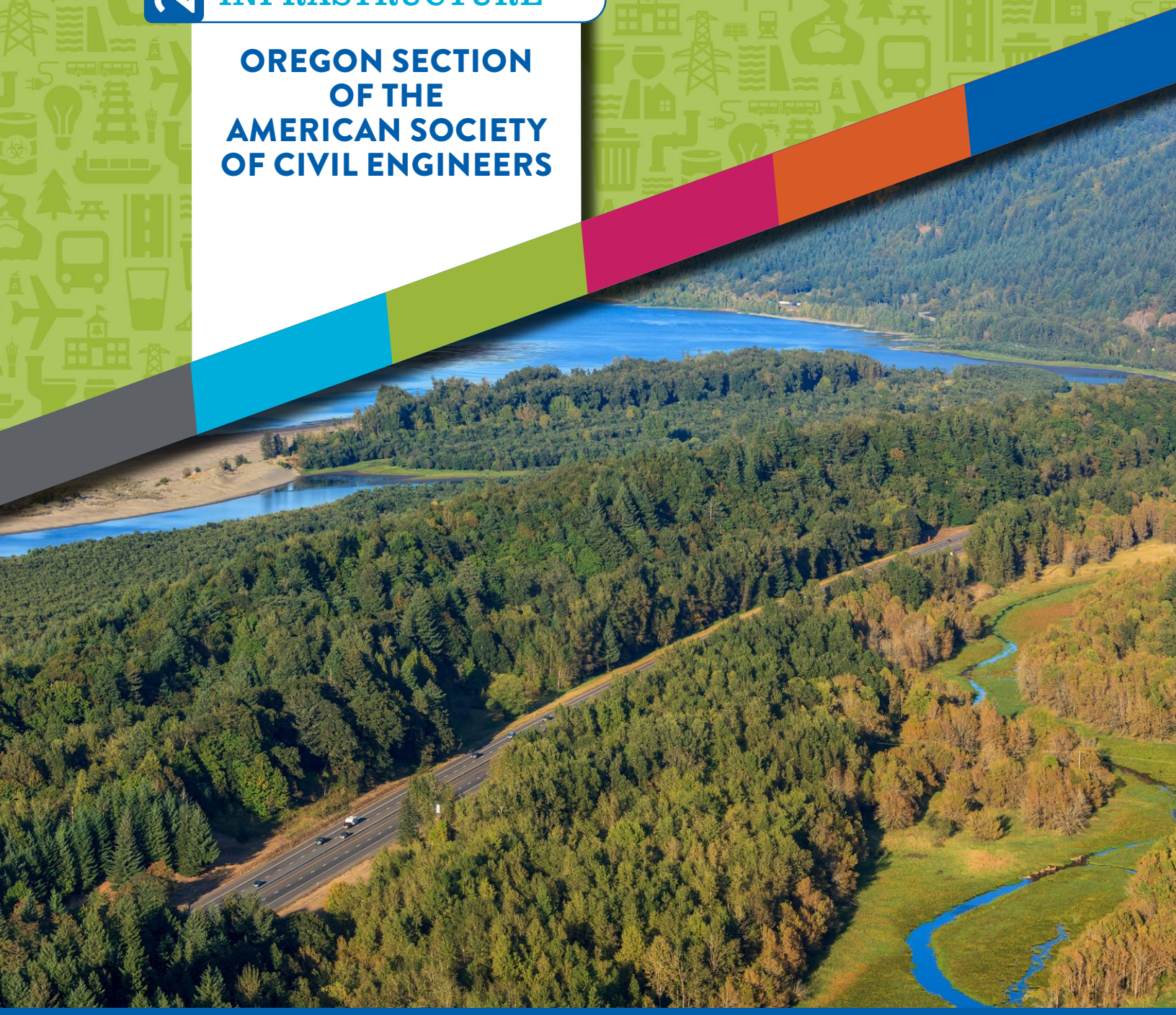
2024

REPORT CARD FOR OREGON'S INFRASTRUCTURE

OREGON SECTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS



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The ASCE Oregon Section would like to thank the volunteers who dedicated their time to the research, review, and writing of this report card. We would also like to thank the many other unnamed contributors who performed peer reviews, assisted in data collection and review, answered questionaires, or participated in other ways. Thank you all for your service to Oregon and our infrastructure.

2024 Oregon Report Card Executive Summary

Oregon's infrastructure plays a critical role in the lives of its residents, from providing clean drinking water to ensuring safe travel to work, school, and recreation. With a rich history of innovation, such as implementing the nation's first gas tax, piloting a road usage charge program, and offering the first interurban electric rail service in the country, Oregon has long been a leader in the realm of infrastructure. However, the state now faces significant challenges that require substantial planning, strong leadership, and adequate financial investment.

