

# The Business Case for Investing in Water in Oregon

July 2023



AMP Insights

ONWATER  
— ECON —

## ACKNOWLEDGEMENTS

---

This report was completed under a contract awarded by the Oregon Water Resources Department (OWRD) to AMP Insights. The Authors would like to thank OWRD for the opportunity to craft and articulate this *Business Case for Investing in Water in Oregon*.

We would also like to thank the many individuals we spoke to as part of this project who provided valuable insight and perspective and truly helped shaped this report.

## AUTHORS

---

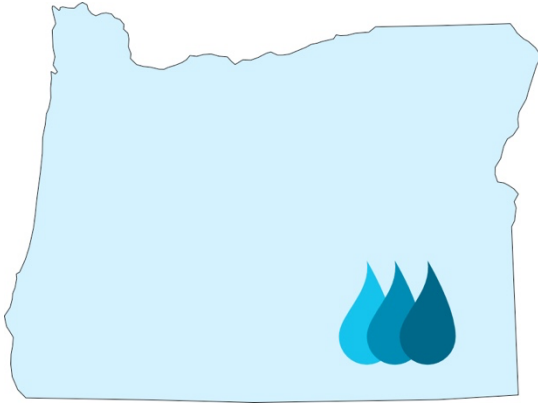
This report was a joint effort between AMP Insights, LLC, OneWater Econ and Robert S. Raucher.

Authors:

- David Pilz, JD, AMP Insights
- Sarah Kruse, PhD, AMP Insights
- Robert S. Raucher, Raucher LLC
- Janet Clements, OneWater Econ
- Tess Gardner, AMP Insights
- Jeff Odefey, OneWater Econ
- Trygve Madsen, Independent Contractor
- Andrew Purkey, AMP Insights
- Claire Sheridan, OneWater Econ
- Amy McCoy, AMP Insights
- Alex Ehrens, AMP Insights

Suggested Citation: Pilz, D., Kruse S., Raucher R., Clements J., Gardner T., Odefey J., Madsen T., Purkey A., Sheridan C., McCoy A., Ehrens A., *The Business Case for Investing in Water in Oregon* (June 2023).





## EXECUTIVE SUMMARY

---

Beginning with Indigenous cultures since time immemorial, Oregon’s land, people and environment have always been deeply connected to water. The objective of this report is to highlight the critical value of water to Oregon, and clearly articulate the case for making and sustaining investments to protect and manage Oregon’s water assets — to make the business case for investing in water in Oregon.

Applying a *business case* perspective provides an objective approach for assessing the beneficial returns that potential water investments might generate, and how those benefits are likely to be distributed across Oregon’s people, regions, economic sectors and ecosystems. At its core, a business case is about considering risks, opportunities and benefits to make an informed decision about the wisdom of investment(s).

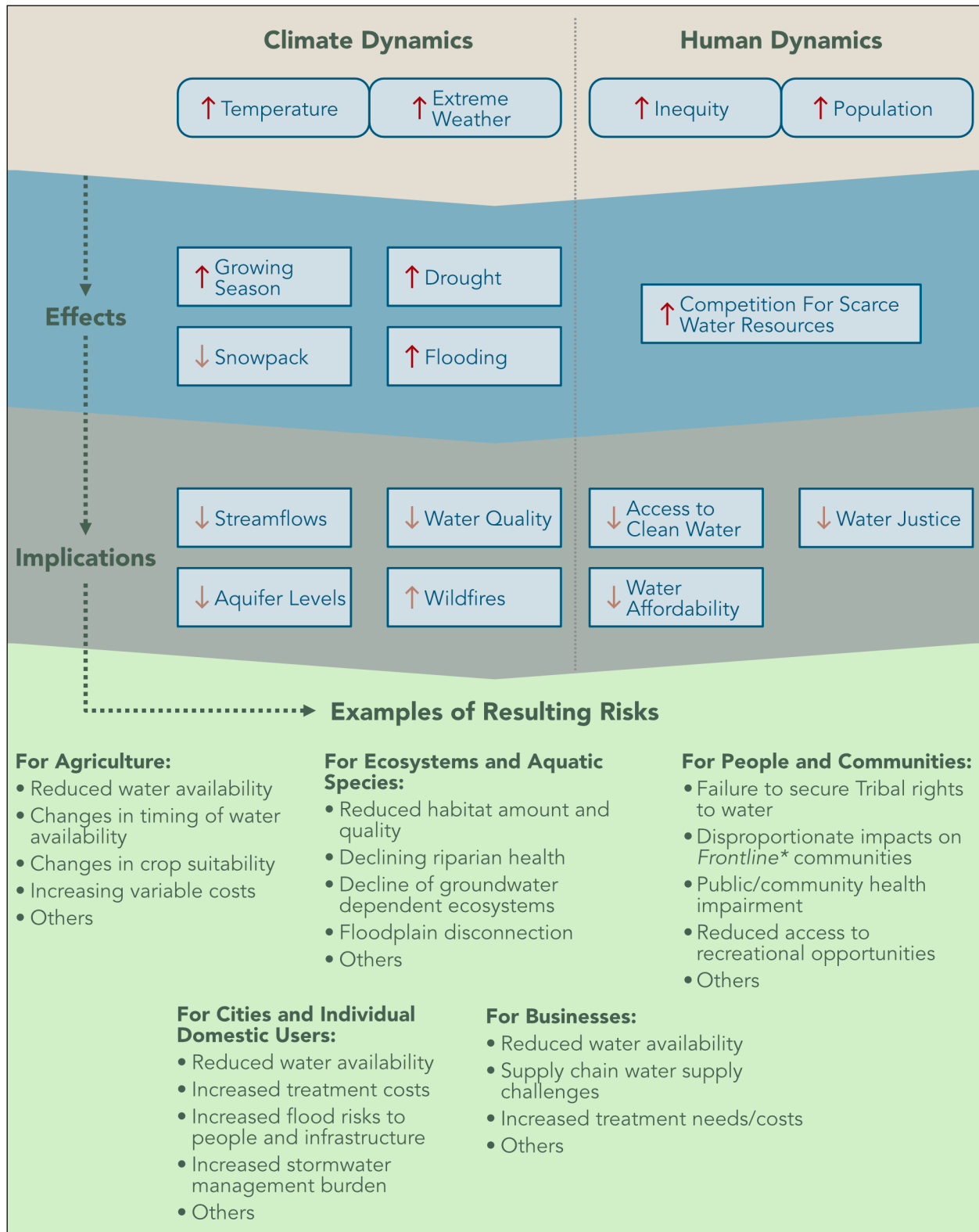
More specifically this report builds the business case for investing in water in Oregon in six parts:

