

APPENDIX 1 – PROGRESS SINCE LAST FRAMEWORK

The 2010 Framework recommended twenty-four short-term priority actions needed to improve Oregon’s capacity to address the identified climate change effects, called “risks” in the 2010 Framework (Link).

Table 1: Climate Change Effects and Short-Term Priority Actions as Described in the 2010 Climate Change Adaptation Framework

Climate Change Effect	2010 Short-term Priority Actions
Increase in average annual air temperatures and likelihood of extreme heat events	Enhance and sustain public health system capacity to prepare for and respond to heat waves and smoke emergencies, and improve delivery of information on heat events and cooling centers, especially for isolated and vulnerable populations.
Changes in hydrology and water supply; reduced snowpack and water availability in some basins; changes in water quality and timing of water availability	Maintain the capacity to provide assistance to landowners to restore wetlands, uplands and riparian zones to increase the capacity for natural water storage.
	Improve real-time forecasting of water delivery and basin yields to improve management of stored water. Improve capacity to provide technical assistance and incentives to increase storage capacity and to improve conservation, reuse, and water use efficiency among all consumptive water uses.
Increase in wildfire frequency and intensity	Include wildfires in planning to reduce vulnerability to natural hazards.
	Restore fire-adapted ecosystems to withstand natural recurring wildfires.
	Develop short- and medium-term climate change adaptation strategies for forests and other fire-prone habitats, and improve development standards to reduce exposure to fire risk at the urban-wildland interface.

	<p>Improve the capabilities of public health agencies to plan for and respond to the public health and safety risks of wildfire emergencies.</p>
<p>Increase in ocean temperatures, with potential for changes in ocean chemistry and increased ocean acidification</p>	<p>Increase research on the impacts of changes in ocean temperature and chemistry on estuarine and near-shore marine habitats and resources, including commercial and recreational fisheries.</p>
<p>Increased incidence of drought</p>	<p>Improve capacity to provide technical assistance and incentives to increase storage capacity and to improve conservation, reuse, and water use efficiency among all consumptive water uses.</p>
<p>Increased coastal erosion and risk of inundation from increasing sea levels and increasing wave heights and storm surges</p>	<p>Inventory and map coastal shorelands that are at risk of erosion or inundation, or are barriers to shoreline migration, and develop long-term state and local adaptation strategies for shorelands.</p>
<p>Changes in the abundance and geographical distributions of plant species and habitats for aquatic and terrestrial wildlife</p>	<p>Identify ways to manage ecosystems that will improve their resilience to changes in climate conditions.</p>
<p>Increase in diseases, invasive species, and insect, animal, and plant pests</p>	<p>Increase monitoring, detection and control measures for pest insects and plant and wildlife diseases.</p> <p>Increase surveillance and monitoring for climate-sensitive infectious diseases to humans.</p> <p>Increase outreach and community education about disease and invasive species prevention measures.</p> <p>Seek new means of securing resources to detect and combat diseases and invasive species.</p>

Loss of wetland ecosystems and services	Support implementation of priority actions for Risks 2, 5, 6, 7, and 10 related to hydrologic changes, drought, coastal erosion and inundation, habitats, and flooding.
Increased frequency of extreme precipitation events and incidence and magnitude of damaging floods	Inventory past flood conditions and define and map future flood conditions. Improve capability to rapidly assess and repair damaged transportation infrastructure to ensure rapid reopening of transportation corridors.
Increased incidence of landslides	Develop public education and outreach on landslide risks and how to adapt to landslide risks.

Table 2 describes state agency responses.

Table 2: Status of Implementation of 2010 Short-term Priority Actions

2010 Short-term Priority Actions	Implementation Status as of June 2019
<p>Enhance and sustain public health system capacity to prepare for and respond to heat waves and smoke emergencies, and improve delivery of information on heat events and cooling centers, especially for isolated and vulnerable populations.</p>	<p>Oregon Health Authority (OHA):</p> <ul style="list-style-type: none"> • Various state agencies collaborated on the development of the 2013 Oregon Wildfire Response Protocol for Severe Smoke Episodes. This guidance document is updated annually and used consistently. • Crisis and Emergency Risk Communication toolkits for extreme heat and wildfire smoke have been developed by OHA, translated into multiple languages, and their use promoted to local public health authorities. <p>Department of Environmental Quality (DEQ)</p> <ul style="list-style-type: none"> • New air quality monitors have been installed since 2010. DEQ revises the state’s air quality monitoring networks occasionally for a number of reasons, but not specifically to address air temperature. DEQ designs the monitoring network to measure smoke and operates 10 sensor stations in partnership with the US Forest Service and Bureau of Land Management [information acquired from Tom Roick and Anthony Barnack, DEQ Lab].