In recent years, progress in regulatory frameworks has been notable, particularly for dams and energy systems. Enhanced regulations and safety protocols are paving the way for necessary assessments and investments in resilient infrastructure upgrades. The implementation of Emergency Action Plans for high-hazard dams and new regulations for seismic vulnerability assessments and mitigations in large fuel handling facilities represent significant advancements in ensuring public safety and resilience.

A focused effort on resilient networks has also yielded positive results. Enhancing the seismic resilience of critical infrastructure, such as bridges and drinking water systems, is crucial in

preparing for potential natural disasters, including the anticipated 9.0 magnitude Cascadia Subduction Zone earthquake. New public buildings, especially schools, should be designed to serve as emergency shelters. Investments in renewable energy and the development of the Oregon Energy Security Plan further exemplify the state's commitment to building a resilient infrastructure network that can withstand future challenges.

Oregon's infrastructure systems are experiencing capacity challenges due to a growing population and increasing commercial activities such as the expansion of data centers and high-tech manufacturing. There is a significant opportunity to make resilient infrastructure investments that not only address capacity and condition issues but also meet climate and social goals.

However, despite these advancements, the need for sustainable and dedicated funding remains a persistent challenge across all infrastructure categories. While federal and state funding has increased in recent years, current investment levels are insufficient to maintain and upgrade Oregon's aging infrastructure. Long-term funding mechanisms are essential to address the maintenance backlog, improve infrastructure conditions, and support future growth.

Oregon's infrastructure systems are experiencing capacity challenges due to a growing population and increasing commercial activities such as the expansion of data centers and high-tech manufacturing. There is a significant opportunity to make resilient infrastructure investments that not only address capacity and condition issues but also meet climate and social goals. For example, integrating renewable energy sources and enhancing local energy resilience can support Oregon's clean energy and climate goals while providing additional benefits to communities.

The ASCE Report Card provides a snapshot of the current state of Oregon's infrastructure, offering residents and policymakers a tool to engage in a conversation about where we are and where we want to be. While regulatory advancements and resilience efforts are commendable, securing sustainable funding sources is imperative to elevate Oregon's infrastructure to meet modern standards and ensure the safety and well-being of its residents.

About The Report Card for Oregon's Infrastructure

While you may not think about infrastructure every day, civil engineers do because we have pledged to build it, maintain it, and keep the public safe. As an organization of civil engineers who live and work in Oregon, we want to share what its condition is and what can be done to improve it.

Methodology

The purpose of the Report Card for Oregon's Infrastructure is to inform the public and decision makers of the current condition of our state's infrastructure in a concise and easily accessible format of a school report card. Each of the categories of infrastructure covered in the Report Card is assessed using rigorous grading criteria and recent data to provide a comprehensive assessment of the area's infrastructure. ASCE has used the following criteria to discuss and grade the state of the infrastructure:

CAPACITY

Does the infrastructure's capacity meet current and future demands?

CONDITION

What is the infrastructure's existing and near-future physical condition?

FUNDING

What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED

What is the cost to improve the infrastructure? Will future funding prospects address the need?

OPERATION AND MAINTENANCE

What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY

To what extent is the public's safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE

What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences for public safety and health, the economy, and national security?

INNOVATION

What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?

GRADING SCALE

EXCEPTIONAL: FIT FOR THE FUTURE

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.

GOOD: ADEQUATE FOR NOW

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable with minimal capacity issues and minimal risk.

MEDIOCRE: REQUIRES ATTENTION

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.

POOR: AT RISK

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of significant concern with strong risk of failure.

FAILING/CRITICAL: UNFIT FOR PURPOSE

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.

INCOMPLETE

The infrastructure in the system or network does not have sufficient data to provide a grade.

2024 Report Card for Oregon's Infrastructure

G.P.A.

C-

AVIATION **C-**	PORTS **C-**
BRIDGES **C-**	ROADS **C**
DAMS **D+**	SCHOOLS **I**
DRINKING WATER **C**	STORMWATER **D+**
ENERGY **C-**	TRANSIT **D+**
INLAND WATERWAYS **C**	WASTEWATER **D+**

Recommendations to Raise the Grade

As Oregon residents learn about infrastructure needs and decision-makers work to address them, ASCE members in Oregon offer suggestions to start raising the grade:

1. **Increase Dedicated Funding Across Categories:** Secure dedicated and sustainable funding sources to ensure long-term maintenance and improvement of Oregon's infrastructure. Focus on resilient long-term funding solutions rather than short-term influxes of money.
2. **Implement Comprehensive Resiliency Measures:** Enhance the resilience of infrastructure systems against natural and man-made disasters. Implement an all-hazard, comprehensive risk assessment process that evaluates event likelihood and consequences, considers interdependencies and vulnerabilities, encourages mitigation strategies, monitors outcomes, and addresses recovery and return to service. This approach is essential to prepare the region for the Cascadia Subduction Zone Earthquake and other emerging threats.
3. **Strengthen Regulatory Frameworks and Enforcement:** Enforce and strengthen regulations to ensure the public safety and resiliency of critical infrastructure. Properly implement Emergency Action Plans for high-hazard dams, Oregon Energy Security Plan recommendations, and new regulations requiring seismic vulnerability assessments and mitigations for large fuel handling facilities.
4. **Utilize Asset Management Systems to Optimize Spending:** Develop and implement asset management programs that include life-cycle cost considerations, identify and prioritize critical system components, conduct condition assessments, and establish operations and maintenance plans. This approach should prioritize essential repairs and replacement projects and facilitate long-term capital budgeting.
5. **Invest in Workforce Development and Public Participation:** Address the skilled workforce shortage and increase public participation to support long-term infrastructure improvements and community engagement.