- discussing risks facing Oregon and the opportunities and benefits that investing in water can provide;
- detailing Oregon’s demographic and water use context, providing important background on the people of the state and their connections to water;
- describing the methods and approaches used to estimate the value of water and investments in water;
- presenting the baseline economic value of water-related sectors in Oregon — a snapshot of the role of water in Oregon’s economy — along with a discussion of other water values including cultural and spiritual value;
- highlighting the unique role of Tribal sovereignty and connection to water resources in Oregon;
- developing eight case studies highlighting a range of investments that have been made or planned in Oregon and discussing the benefits of these investments or consequences of not investing.

### Oregon Faces Challenges in Managing Water

Freshwater makes up a vanishingly small portion of total water on earth. Of the water that is available, not all is accessible to humans and much of what might be accessible is needed not only by people, but also to sustain a diverse range of ecosystems. A changing climate coupled with anthropogenic stressors are changing the task of managing water resources at a rapid pace with major implications for all water users and water-relates sectors including the natural environment (Figure ES-1).

FIGURE ES-1: EXAMPLES OF WATER SUPPLY RISKS IN OREGON



\*Frontline communities are those who experience impacts “first and worst;” this includes people most exposed to water risks due to where they live and due to a lack of resources, safety nets, political influence, etc. (Stacey Dalgaard 2022).

## Oregon's Water Assets Support Many Values

While risk is one part of the business case for water in Oregon, another part is the benefits and opportunities that investing in water affords. Water provides an array of essential and highly valuable services to Oregon's natural and human communities including but not limited to:

- protecting and enhancing key fisheries and aquatic ecosystems (including threatened and endangered salmonids and other species);
- providing reliable, high quality and affordable potable water supplies for the state's households;
- honoring and preserving spiritual and cultural values for Indigenous people;
- supplying water to farmers, ranchers, orchardists and others;
- supporting agricultural activity throughout the state;
- supporting a wide array of water dependent industries, from health care, to microchip manufacturing, to microbreweries and others;
- providing an array of existence, bequest, spiritual and other nonuse values for residents and visitors;
- providing high-quality recreation and tourism experiences and related economic activity;
- supporting a sustainable commercial fishery;
- enabling water-based navigation and shipping;
- managing flood risks and adverse impacts from stormwater runoff;
- providing an abundant source of economical and low carbon hydropower energy;
- supporting healthy forests, grasslands, and other terrestrial ecosystems, and related timber and agricultural enterprises, and enhancing carbon sequestration; and
- defining an identity and quality way of life for Oregonians.