<p>Maintain the capacity to provide assistance to landowners to restore wetlands, uplands and riparian zones to increase the capacity for natural water storage.</p>	<p>Oregon Watershed Enhancement Board (OWEB) makes significant annual investments via grants to local organizations (e.g., watershed councils, soil and water conservation districts) that support technical assistance and restoration design projects.</p>
<p>Improve real-time forecasting of water delivery and basin yields to improve management of stored water.</p>	<p>Oregon Water Resources Department (OWRD) and partner agencies have made progress in multiple areas since 2010. The OWRD has shifted some of its terminology from a limited focus on water delivery and basin yield to the more-inclusive “Decision-Support Tools for Water Resources Management.” Described in detail in Oregon’s 2017 Integrated Water Resources Strategy, these tools include</p> <ul style="list-style-type: none"> • Development of a Monitoring Strategy. The vision of the Water Resources Department is to assure that water supplies are available to meet current and future needs. This strategy identifies the Department’s monitoring priorities and recommends monitoring actions that will ensure the vision of the Department is being met. • Water Availability Reporting System (WARS). The Water Availability Reporting System was established in the 1990s to calculate the amount of water available for allocation. The underlying hydrologic data are from 1958 through 1987. Science agencies, including the National Weather Service and Natural Resources Conservation Service, update their 30-year reference period every ten years and are now working from a reference of 1980 to 2010. OWRD has begun to update its system to match those reference years. • Mapping Evapotranspiration using high Resolution and Internalized Calibration (METRIC). The use of evapotranspiration data developed from satellite imagery is an established method for characterizing the location, timing, and quantity of agricultural water use. Along with four other western states, Oregon is currently a co-investigator in a project sponsored by the National Aeronautics and Space Administration. Focusing first in the Greater Harney Valley, this project utilizes METRIC with the added benefit of enabling end-users to readily access evapotranspiration information for the region. • Groundwater recharge studies. Groundwater demand in Oregon has led to increasing concerns among water managers about its sustained availability. Groundwater availability in Oregon is measured on the basis of water budgets that estimate the annual rate of four principal components – natural groundwater recharge, natural groundwater discharge, artificial discharge, and flow between hydraulically connected

	<p>basins. In 2019, the U.S. Geological Survey and OWRD embarked on a study to update state-wide natural groundwater recharge estimates.</p> <ul style="list-style-type: none"> • Groundwater basin studies. Oregon has a need for additional basin studies to further understand the relationship between groundwater and surface water, and the availability of both. Since 2010, OWRD completed cooperative studies in the Willamette and Klamath Basins, and currently is working with the U.S. Geological Survey to study the Harney and Walla Walla Basins. <p>In some basins around the state, OWEB grants have supported and continue to support stream gages and other flow measurement tools that increase understanding of hydrological systems.</p>
<p>Improve capacity to provide technical assistance and incentives to increase storage capacity and to improve conservation, reuse, and water use efficiency among all consumptive water uses.</p>	<p>Since the release of the 2012 Oregon Water Resources Strategy, DEQ, OHA, and OWRD have established a statewide groundwater quality monitoring program. This has informed access to stable groundwater resources for those with limited surface water resources.</p> <p>OWEB makes significant annual investments via grants to local organizations (e.g., watershed councils, soil and water conservation districts, irrigation districts) that support both technical assistance and on-the-ground implementation of water conservation projects.</p> <p>OHA and DEQ assessed vulnerabilities to drinking water sources from land uses throughout the state and provided these assessments to system operators. Link?</p> <p>OHA</p> <ul style="list-style-type: none"> • Water system master plans are required for systems serving 300 or more connections. The plan must include an evaluation of the water supply’s ability to meet anticipated demand over the next 20 years and identify and plan for solutions as necessary. • Funding for the development of a resiliency plan is available to public water systems serving more than 25 people. <p>In 2008, OWRD initiated funding for Feasibility Study Grants, plus funds for the Umatilla Basin Aquifer Recovery Project. Since 2008, OWRD has provided approximately \$4.8 million for 76</p>

feasibility studies. These grant dollars have leveraged approximately \$14.8 million in matching funds and in-kind services to determine the feasibility of water conservation, storage, and reuse projects.