Aviation

C-

EXECUTIVE SUMMARY

Oregon's 97 airports range from large commercial and cargo service facilities to small rural air strips. These airports are vital to Oregon's economic development and to connect people and goods at local, national, and global levels. Oregon's airports also play an important role in the safety and welfare of residents, businesses, and visitors. Each airport faces unique challenges due to varying topography and the characteristics of the communities they serve. The conditions of most pavements and facilities are Satisfactory to Good, but the current funding mechanisms, particularly for rural and small communities are unlikely to meet long term needs. Additionally, many of Oregon's airports play a critical role managing wildfires, while coastal airports as well as some airports in the Willamette Valley, face significant resiliency issues in the event of an earthquake or severe flooding. Figure 1 below shows the network of Oregon's airports.

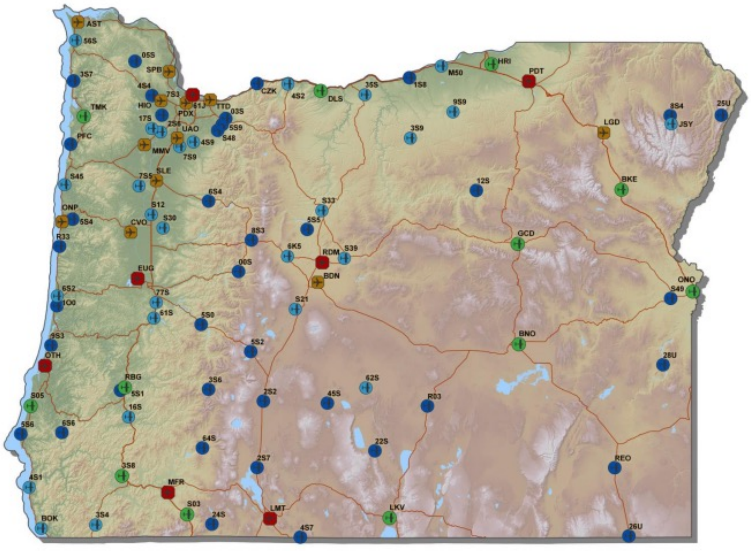
FIGURE 1. OREGON'S SYSTEM OF AIRPORTS.

Public use airports by district

Coast (17)
Valley (10)
Portland (10)
Gorge (6)
Central (7)
Southern (21)
Eastern (25)

Airports with:

Air ambulance bases (15)
Based wildfire aircraft (11)
Coast Guard stations (3)
Control Tower (11)
Commercial airline service (7)
Scheduled Air cargo (14)



BACKGROUND

There are 82 publicly-owned and 15 privately owned public airports in Oregon. Under FAA National Plan of Integrated Airport Systems (NPIAS) classifications, six are classified as commercial aviation airports, two are reliever/general aviation airports in the Portland metro area, and the remainder are considered general aviation airports that serve communities and residents, and natural resource areas throughout the state. Of the 82 publicly owned airports, 28 airports are owned and operated by the State with the remainder owned and operated by ports, local cities, counties, and the US Forest Service. In addition to moving people and cargo, Oregon's airports support critical activities such as law enforcement, wildland fire suppression, commercial fishing, air ambulance, search and rescue, freight and mail transport, military and US Coast Guard activity, real estate tours, agriculture, wildlife management, and natural resource conservation. The aviation industry contributes $29 billion and 117,000 jobs to the state's economy. Portland International Airport (PDX) is Oregon's only medium hub commercial airport and is ranked 33rd by passenger volume and 20th by cargo volume in the US.

In addition to management of the state airports, the Oregon Department of Aviation (ODAV), and the State Aviation Board, provides statewide oversight of all of Oregon's public use airports. The Oregon Aviation Plan established five airport classifications that serve as a basis for the planning, assessments, and informed investments that are needed to address deficiencies and support economic development and health and safety. The classifications are summarized in Table 1.