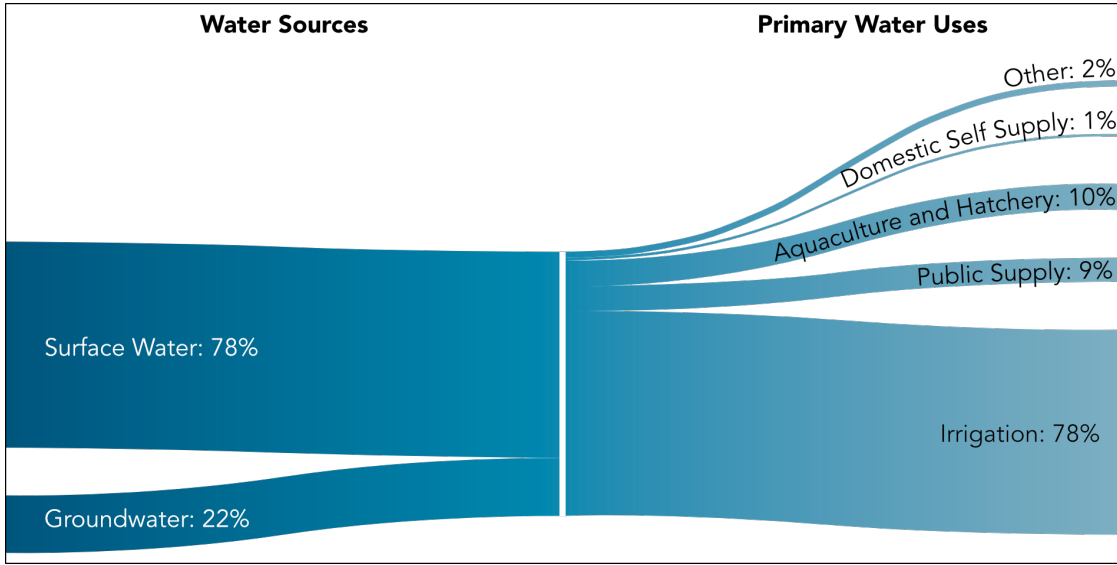
## Making a Business Case

Developing a business case is a well-established approach for evaluating whether potential investments are likely to provide beneficial returns to the state through a systematic assessment of the costs and benefits of investment alternatives. The objective is to identify options with high returns on investment while recognizing that many returns are *not* monetary. When weighing investments, fiscal and economic considerations are critical but so too are intangible factors. The business case for investing in water in Oregon is in large part based on economic considerations but is not constrained by that frame of reference. Compelling reasons to invest in water in Oregon are as diverse as the benefits water provides and as numerous and serious as the risks the state is facing. This report is an attempt to capture and articulate all these reasons through quantitative analysis, qualitative discussion and storytelling, and to do so in a way that inspires a collective commitment to investing in Oregon's most precious resource.

## Oregon Water Use and Demographic Context

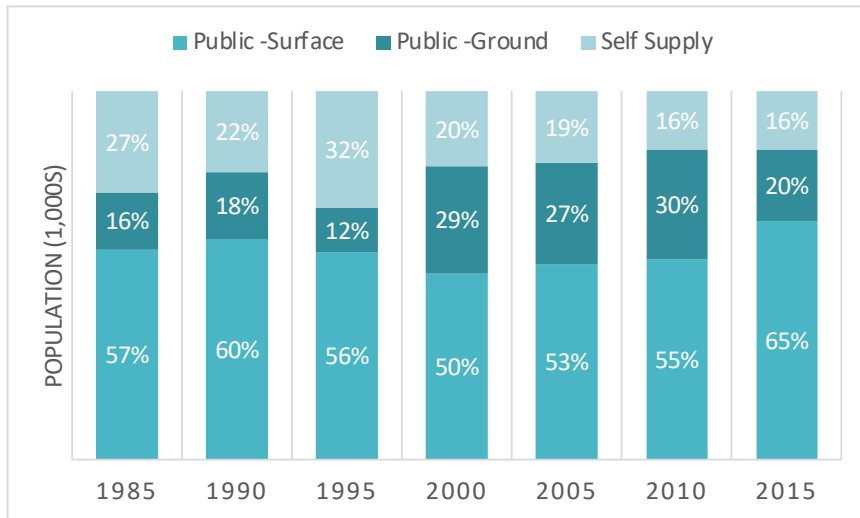
Approximately 78% of total water withdrawals in Oregon are from surface water sources while 22% come from groundwater. (USGS 2023). Of the water withdrawn, 78% is used for irrigation. Figure ES-2 shows the source of withdrawals in Oregon on the left side and how the total withdrawn water is used on the right side.