In summer 2014, the City of Hermiston Recycled Water Treatment Plant completed construction and permitting of the state's **first and largest** water reuse project that delivers recycled Class A Water. Discharge regulations designed to protect salmon in the Umatilla River during summer restricted warm-water discharge from the City while the irrigation district sought an additional source of irrigation water. Working closely with permitting staff from the U.S. Bureau of Reclamation, **DEQ, OWRD**, the Confederated Tribes of the Umatilla Indian Reservation, and other partners, the city and West Irrigation District designed an arrangement that addressed the needs of member irrigators, citizens, and regulators.

In 2015, **OWRD** initiated funding for the Water Project Grants and Loans program. OWRD co-funded a WaterSMART Basin Study in the Deschutes River Basin with the U.S. Bureau of Reclamation and a reallocation feasibility study in the Willamette River Basin with the U.S. Army Corps of Engineers. The state also awards grants and loans from the account through a competitive funding opportunity. These Water Project Grants and Loans provide funding to evaluate, plan, and implement instream and out-of-stream water resources projects. Since 2015, OWRD has awarded approximately \$15 million in funding. OWRD also managed additional direct appropriations for the study or implementation of storage projects through this fund.

In 2015, **OWRD** published Oregon's 2015 Long-Term Water Demand Forecast. The document describes potential long-term consumptive use demands given that historic patterns may not allow to prediction of future rainfall and snowpack. The 2015 scenarios and assumptions include a projected increase in population and a longer, warmer growing season, leading to more demand by agricultural, commercial, residential, and industrial water uses in 2050. Additional projection also is necessary to determine instream flow needs.

In 2015 and 2016, **ODA** applied to **OWRD** to extend reservations established in rules for stored water in six basins: Grande Ronde, Hood River, Malheur, Malheur Lake, Owyhee, and

	<p>Powder River. A reservation sets aside unappropriated water for multi-purpose storage to meet future needs.</p> <p>In 2016, OWRD initiated a pilot phase of the <u>Place-Based Integrated Water Resources Planning</u> program. The department entered into contracts or agreements with four communities: Upper Grande Ronde River Sub-Basin, convened by Union County; Lower John Day River Sub-Basin, co-convened by the Gilliam Soil and Water Conservation District and the Mid-John Day Bridge Creek Watershed Council; Malheur Lake Basin, co-convened by the Harney County Watershed Council and the Harney County Court; and the Mid-Coast Region, co-convened by the City of Newport and the Water Resources Department. Multiple state natural resources agencies – primarily OWRD, ODA, DEQ, and ODFW– are contributing their time and resources to the planning efforts and working to better integrate agency efforts at the local level.</p> <p>Some federal storage projects are not fully allocated, representing key points of discussion between the State of Oregon and federal agencies. In 2015, the U.S. Army Corps of Engineers, which operates the Willamette Valley Project reservoirs, reinitiated a feasibility study in the Willamette Basin with sponsorship from OWRD. This multi-year study quantified the current use of storage and estimated future water needs for irrigated agriculture, municipal, industrial, and instream uses in the Willamette Basin. The study examined whether operational changes or modifications in the storage allocation from the Willamette Valley Project reservoirs would better serve present and future water needs in the basin. The study was completed in late 2019, and is being used by the U.S. Army Corps of Engineers to seek authorization from Congress to proceed with implementation. (Link)</p>
<p>Include wildfires in planning to reduce vulnerability to natural hazards.</p>	<p>DEQ's Wildfire Severe Smoke Response Protocol was first initiated in 2012 and has been updated almost annually. The protocol is focused on air quality impacts and is intended to guide the use of resources in response to air quality due to major wildfires. The protocol is intended to help guide public agencies and to facilitate collaboration among agencies to gather the appropriate information on smoke and recommend public actions.</p> <ul style="list-style-type: none"> • Monitors exist in all but one of the smoke sensitive receptor areas covered by the Smoke Management Plan (link?), and the last sensor will be installed during 2021. DEQ also will deploy 30 new monitors throughout the state by late 2020 to collect more comprehensive data on particulate matter (PM) The increasing prevalence of wildfires in the last few has resulted in more requests for PM monitoring in areas of the state where monitors were