TABLE 1. OREGON DEPARTMENT OF AVIATION (ODAV) AIRPORT ROLE CATEGORIES

Category I: *Commercial Service Airports*	Minimum runway length 6,000 feet Support some level of scheduled commercial airline service and a full range of general aviation aircraft activities.
Category II: *Urban General Aviation Airport*	Minimum runway length 5,000 feet Supports all general aviation aircraft, business jets, helicopters, and gliders. Serve a large/multi-state geographic region or high general aviation activity.
Category III: *Regional General Aviation*	Minimum runway length 4,000 feet Supports most twin and single-engine aircraft and occasional business jet operations. Support regional transportation for large service area.
Category IV: *Local General Aviation Airport*	Minimum runway length 3,000 feet Primarily single-engine and smaller twin engine general aviation aircraft Support local air transportation needs and special-use aviation activities.
Category V: *Remote Access/ Emergency Services (RAES)*	Minimum runway length 2,500 feet Support primarily single engine general aviation aircraft, special-use aviation activities, access to remote areas, or provide emergency service access.

CAPACITY

Airports are defined by airside facilities and landside facilities. Airside facilities include runways, taxiway apron network, navigational aids, and other general aviation facilities required to accommodate safe aircraft operations. Airport operations are defined by the frequency of aircraft using the airport's runways and is a typical indicator of airside facilities' capacity. Other capacity constraints (i.e. runway length and pavement strength, navigational aids) related to the types of aircraft that can use these facilities are specific to each airport. Landside facilities typically include terminal buildings, aircraft storage facilities, automobile parking, transit and cargo access, and other general facilities needed to support public access and airport operations. For commercial airports, passenger enplanements are the primary method for monitoring landside capacity and growth projections.

In general, Oregon airside facilities have adequate capacity to accommodate current aircraft operations and anticipated growth. The pandemic significantly affected commercial airport operations and passenger enplanements. Annual commercial operations and enplanements continue to grow, and other than PDX and Rogue Valley International Medford Airport (RVI-M), 2023 operations and enplanements are above 2019 levels. However, these statistics are well below the anticipated rate in the Oregon Aviation Plan. Similarly general aviation annual operations continue to increase but the growth rate is below the Oregon aviation plan projections. Current and planned improvements to PDX landside facilities will accommodate the anticipated passenger and cargo growth for the foreseeable future. Landside facility capacity and future need at other airports vary. Although not a significant operations issue, the ongoing growth in air cargo may present some future landside capacity issues for some Category I and II airports that currently do not meet NPIAS objectives. Additionally, sufficient aircraft storage is a potential issue for some airports.

TABLE 2. OREGON COMMERCIAL AIRPORTS PASSENGER ENPLANEMENTS (Courtesy Department of Transportation Statistics).

Airport	2019	2023
PDX, Portland International	9,789,568	8,115,842
EUG, Mahlon Sweet Field. Eugene	590,326	836,810
RDM, Redmond Municipal	482,466	513,216
MFR, Rogue Valley International, Medford	527,408	478,013
OTH, SW Oregon Regional, North Bend	13,246	19,398
PDT, Eastern Oregon Regional, Pendleton	6,809	5,544
Total	**11,409,823**	**9,968,823**
PDX Air Cargo		
Landed Weight lbs	2,021,064,767	2,383,881,608

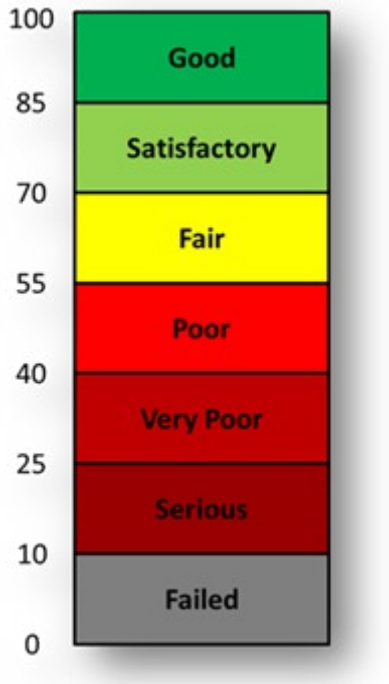
TABLE 3. FAA AIRPORT OPERATIONS REPORT FOR SELECT OREGON AIRPORTS (Courtesy FAA OPSNET Airport Operations Report).

Airport	2019		2023	
Commercial Service Airports	**Air Carrier**	**GA/Other**	**Air Carrier**	**GA/Other**
PDX, Portland International	195,747	42,637	153,371	36,779
EUG, Mahlon Sweet Field. Eugene	14,621	48,316	16,585	41,392
RDM, Redmond Municipal	11,174	71,561	13,139	76,017
MFR, Rogue Valley International, Medford	11,909	34,514	10,629	28,539
OTH, SW Oregon Regional, North Bend	64	15,266	716	17,263
PDT, Eastern Oregon Regional, Pendleton	**2**	**15,109**	**0**	**16,501**
Total	**233,517**	**227,403**	**194,440**	**216,491**
Total				
Reliever Airports/General Aviation				
HIO, Portland Hillsboro	1	153,889	17	183,754
TTD, Portland Troutdale	0	97,467	0	104,662
LMT, Klamath Falls	0	41,706	4	35,359
SLE, Salem Municipal	11	39,409	123	44,094
UAO, Aurora State Airport	2	62,848	0	63,015
Total	**14**	**395,319**	**144**	**430884**
Total Operations	**233,531**	**622722**	**194584**	**647375**