FIGURE ES-2: WATER WITHDRAWALS BY SOURCE AND USE ACROSS OREGON



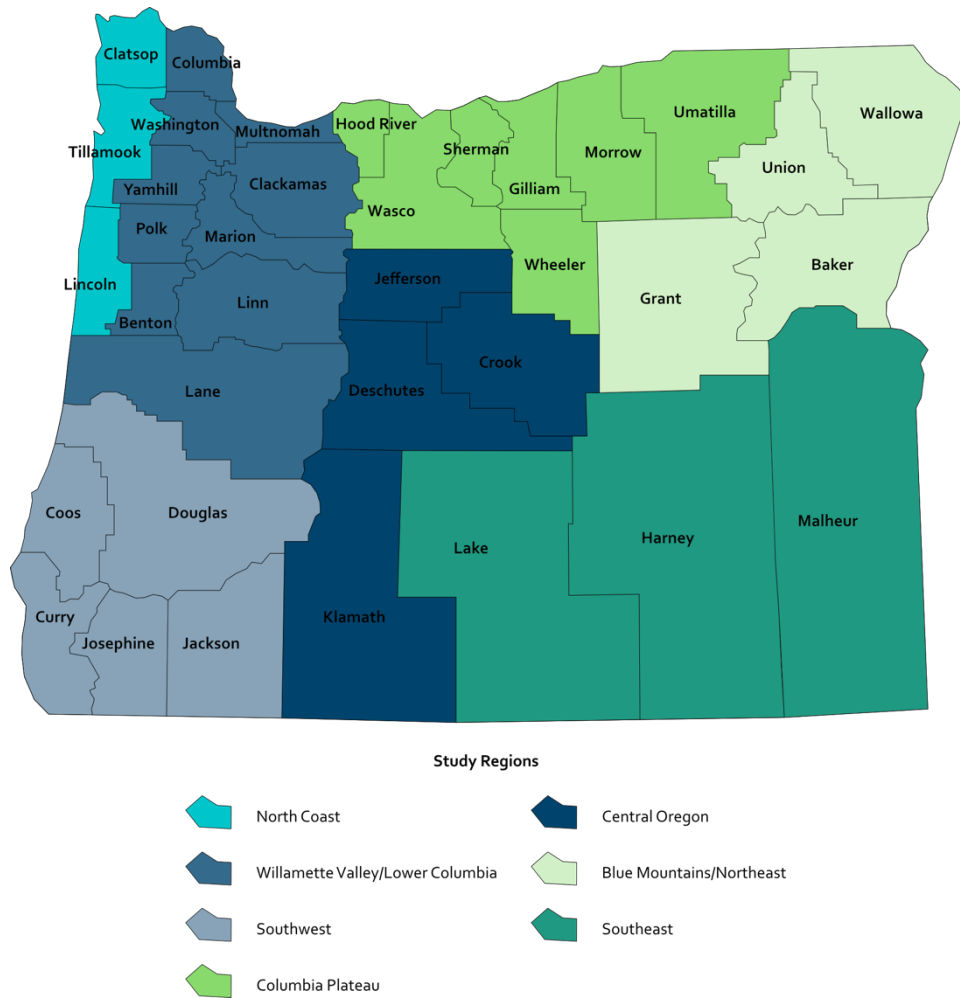
Most of Oregon’s population relies on public supply from surface water sources for household and other domestic uses (Figure ES-3). The proportions of public surface, public groundwater and self-supply have changed over time; self-supply today is lower than in 1985 while public groundwater use has increased (USGS 2023).

FIGURE ES-3: WATER WITHDRAWALS BY SOURCE AND USE ACROSS OREGON



This report also examines various economic, water use and demographic data at the regional scale (Figure ES-4). County boundaries were used for regional grouping to align the analyses with the geographic scope of the most widely available data sources. The choice of what counties to group together balanced efficiency (i.e., limiting the number of total regions) with an attempt to group counties together that share physical, demographic, climate and water use characteristics.

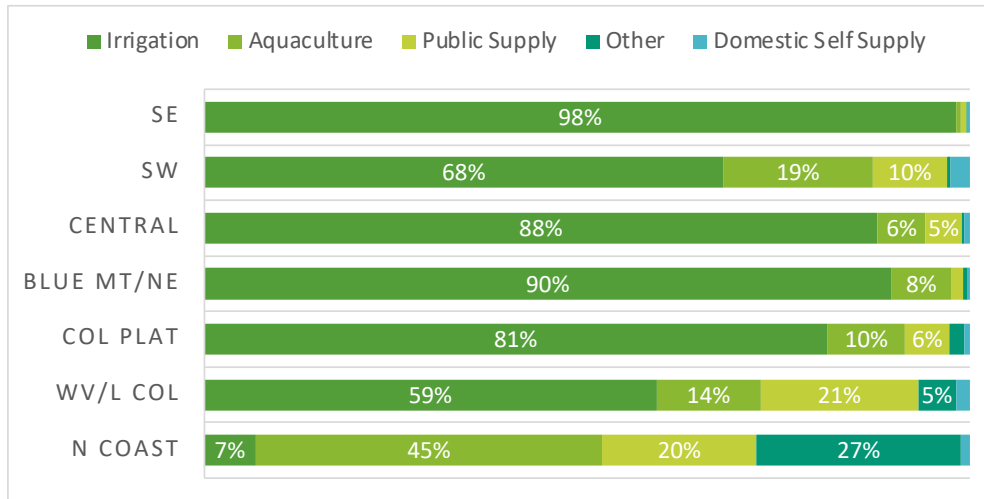
FIGURE ES-4: REGIONS USED IN THIS REPORT



Water use varies substantially across the regions (Figure ES-5). Irrigated agriculture represents more than 80% of total water use in the Columbia Plateau, Blue Mountain/Northeast, Central and Southeast regions. While irrigated agriculture still accounts for most of the water use in the Willamette Valley/Lower Columbia and Southwest regions, use for aquaculture and public supply are proportionally higher. The North Coast region is distinct among regions in this report in its limited use of water for irrigated agriculture.