	<p>not previously installed. Therefore, DEQ requested funds from the Oregon Legislature in 2017 for additional PM monitors.</p> <ul style="list-style-type: none"> • DEQ published trends, derived from monitoring data, on the effects of wildfire smoke on health in four cities . <p>OWEB administers grants to forest collaboratives around the state, which are funded by the Oregon Department of Forestry through its Federal Forest Health Program.</p>
<p>Restore fire-adapted ecosystems to withstand natural recurring wildfires.</p>	<p>DEQ updated its Smoke Management Plan in 2017 to allow for more prescribed fire. The parameters were set by ODF, but the aim was to balance use of prescribed fire with public health impacts from smoke. Similar to the wildfire severe smoke response protocol, changes in the smoke management plan do not explicitly reference climate change. Prescribed fire scenarios examine meteorology, fuel parameters (for example, moisture content, density, and distribution), and air quality impacts. The 2017 update allowed more smoke exposure in communities and did not increase use of fire in shoulder seasons. ODF sets burn prescriptions and approves burns.</p> <p>OWEB grants have supported dry forest restoration projects in Oregon, with a focus on southwestern Oregon. In 2016, under its Focused Investment Partnership (FIP) Program, OWEB awarded funding to the Ashland Forest All-Lands Restoration Initiative to support six years of restoration. In 2019, OWEB awarded another FIP to the Rogue Forest Restoration Initiative.</p>
<p>Develop short- and medium-term climate change adaptation strategies for forests and other fire-prone habitats, and improve development standards to reduce exposure to fire risk at the urban-wildland interface.</p>	<p>ODF field foresters work directly with landowners, local governments, and non-profit organizations to address forest threats, such as wildfire, invasive species and forest fragmentation, on state and private forest lands.</p> <p>ODF responds to increasing fire magnitude by maintaining its suppression capacity and working with closely with partners.</p> <p>ODF is working to improve the condition of Oregon’s federal forests through the use of Good Neighbor Authority, Shared Stewardship, and the Federal Forest Restoration Program. (Links)</p>
<p>Improve the capabilities of public health agencies to plan for and respond to the public</p>	<p>OHA provided small grants to five local health jurisdictions to develop and begin implementation of climate and health adaptation plans.</p>

<p>health and safety risks of wildfire emergencies.</p>	
<p>Increase research on the impacts of changes in ocean temperature and chemistry on estuarine and near-shore marine habitats and resources, including commercial and recreational fisheries.</p>	<p>In 2018, OWEB funded a monitoring grant to assess the effects of ocean acidification and hypoxia in Tillamook Bay.</p> <p>Oregon marine reserves have been created.</p> <p>The Oregon Coordinating Council on Ocean Acidification and Hypoxia. Has made considerable investment in studying ocean acidification and hypoxia Harmful algal bloom monitoring has increased, but is not yet sufficient. The state is participating in the international Ocean Acidification Alliance and coordinating across the Pacific with the Pacific Coast Collaborative.</p> <p>ODFW has prepared a Nearshore Conservation Strategy.</p>
<p>Inventory and map coastal shorelands that are at risk of erosion or inundation, or are barriers to shoreline migration, and develop long-term state and local adaptation strategies for shorelands.</p>	<p>In 2015, OWEB funded a technical assistance grant to assess estuary and landward migration zones along the Oregon coast. (link)</p> <p>DLCD conducted an exposure inventory of Oregon's estuaries in 2017.</p> <p>ODOT partnered with DLCD to produce a sea level rise exposure inventory for state highways, which focused on future inundation of roadways in coastal estuaries. GIS data are available on the Coastal Atlas website for use in planning.</p>
<p>Identify ways to manage ecosystems that will improve their resilience to changes in climate conditions.</p>	<p>Since 2016, OWEB has funded development of several strategic action plans that identify restoration opportunities and priorities along the Oregon coast.</p> <p>OWEB makes significant annual investments via restoration, acquisition, technical assistance, monitoring, and stakeholder engagement grants that inform design and enable implementation of resiliency actions.</p> <p>ODFW has yet to be funded to implement the Oregon Conservation Strategy, but the Strategy has been updated to incorporate climate change as referenced in the Framework. ODFW has a new wildlife connectivity biologist who is working on statewide analysis of connectivity and corridors for wildlife movement. ODFW is still a few hundred thousand dollars short of the funds needed to pay for the statewide analysis.</p>