CONDITION

To be eligible for Federal Airport Improvement Program (AIP) funding, airport managers must maintain a Pavement Management Program (PMP) detailing condition data for airside pavements in movement and non-movement areas, as well as applicable landside pavements, if eligible for such funding. The PMP requirements are outlined in Advisory Circular 150/5380-7B. As part of a PMP, both Asphaltic Concrete (AC) and Portland Cement Concrete (PCC) pavements are categorized based on the amount of distress present within a given unit area, or sample unit, of pavement. Based on the condition of sample units within a facility, pavement is assigned a numeric Pavement Condition Index (PCI) score, which ranges from 0 (failed) to 100 (very good). The PCI scale is shown below in Figure 2.

FIGURE 2. PAVEMENT CONDITION INDEX (PCI) RATING SCALE FOR ASPHALT CONCRETE (AC) AND PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS (Courtesy of FAA PaveAir).



A PAVEMENT CONDITION INDEX (PCI) SURVEY BEING CONDUCTED AT CRATER LAKE-KLAMATH REGIONAL AIRPORT IN KLAMATH FALLS, OR (Photo courtesy of GRI)

Presently, many airports in the state of Oregon are managed by the Oregon Department of Aviation (ODAV), which includes mostly public-use General Aviation (GA) airports, as well as some airports supporting commercial service. The airports under the purview of ODAV are part of a one PMP which encompasses the condition of pavements of all airports in the network. Other airports, such as larger airports with a significant level of commercial service and/or those who accommodate military aircraft, and some regional airports, are managed individually by the respective airport authority.

A summary of the available condition data for a subset of Oregon airports from 2023 was obtained to summarize airport pavement condition information for this report. Table 4 shows the area-weighted average PCI ratings of select airport networks in Oregon.

TABLE 4. WEIGHTED AVERAGE PCI BY SURFACE TYPE FOR AVAILABLE OREGON AIRPORT NETWORKS.

Airport Identifier or Network	Pavement Type	Total Pavement Area, sqft	Weighted Average PCI	Condition Category
PDX	AC	15,784,235	76.6	76.6
	PCC	12,089,206	88.3	88.3
HIO/TTD	AC	15,784,235	76.6	76.6
	PCC	12,089,206	88.3	88.3
EUG	AC	7,941,368	75.2	75.2
	PCC	277,458	90.0	90.0
OTH	AC	542,982	85.3	85.3
	PCC	2,701,361	78.7	78.7
MFR	AC	6,708,252	76.4	Satisfactory
	PCC	621,811	86.5	Good
ODAV	AC	70,444,963	74.6	Satisfactory
	PCC	3,977,749	80.7	Good

As is shown in Table 4, the weighted average condition of pavements at these select Oregon airports generally ranges from Satisfactory to Good. Depending on the facility's use, pavements in this category can be preserved through regular preventive maintenance and surface treatments. Pavement rehabilitation is often required at condition categories lower than Satisfactory.

The condition of airport pavements at the above-listed airports can be better understood by examining the percentage of pavement area within each condition category. This information is summarized below in Table 5.

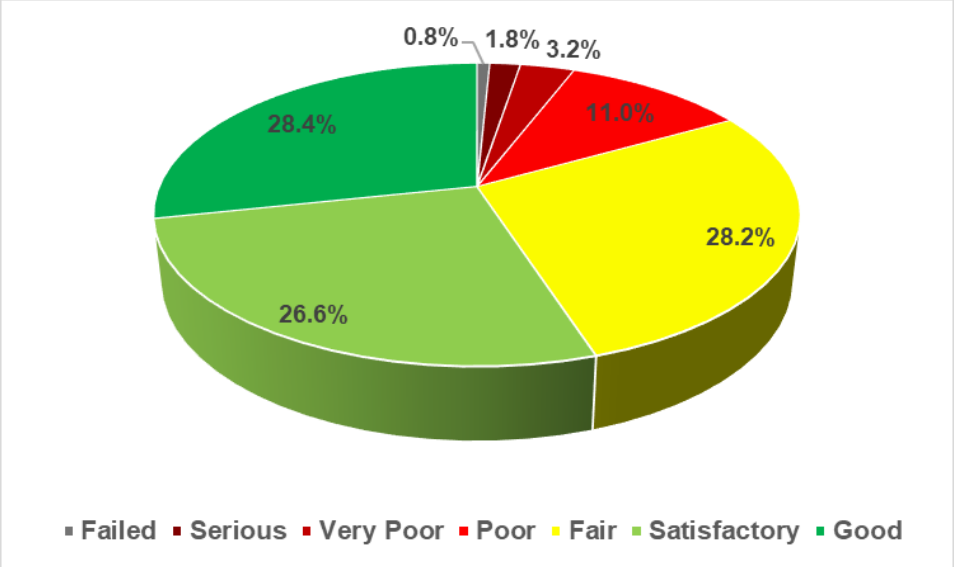
TABLE 5. PERCENT PAVEMENT AREA BY CONDITION CATEGORY FOR SELECT OREGON AIRPORTS.