FIGURE ES-5: WATER USE BY REGION



### Economic Baseline for Water Dependent Sectors in Oregon

This report analyzes uses and economic values associated with sectors that are highly dependent on water resources including:

- irrigated agriculture;
- water dependent industries such as manufacturing, health care, wineries and other businesses that rely heavily on water for key aspects of production;
- recreation and tourism;
- commercial fishing;
- hydropower;
- thermoelectric power; and
- households dependent on safe and reliable water supplies for drinking water and sanitation.

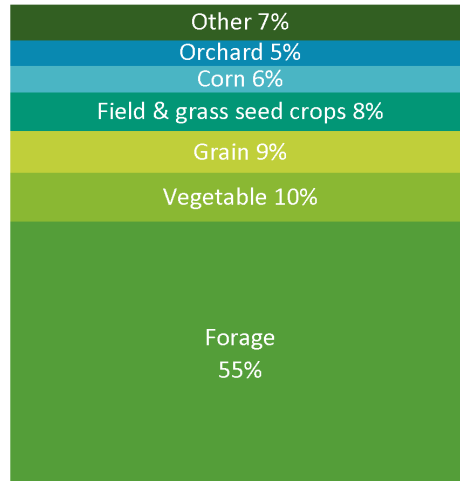
### Agriculture

Irrigated agriculture makes vital economic contributions to the state.

**The total annual economic contribution of irrigated agriculture to Oregon’s economy is \$7.3 billion.**

Figure ES-6 shows the makeup of harvested irrigated acreage by crop type based on the most recent National Agricultural Statistics Service (NASS) Census of Agriculture (CoA), conducted in 2017. Forage crops make up the largest percentage of irrigated acreage at 55%. Vegetables, grains, field and grass seed together account for an additional 27%, while the remaining 19% of irrigated acreage is made up of a variety of crops, including corn, orchards (fruit and nut trees), berries, mint, hops, dry beans, sugar beets and other (miscellaneous) crops.

FIGURE ES-6: HARVESTED IRRIGATED ACREAGE BY CROP TYPE



Source: USDA NASS 2017.

Notes: Forage crops include alfalfa and other hay, as well as haylage, grass silage, and greenchop.

Irrigation is used to produce many of Oregon’s highest value crops, accounting for approximately 80% of economic output associated with total cropped acreage.<sup>1</sup> As shown in Table ES-1, many of the state’s leading crops (in terms of direct economic output) rely heavily on irrigation, including hay, vegetables, fruits, nuts, berries, hops and corn.

---

<sup>1</sup> Estimated based on the ratio of cash rents for irrigated and non-irrigated land (NASS 2022) and the amount of cropped acreage in each crop category. Ratio was applied to value added estimates for cropped agriculture from IMPLAN to determine total value added of irrigated agriculture. The ratio of value added to economic output for each crop sector was then applied to determine total economic output by sector.

TABLE ES-1: HIGH VALUE CROPS – DIRECT ECONOMIC OUTPUT AND ACRES IRRIGATED

Crop	Economic Output (\$M)	% of Cropland Irrigated
Greenhouse & nursery	1,344	N/A
Hay	643	67%
Grass seed	518	25%
Wheat	310	11%
Vegetables		86%
Potatoes	245	
Onions	135	
Crops in orchards		53%
Grapes for wine	179	
Cherries	152	
Hazelnuts	149	
Apples	44	
Pears	111	
Blueberries	136	100%
Christmas trees	121	1%
Corn, grain	88	75%
Hops	85	100%
Sweet corn	46	100%

Source: Oregon Department of Agriculture 2021; USDA NASS 2017.

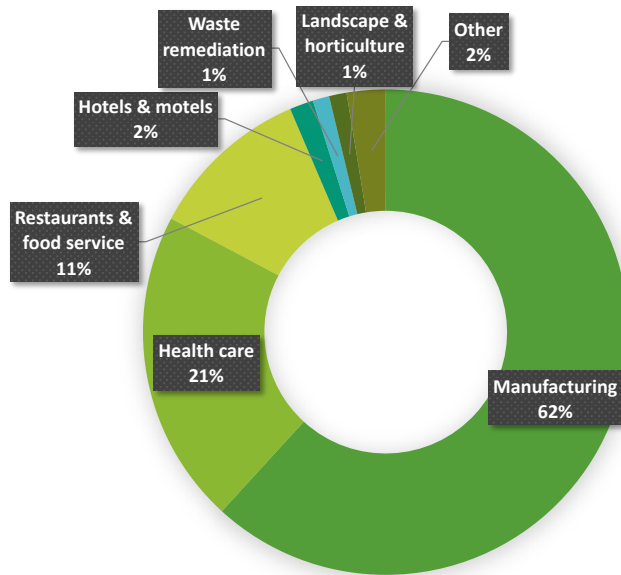
### Water Dependent Industries

Figure ES-7 shows the relative direct contribution of water dependent industries by industry category for the state.<sup>2</sup> Manufacturing is by far the largest economic contributor and employer, with an annual economic output of \$88.8 billion, accounting for 18.3% of the total state output and 61.8% of output from only water dependent industries. Health care services such as hospitals, physicians’ offices and nursing homes contribute \$39 billion to the state’s economy annually (or 7.5% and 21.0% of total output and water dependent industries output, respectively). Manufacturing and health care services collectively employ over 400,000 people, making up about 16% of the state’s total workforce.