	<p>ODFW is working to acquire instream water rights for fish habitat. Since the release of the 2012 Integrated Water Resources Strategy, Oregon has made a number of advancements in water resources management, including initiation of new instream flow studies, protection of additional rivers by designating scenic waterways (OPRD and OWRD), establishing outstanding resource waters (OWRD), and applying for new instream water rights (ODFW). ODFW is currently utilizing existing information to recommend flows for future instream water rights applications and is prioritizing future studies. Collection and processing of new data for a given stream reach takes two to three years. New instream flow studies will provide data for future instream water rights applications.</p>
<p>Increase monitoring, detection and control measures for pest insects and plant and wildlife diseases.</p>	<p>While not focused on plant diseases, but rather invasive species, OWEB supports grants through several of its programs (e.g., Open Solicitation, Oregon State Weed Board Grants, etc.) that enable early detection and rapid response for invasive plant species.</p>
<p>Increase surveillance and monitoring for climate-sensitive infectious diseases to humans.</p>	<p>OHA: Utilizing the Statewide Syndromic Surveillance System (ESSENCE), the Public Health Division publishes seasonal Hazard Reports that include data on many climate-sensitive health conditions.</p>
<p>Increase outreach and community education about disease and invasive species prevention measures.</p>	<p>OHA regularly posts recreational advisories for</p> <ul style="list-style-type: none"> • Harmful algal blooms • Beaches • Fish and shellfish • Stay Safe in the Outdoors, including <ul style="list-style-type: none"> ○ West Nile virus and mosquito bite prevention ○ Lyme disease and tick bite prevention and response
<p>Seek new means of securing resources to detect and combat diseases and invasive species.</p>	<p>OHA has secured funds for Public Health Modernization, which includes improving Oregon’s public health system to prevent and respond to climate-related communicable diseases. As part of the modernization implementation plan, future funding will be directed to climate-related non-communicable diseases.</p> <p>ODFW’s aquatic invasive species monitoring has increased with the implementation of all year check stations at the borders with Washington, California, Idaho, and Nevada. ODFW is not monitoring for a more diverse suite of potential invasive species.</p>
<p>Support implementation of priority actions for Risks 2, 5, 6, 7, and 10 related to hydrologic changes, drought, coastal erosion and inundation, habitats, and flooding.</p>	<p>The Governor’s Water Core Team fits in well with this section. (incomplete)</p>

ODOT

- Produced a Climate Change [Adaptation Strategy Report](#), outlining primary climate impacts and risks to transportation, existing programs, and adaptive capacity in response.
- Long-term research is being conducted to inform a coastal landslides and bluff retreat, which will conclude with a targeted risk assessment for landslide/coastal highways that are vulnerable to landslides and erosion hazard priorities along highway US 101. Research is also underway for an automated landslide hotspot identification and risk mapping tool for state highways that considers future climate change and landslide risks.
- Conducted a [vulnerability assessment pilot study](#) for highways in Tillamook and Clatsop counties. The study focused on roadway hazards that may worsen with future sea level rise and extreme weather events. Adaptation options were developed for five roadway hazard sites on US 101.
- Conducted a [pilot study](#) analyzing nature-based options to protect coastal highway infrastructure from future storm surge and sea level rise using. The study focused on the use of dynamic revetments and sand dunes.
- ODOT's [Sustainability Program](#) Initiated work on a Statewide Climate Change Risk Assessment (2020), which will result in an operational adaptation action plan that guides future agency investments.
- Established the [ODOT Climate Office](#) (March 2020) to enhance focus and resources on mitigating greenhouse gas (GHG) emissions from transportation sources and to address the effects of climate change on Oregon's transportation system.
- Established the Adaptation Work Group, an interagency team of managers and subject experts who help set agency priorities and provide technical guidance for adaptation planning.