	Percent Area					
Condition Category	**PDX**	**HIO/TTD**	**EUG**	**OTH**	**MFR**	**ODAV**
Failed	0.0%	0.6%	0.2%	0.0%	0.0%	0.8%
Serious	0.0%	5.2%	0.1%	0.1%	0.2%	1.8%
Very Poor	0.4%	6.5%	1.6%	0.2%	1.8%	3.2%
Poor	5.0%	10.6%	13.5%	1.7%	9.0%	11.0%
Fair	12.6%	17.0%	21.4%	4.3%	14.8%	28.2%
Satisfactory	35.8%	31.0%	31.9%	78.9%	44.9%	26.6%
Good	46.2%	29.2%	31.3%	14.8%	29.4%	28.4%

As is shown in Table 4, the weighted average condition of pavements at these select Oregon airports generally ranges from Satisfactory to Good. Depending on the facility's use, pavements in this category can be preserved through regular preventive maintenance and surface treatments. Pavement rehabilitation is often required at condition categories lower than Satisfactory.

The condition of airport pavements at the above-listed airports can be better understood by examining the percentage of pavement area within each condition category. This information is summarized below in Table 5.

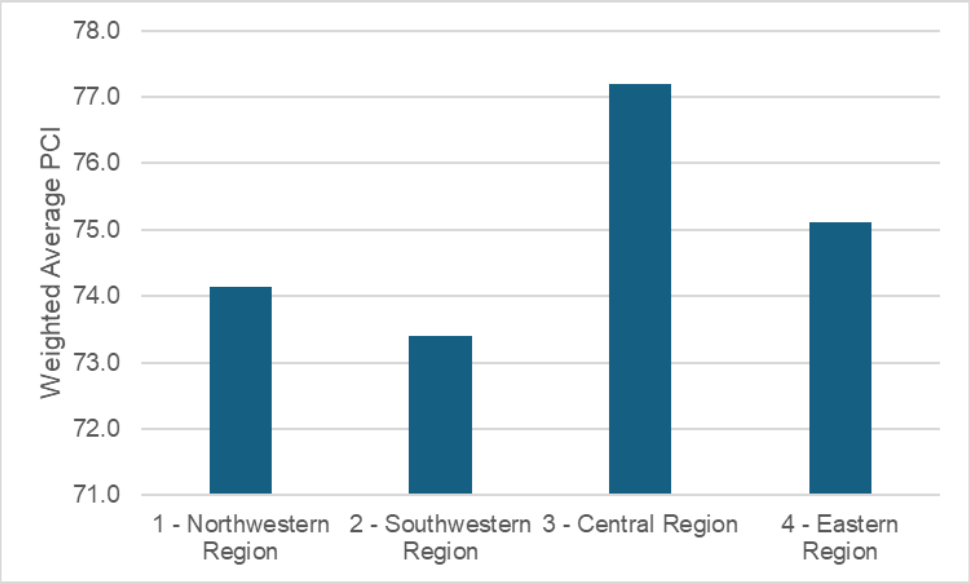
FIGURE 3. CONDITION OF AC AND PCC PAVEMENTS WITHIN ODAV NETWORK BY CONDITION CATEGORY.



The figure above shows that more than 75% of the pavements within the ODAV network are in a fair to good categories. While pavement condition varies based on factors such as climate, usage, and area type (runway/taxiway/apron/etc.), this data indicates that most airport pavements in the state of Oregon do not need substantial investment to maintain an acceptable condition for continued use.

Finally, the network of ODAV-managed airports are managed on a regional basis relative to their geographic location. To understand pavement condition variability by region, Figure 4 shows the weighted average PCI by region for ODAV-managed airports.

FIGURE 4. WEIGHTED AVERAGE PCI OF ODAV AIRPORTS BY REGION.



FUNDING AND FUTURE NEED

Airport funding needed to maintain airside facilities depends on a combination of federal, state, and local grants. Fees, leases, and other revenue sources generated at general aviation airports are insufficient to maintain and operate all airport facilities and therefore, those airports depend on state and local funding. Although commercial airports are dependent on state, local, and federal funds for maintaining the airside facilities, they also receive revenue from other sources related to passengers, cargo, and air carriers. Passenger Facility charges (PFCs), landing fees, leases, concessions, parking revenue, and other sources, generate revenue to operate, maintain and expand both airside and landside facilities at airports. However, efficient airport operations also depend on adequate funding for FAA air traffic control and navigational aids, and TSA passenger security.