---

<sup>2</sup> Water dependent industries include: manufacturing, hospitals and health care facilities, junior colleges, colleges, universities and professional schools, hotels and motels, restaurants and other food service industries, car washes, dry-cleaning and laundry services, landscaping and horticulture services, breweries and wineries and waste remediation.

FIGURE ES-7: WATER DEPENDENT INDUSTRIES OUTPUT



Source: IMPLAN.

Beyond direct economic contribution, water dependent businesses create additional economic activity in the form of indirect and induced spending. Together, these industries support \$221 billion in economic output (46% of the state’s total) and \$111 billion in total value added (40% of the state’s total), supporting just over 1 million jobs (41% of the state’s total).

### Freshwater-Related Recreation and Tourism

Oregon’s diverse geography and ecology create opportunities for a range of outdoor recreation activities including hiking, boating, swimming, fishing, camping, skiing and more. The state’s clean and abundant water sources — including its lakes, rivers, and streams — underpin the values and economic activity associated with many outdoor recreational activities. The inherent value that individuals place on outdoor recreational activities can be difficult to measure. However, economists have developed non-market valuation techniques to estimate the value of recreational experiences across a range of activities. These studies yield what economists refer to as *direct use values*, which reflect the maximum amount that individuals would be willing to pay to participate in a recreational activity.<sup>3</sup> Applying this methodology to a statewide survey of participation in outdoor recreational activities, Rosenberger (2018) estimated that in 2017, Oregonians participated in 1.4 billion outdoor recreation activity days, with a total net economic value of \$63.2 billion.

### Commercial Salmon Fishing

The coastal waters off Oregon’s shores support vibrant fisheries and fishing communities. Among the iconic commercial fisheries are the six runs of anadromous salmonids, including Coho, Chinook, Chum, Pink and Sockeye salmon and steelhead trout. In 2021, Oregon’s fishing fleet landed close to 1.8M pounds of salmon, producing more than \$6.5 million in revenue (NOAA Fisheries 2021). Salmon fishing

<sup>3</sup> The net economic value of a recreation activity equals maximum willingness-to-pay minus any costs incurred to participate.

accounted for just over 3% of direct revenues (or ex-vessel sales) from onshore landings along the coast in 2021. Based on data from the IMPLAN model, the salmon fishery supported an estimated 151 direct jobs and \$5.2 million in labor income (including proprietor income).<sup>4</sup> The direct economic activity associated with salmon fishing – \$23.5 million – is concentrated in the coastal regions of the state, and in particular, the North Coast region, which is responsible for 89% of total on shore landings across its five ports (ECONorthwest 2019).

### Hydropower

Oregon's rivers provide the state with an immense amount of hydropower. Oregon is the second largest producer of hydroelectric power in the US after Washington. In recent years, approximately half of Oregon's electricity generation has come from over 100 hydroelectric facilities located within the state or on its shared borders with Washington and Idaho. This energy has two primary economic signatures; first, and most importantly, it powers homes, businesses and industries across the state, contributing to statewide and regional economic productivity. Second, hydropower is an industry, with revenues and employment levels that also contribute to the state's economic well-being. The hydropower industry in Oregon employs approximately 1,500 people across the state. (Oregon Department of Energy 2022)

### Thermoelectric Power Generation

Compared to the number of hydroelectric generating facilities, Oregon has relatively few thermoelectric generation stations. There are 13 natural-gas fired facilities, several with multiple generating units, located within the state (Northwest Power and Conservation Council (NPCC) 2023). These plants rely on consistent supplies of fresh water for cooling and steam generation. Water withdrawals from rivers, as well as discharges of heated water by these facilities, can have adverse effects on aquatic fish and habitat. (Mehaffey, Neale, and Horvath 2017). Despite their small numbers, thermoelectric generating facilities produced approximately 20 million megawatt hours (MWh) in 2020, or about 30% of the electricity generated within the state. Oregon power producers also exported approximately 7.5M MWh of natural gas fueled electricity in 2020 (Oregon Department of Energy 2022). In addition, the State's thermoelectric facilities are important contributors to the State and regional economies. In 2022, natural gas fired power plants directly employed nearly 500 Oregonians, with most of these positions concentrated in the Willamette Valley/Lower Columbia and Columbia Plateau.

### Potable Water Supply

Understanding water use by households and businesses for drinking water and sanitation purposes, as well as the water systems that provide these services is critical to making the business case. Very small public water systems serve 12%–16% of the population in all regions but Willamette Valley/Lower Columbia, which leans on large and very large systems to serve water to 86% of the population. Most of the population in the Blue Mountains/NE, Columbia Plateau, North Coast and Southeast regions get their water from systems that serve under 10,000 people. (EPA 2023)

---

<sup>4</sup> Employment and labor income are estimated based on industry patterns for the commercial fishing sector.