Since 2015, the Drought Readiness Council (chaired by **OWRD and OEM**), a standing body of federal and state natural resource, public health, and emergency response agencies, has reviewed local requests for assistance during drought and made recommendations to the Governor.

	<p>In early 2016, OWRD and OEM updated Oregon’s incident annex on drought, a response plan for state agency coordination activities. Response plans focus on short-term actions to reduce the immediate impact of drought, whereas mitigation plans tend to address actions taken before a drought occurs to reduce potential future drought impacts.</p> <p>In 2016, the Oregon Legislature established a Drought Task Force to develop <u>recommendations</u> that could help improve the state’s response to drought. In November 2016, the Task Force released a full report detailing their efforts and highlighting several recommendations for addressing drought emergencies. The report is available at https://www.oregon.gov/owrd/WRDReports/Draft_Final_Task_Force_Report_11_1_2016_Final.pdf.</p> <p>In 2017, the Governor’s Drought Policy Office, working with agency staff at OWRD, published guidance for in-home and out-of-home conservation measures that can be taken during drought.</p> <p>The 2017 Legislature passed a bill requiring owners or operators of high-hazard dams to develop an emergency action plan and file it with OWRD, OEM, and the local county emergency agency no later than January 1, 2019. The 2019 Legislature passed critical laws authorizing OWRD to better enforce state dam safety laws to protect people and property from dam failure. These critical authorities allow OWRD and others to support community safety in the face of severe flooding.</p>
Inventory past flood conditions and define and map future flood conditions.	<p>OWEB makes grants that support technical assistance and restoration design and implementation projects to help minimize the risk of flooding (e.g., Southern Flow Corridor project in Tillamook County).</p> <p>DLCD and DOGAMI, in corporation FEMA Map Modernization and Risk Map Programs, updated Flood Insurance Rate Maps in xx Oregon counties. DOGAMI used state-of-the-art modeling methods along the Oregon Coast to improve floodplain delineations. (incomplete)</p>
Improve capability to rapidly assess and repair damaged transportation infrastructure, in order to ensure rapid reopening of transportation corridors.	<p>ODOT’s Maintenance and Operations Branch developed a Statewide Resource Optimization Plan, which establishes extreme weather thresholds and maps resource priorities to enable efficient deployment of resources (such as snow plows) during critical weather events.</p>

<p>Develop public education and outreach on landslide risks and how to adapt to landslide risks.</p>	<p>DLCD and DOGAMI collaborated in 2019 to produce a landslide guide for use by local government planners and land use managers.</p> <p>ODOT – Developed the Unstable Slopes Program, which identifies and assigns risk scores to landslides and rockfalls on the state highway system, informing hazard mitigation and public safety projects.</p>
<p>Other climate adaptation activities not identified as short-term priorities in 2010 but which demanded a response</p>	<p>DLCD's 2011 publication Cool Planning: A Handbook on Local Strategies to Slow Climate Change highlights adaptation strategies for transportation projects.</p> <p>ODOT enhanced its TripCheck program , which provides real-time information on road conditions and forecasted events.</p> <p>ODOT – Improved its Road Weather Information System network, which provides information on local road weather and images from cameras, and is testing weather-triggered variable speed limit signs on Interstate 84 in eastern Oregon.</p> <p>ODOT – Conducting a statewide culvert inventory that identifies the location, age, and condition of roadway culverts, and will enhance system maintenance and resilience to extreme weather events.</p> <p>OHA engaged diverse stakeholders in development of the Oregon Climate and Health Resilience Plan, which outlines priority strategies for Oregon’s public health system. Implementation of strategies is underway and includes support for local public health authorities in implementing local climate and health adaptations.</p> <p>ODOE created a new rebate program that makes solar electric systems and paired solar storage systems more affordable for residential customers and providers of services to low-income households.</p>