The federal Airport Improvement Program (AIP) is funded from the Airport and Airway Trust Fund, which is made up of user fees, fuel taxes, and other revenue sources. AIP grants are for planning and developing public-use airports included in the National Plan of Integrated Airport Systems (NPIAS). The Oregon Aviation Plan lists 57 airports in the NPIAS. Most public-use general aviation airport improvements are eligible for 90 percent federal funding, with the remaining 10 percent coming from local or state matching funds. Local funding matches for commercial airport AIP programs are often provided from PFCs. PFCs allows airports to collect fees of up to $4.50 for every enplaned passenger at commercial airports with a maximum of two PFCs charged on a one-way trip or four PFCs on a round trip. PFC's can also be used to fund FAA-approved projects that enhance safety, security, or capacity; reduce noise; or increase air carrier competition.

The Oregon Department of Aviation (ODA) administers airport funding for state owned airports and state funded programs that support all other public airports in the state. Those programs include Pavement Management Program (PMP), General Aviation Entitlement, and the Oregon Aviation System Action Program (ASAP) Fund established in 2016. ASAP allocates and distributes the proceeds from a fuel tax increase to three grant programs, Critical Oregon Airport Relief (COAR), State Owned Airport Relief (SOAR), and Rural Airport Relief (ROAR). Unfortunately, the ROAR program was discontinued in 2021 and the current funding allocation is 75% COAR and 25% SOAR. COAR has awarded $9,912,868 through 135 statewide grants to date. Connect Oregon, managed by Oregon Department of Transportation, has been a source of State funding for Federal funding match requirements. Since its inception in 2005, Connect Oregon has awarded $114,280,719, leveraging $399,204,216 of Federal funding. Connect Oregon funding has decreased over time as its funding sources changed. The latest round in 2021 awarded $16,351,286 for seven airport pavement rehabilitation projects throughout the State, a new control tower at Bend/Redmond airport, and fuel facility at Union County airport.

TABLE 6. 2022 ODAV STATE FUNDING ALLOCATIONS.

Program	Projects	Amount
Capital Construction	2 projects	$5.8M
Pavement Maintenance Program	18 airports	$1.1M
GA Entitlement	4 projects	$2.4M
COAR	37 grants	$3.0M
SOAR	3 projects	$300K

The 2018 Oregon Aviation Plan (OAP) identified $165 million to address NPIAS airport deficiencies, $68 for the Pavement Management Program (PMP), and $390 million for Statewide Capital Improvement Program (SCIP) to be implemented over the next five years. The SCIP program estimated $334,705,662 for airport pavement rehabilitation, $12,698 for land acquisition, $15,216,731 for studies, and the remainder for other airport needs around the state. The OAP acknowledged that costs of ODA's three plans were well beyond the available funding. This gap was further impacted by the pandemic. Aviation revenue resources were significantly impacted during the pandemic and have yet to return to 2019 levels. Capital improvement programs were deferred due to the loss of revenue and inflation has significantly +increased the costs to implement these programs. The Infrastructure Investment and Jobs Act (IIJA) allocated $211 million over five years for airports development in Oregon. The IIJA Airport Infrastructure Grant program has allocated $125 million through FY24 for projects in most of the NPIAS airports in Oregon, and the Airport Terminal Program has allocated $39.6 million for projects at PDX and Redmond. ODA is the only non-local source of funding for maintaining and improving 40 NPIAS airports and 6 unclassified airports in the State. New funding sources are needed to address non-NPIAS airports' long-term capital improvements.

OPERATIONS AND MAINTENANCE

The function of airport operations and maintenance is essential to the reliability of airports as hubs for national and international transportation and commerce. Airside operations serve to ensure the continuous safety and operation of airfields. by mitigating foreign object debris (FOD), wildlife and security threats which can hamper airport function. Airport operations also ensure that aircraft, vehicles, and personnel are maintained within designated areas to ensure airfield safety. Airport maintenance includes inspection and repair of airfield infrastructure, as well as response to weather events which impact airport function. Landside O&M for commercial airports can be extensive that includes roads, utilities, parking facilities, terminals, baggage systems, storm water treatment facilities, fire stations, etc. necessary to support commercial operations, and require comprehensive lifecycle plans to maintain and operate the facilities. Some remote, smaller, airports in Oregon do not have operations and maintenance staff onsite full-time, whereas major airports such as PDX has a large multidisciplined operations and maintenance staff on duty at all hours.

Airport operations and maintenance needs are centered on increasing fleet equipment to perform critical maintenance in a timely manner. As some smaller regional airports expand to accommodate a higher degree of commercial service, timeliness of response to weather events, natural disasters and other unforeseen circumstances is extremely important. Similarly, airport operations in such circumstances can be challenging without the necessary communication and navigation infrastructure to support Instrument Flight Rules (IFR) conditions, communications towers and other sophisticated infrastructure that can support more than the ordinary needs of GA aircraft. Some of these needs cannot be addressed simply through increased budgets for operations and maintenance staff, but must be part of a more comprehensive airport master planning effort. The Bend Municipal airport in Bend, OR, which is operated and maintained by the City of Bend, recently completed a revised airport master plan which contains plans for constructing a control tower and other critical infrastructure that can support commercial service.