TABLE ES-2: SHARE OF REGIONAL POPULATION SERVED BY SYSTEM TYPE

Region	Very Small	Small	Medium	Large	Very Large
N Coast	12%	30%	27%	31%	0%
WV/L Col	4%	5%	5%	43%	43%
Col Plat	16%	18%	31%	35%	0%
Blue Mt/NE	15%	25%	34%	26%	0%
Central	12%	15%	11%	62%	0%
SE	14%	43%	0%	43%	0%
SW	12%	12%	19%	57%	0%

Table ES-3 provides a snapshot of each region’s relative dependence on public water systems vs. domestic self-suppliers. Self-supply is most often from groundwater. These data reveal to what degree regions rely on domestic self-supplied water sources instead of public water sources. The Willamette Valley/Lower Columbia region, with its large population and large and very large water systems is one of the least dependent on domestic self-supply, along with the North Coast region. On the other side of the spectrum, regions like the Southeast (38% domestic self-supply), Blue Mountains/NE (28%) and Southwest (28%) are relatively more dependent on domestic self-supply and thus groundwater.

TABLE ES-3: SHARE OF POPULATION SERVED BY DOMESTIC SELF-SUPPLY VS. PUBLIC WATER SYSTEMS

Region	Domestic Self-Supply	Public Water Systems	Domestic Self-Supply
N Coast	9,741	104,549	9%
WV/L Col	379,902	2,694,413	12%
Col Plat	35,226	117,254	23%
Blue Mt/NE	16,013	42,212	28%
Central	64,071	248,564	20%
SE	17,968	29,492	38%
SW	144,873	363,777	28%

Source: USGS 2018.

### Other Water Values

In addition to the sectors described above, the benefits of water uses that either 1) do not fall neatly into a single industry sector (e.g., golf courses, navigation and transport); 2) represent only a portion of an industry sector (e.g., freshwater aquaculture); or 3) require non-market valuation approaches to estimate are also discussed. These benefits include:

- spiritual and symbolic values;
- ecological function values;
- Tribal values;
- aquaculture values;
- navigation and transport values;
- aesthetic property values; and
- golf courses.

## Economic Baseline Summary

**From the data analyzed in this report, a conservative estimate is that businesses, including agriculture, that depend on water for production and output in Oregon contribute approximately half (48%) of the state’s total economic output and close to half (44%) of the state’s employment (Table ES-4).**

This estimate is conservative because – due to differences in how output in these sectors is calculated, differences in available data sources and to avoid risk of double counting some sectors – it does not include economic contributions from recreation, commercial fishing, hydroelectric power generation or thermoelectric power generation.

**TABLE ES-4: TOTAL COMBINED ECONOMIC CONTRIBUTION OF WATER-DEPENDENT INDUSTRIES AND AGRICULTURE IN OREGON**

Impact Type	Employment (jobs)	Labor Income (\$B)	Value Added (\$B)	Output (\$B)
Direct	686,364	\$46.3	\$68.4	\$147.4
Indirect	229,221	\$18.6	\$26.7	\$48.5
Induced	167,359	\$9.6	\$19.4	\$32.3
Total	1,082,944	\$74.5	\$114.5	\$228.2
Percent of state total	44%	43%	41%	48%

### Investing in Water in Oregon: Regional Case Studies

After presenting the baseline section, the next step in making the business case is analyzing different ways to invest in water in Oregon. In the business case framework, these analyses describe possible investments the state might undertake, using a combination of quantitative economic analysis and qualitative discussion to weigh costs and benefits of investing. Lessons drawn from these case studies provide a platform for demonstrating potential returns, both economic and non-economic, from investing in Oregon’s water assets.

This approach to analyzing and discussing investment in Oregon’s water assets is not exhaustive. Many types of investments are not discussed and there are cases that could be highlighted in every region and at the state level that are likewise left out. Selection of case studies is not meant to promote the specific investments described and analyzed in each study. Rather, the project team prioritized replicability, regional diversity and cases that represent key issues for each region and the state.

The dominant theme that emerges from the investments analyzed below is that they increase *resiliency and flexibility*, enhancing Oregon’s ability to withstand or recover from shocks and challenges, both predictable and unpredictable. Case studies are summarized below in Table ES-5.

