.
    - Coordination across all these groups, it was well organized and good communication.
    - The interagency workshop went well, was organized, appreciated the opportunity to talk in-person with other agencies.
    - Overall communication between teams, everyone was in it for the end goal.
    - Recognition that we have so much data and we have a common goal of converging and sharing.

3. What do you think we need to do differently during Stage 2?
    - Need to be able to share documents across agencies. We were not able to find old documents. One Teams or SharePoint site so we could access notes, outcomes of the work.
    - Were some important players not at the table. There are some agencies with water data who weren't as involved as we might wish.
    - More follow-up from the workshop, to move from the workshop into the final report.
    - Trying to get in-person engagements more often (helps to build camaraderie)
    - The virtual follow-up didn't get as much engagement from people.

- Explore and discuss solutions to addressing barriers, for example, social barriers to data sharing that we haven't addressed (private property) also having the human resources to do it.
- Describe how input from workshop will be implemented in Stage 2.
- You can have a great modern system, but you don't have anything without the people to do it.

Lessons Learned from Project Issues Log

June 30, 2023

Assembled by Oregon State University, Center for Applied Systems and Software (CASS)

ID	Lesson	Description
L01	Check contractors company type before starting contract)	We thought Duke University was a public university. Once determined it is private, caused some major snags in contracting.
L02	For Tribal and Stakeholder engagement, have an expert to lead the team	We would not have pulled off the work we did without Michele Martin's engagement
L03	Start any tribal or stakeholder engagement 6 months before planned engagement	We started planning end of June for early October dates (originally thought we would do them early September) and it took MUCH more time that anyone expected.
L04	Find cross agency participation allies	While we didn't get all agencies to be active participants in this project, there we a good number that joined in and actively participated. The various teams brought up some tough topics and in general, everyone was supportive and worked through issues and questions in a collaborative manner.
L05	Send out a letter of Consultation to Tribes to include them in the process.	
L06	Evaluate data readiness in terms of OWDP. Don't just assume if the data is ready for the Open Data Standards that it is automatically ready for OWDP	
L07	Need sufficient resources for documentation.	Our project management documentation could have been more robust and in the next stage it will *have* to be on point. We did not have sufficient resources to create and maintain this documentation this round.
L08	Project Concept was a great document. Recommend continuing to maintain it.	The Project Concept ended up being the document that was shared externally as well as internally to bring new members up to speed. It was very comprehensive but short enough to be digestible.

L09	Tribal and various water work group schedules fill up fast. Get on the schedule as soon as you can be confident in the timeframe to complete any presentations	It was a challenge to get in front of the Tribes because their agendas are set out pretty far. We were able to do a 30 min briefing but would have liked to have time to work with tribes to determine how much they wanted to be included in the various listening sessions
L10	Tribes will determine how much and what data they wish to share.	Data sovereignty is a big topic
L11	Not all agencies have a regulatory aspect. Those ask for data, but it is not required.	
L12	Dig into more formal project management practices sooner.	We were a little lax in our project management approach the first part of this project.