TABLE ES-5: CASE STUDY SUMMARIES

Region	Case Study	Water Use Sector(s)	Investment Focus
<b>North Coast</b>	Addressing Flooding, Diminished Critical Habitat and Other Impacts of Declining Watershed Health	Municipal, Aquatic Species/Habitat	Floodplain restoration and upland forest restoration
<b>Willamete Valley/Lower Columbia</b>	Investing in Water Reuse for Supply Diversification and Reliability to Support Households, Businesses, Agriculture and the Environment	Municipal, Aquatic Species/Habitat, Wetland Restoration	Using highly purified wastewater for various fit-for-purpose irrigation uses
<b>Columbia Plateau</b>	Farmer's Irrigation District Reservoir Expansion Project	Agriculture, Aquatic Species/Habitat	Expanding existing reservoir storage
	Nitrate Contamination in Groundwater-Sourced Drinking Water	Individual Domestic Use, Municipal, Agriculture	Immediate treatment technology and long-term best management practices; water justice
<b>Blue Mountains/Northeast</b>	Investing in Conservation and Environmental Water Transactions to Support Farms Culturally and Ecologically Important Chinook Salmon	Agriculture, Aquatic Species/Habitat	On-farm water conservation and environmental water transactions
<b>Southeast</b>	Groundwater Overdraft and Threats to the Local Economy and Environment	Agriculture, Individual Domestic, Wildlife, Wildlife Viewing	Payments to retire groundwater rights
<b>Central</b>	Addressing Impacts to Agriculture and Aquatic Species from Long-Term Drought Through Conservation and Innovative Governance	Agriculture, Aquatic Species/Habitat	Piping large irrigation canals and developing innovative governance approaches (water banking)
<b>Southwest</b>	Characterizing the Value of Water for Recreation on the Rogue River	Recreation	River restoration actions to address water quality, quantity and instream barriers

The purpose of these case studies is to test the business case hypothesis that investing in water can help Oregon overcome current and future water-related challenges. Important high-level observations from these cases include:

- Aridification may be the new normal for much of Oregon east of the Cascades, underlining the importance of aggressive conservation and flexible innovations in governance to weather unpredictable future changes.
- Too much water (flooding), not just drought, will stress public water systems and watersheds as the climate changes.
- Wildfires impact watersheds in many ways that can harm water quality and reduce the landscape's ability to store water in soils. Limiting wildfire risk is critical to limiting risks to both human and natural communities that depend on forested watersheds.
- Whole-watershed and nature-based approaches are effective *and* leverage investment by generating co-benefits.



- Modernizing infrastructure across the landscape, from diversions and canals to farm fields to dams supports a range of productive economic water uses.
- In many places in Oregon, agriculture can benefit from testing more heat and drought tolerant crops and cropping patterns, including dryland agriculture, to keep agriculture viable despite growing water scarcity.
- Even partial solutions to some of Oregon’s water supply challenges are likely to be expensive.
- Groundwater is one of the most difficult resources to manage because it is hidden, and some impacts of groundwater pumping don’t manifest immediately or in the places they are expected.
- Frontline communities are especially vulnerable. Due to language and other barriers, some members of these communities may not know a problem exists while those who are aware may not have the resources, time or capacity to access information and assistance.
- Indigenous Tribes face similar water risks as all Oregonians but with enhanced urgency and import because of their especially deep cultural and spiritual ties to water and fish species that rely on water.
- Many uses of water have lagged impacts or impacts that compound over time and it is critical to identify these types of potential impacts (for example groundwater pumping that can impact surface water long after a pump is turned on) and design approaches for managing them now rather than waiting for their full impact to appear years later.
- Collaboration is powerful; trust built over time between collaborators increases resiliency by reducing conflict and providing a basis for the level of commitment that is required to tackle future challenges.

These observations can be further distilled into five guideposts that support the business case for investing to increase resiliency and flexibility with the urgency that Oregon’s current and future water-related challenges merit:

- Invest in whole-watershed and nature-based approaches for a range of benefits including future including avoided costs of potential negative impacts from climate change.
- Fund innovative governance and policy adaptations to increase the flexibility of water management and capitalize on collaboration and creativity.
- Focus on modernizing infrastructure across the landscape in ways that help address specific risks like flooding, stormwater management, reduced summer baseflow, shrinking glaciers, fish passage, etc.
- Enhance water justice by authentically engaging frontline communities in policy and power and targeting investment so that benefits are distributed to these communities equitably with others.
- Recognize and invest to support Tribal economic, spiritual and cultural values for water and fish and engage with Tribes as sovereign co-managers of the resource.

## Conclusions

The business case that emerges from the analysis and discussion in this report is straightforward. Water provides countless benefits – economic and non-economic – and defines Oregon’s sense of place; it has been this way since the ancestors of Oregon’s Indigenous people first called the land home. But these

benefits are at risk; Oregon faces significant threats to its environment, economy and way of life from current and future water-related risks and challenges. Oregonians have demonstrated that they have many of the required strategies and tools at hand and have the expertise and motivation to develop new approaches when necessary. Wielding the tools and deploying the strategies, however, requires major investment not just once, but for the foreseeable future. The necessary investment cannot be underestimated and requires determination, commitment and engagement across all sectors, agencies, communities and levels of government and power. Importantly, it also requires inclusion of frontline communities that have been traditionally left out of decision-making and power over water including Tribes, low-income communities, rural communities, communities of color and others. If the aim of a business case assessment is to answer the question of whether investment is wise, the answer to whether Oregon should invest in its water resources is an emphatic yes.

**At its core, the business case for investing in water is that Oregon simply is not Oregon without clean, abundant water.**