BEND MUNICIPAL AIRPORT IN BEND, OR
(Photo courtesy of Blaine Wruck)

PUBLIC SAFETY AND RESILIENCE

Oregon airports are critical to early disaster response efforts and wildland firefighting services. 36 airports support emergency services and 12 airports support full-time firefighting operations with based aircraft. Temporary and short-term firefighting operations occur at airports in the vicinity of wildfire events as well. Often jet fuel availability is an issue for airports supporting fire, and currently just 34 airports have jet fuel storage facilities. Based on recent wildfire activity, fuel storage capacity for 20 additional airports will be needed to improve wildfire response.

Oregon's unique geology and proximity to the Cascadia subduction zone inherently poses the risk of a major earthquake event in the near future. The ability to support emergency response and recovery efforts during a Cascadia earthquake event is a significant risk. Of the 16 public use coastal airports, 10 are located within Tsunami hazard area and all are at risk of damage to facilities resulting from an earthquake. 12 airports have been designated as staging and FEMA support bases; 10 of those airports are on the coast or along the Interstate 5 corridor and need some level of seismic improvements for emergency support operations, and in some cases, significant improvements to resume other operations necessary for economic recovery. There are 4 airport runways west of the Cascade mountain range that should be strengthened for earthquake resilience. PDX is in the design phase to improve its primary runway through a novel seismic retrofit. Current estimated cost to retrofit 7000 feet of the runway to facilitate emergency response is $220-$300 million. 90% of Oregon's fuel is stored and distributed at the Critical Energy Infrastructure Hub in Portland along the Willamette River on soil that is susceptible to loss of structural integrity during an earthquake. Oregon's airports combined aviation fuel storage in 4.1 million gallons, of which 70% is stored at PDX on this type of soil.

A Statewide Airport Resiliency Assistance (SARA) program was established to assist airports with funding airport resilience projects that are not eligible for Federal transportation funding. This two-year pilot program administered by Oregon Department of Aviation and Oregon Emergency Management has $10 million in funding

Additionally, 15 airports are located within FEMA flood zone A, which have a 1% chance of annual flooding. Four drainage districts manage the 27-mile Federally-authorized levee system that includes 45 miles of ditches and sloughs, and 12 pump stations. Portland International Airport and Troutdale Airport are located within two of the drainage districts and help fund those districts. The U.S. Army Corps of Engineers has estimated $110.5 million is needed to protect Oregon's airports from flooding.

INNOVATION

The expanded and remodeled terminal building at PDX showcases many innovative features that support the Port of Portland's sustainable design and construction goals. Key features include sourcing the wood from regional forests for the new 9-acre mass timber roof structure, LED lighting, extensive natural day lighting and the state's largest ground source heat pump which uses 50% less energy than conventional systems.

The continued proliferation of unmanned aerial vehicles (UAV) and development of unmanned aircraft systems (UAS), urban air mobility (UAM) and electric aviation present new challenges for airports. Currently there are several Oregon test sites for UAS that have been used to assist in wildland firefighting and ensure safe integration of UAS into the nation's airspace. National integration of UAM is expected within the next ten years. Use of existing general aviation and heliports is likely as this new transportation mode is developed. The potential impacts to existing facilities is still unknown, however the FAA has made strides to accommodate UAS within airspace near airport facilities by launching the Low Altitude Authorization Notification Capability (LAANC), which allows UAS pilots to obtain real-time UAS flight approval within the given airspace. Presently, this capability is available primarily at larger towered airports, but additional efforts are being made to integrate this technology into airspace at minor airports as well. The FAA has also mandated that UAS be capable of Remote Identification, which broadcasts the information about the UAS pilot, the aircraft, and other pertinent information to other airspace users in the area in order to mitigate potential conflicts with manned aircraft. This regulation took effect on March 16, 2024.

"Currently, at the end of 2020, there are over 320 public electric vertical takeoff and landing aircraft (eVTOL) concepts, of which around 5% are full size aircraft in flight testing. It is estimated that well over 1,000 flights were conducted over the course of the previous year in the U.S. alone. Several of these concepts are well advanced in their certification programs. Hundreds of other concepts are moving through the development pipeline behind these first movers. Cargo operations, operations using smaller eVTOL aircraft (sUAS), and operations in low-complexity airspace are already happening today."

Community Air Mobility Initiative CMAI, Advanced & Urban Air Mobility Impact and Timing

Aviation

C-

RECOMMENDATIONS TO RAISE THE GRADE

- Increase Airport Improvement Program (AIP) funding and allow AIP funds to be used for critical resiliency upgrades
- Seek funding opportunities for pavement preservation and maintenance at airports throughout Oregon to maintain or increase the weighted average PCI of airport networks
- Increase funding for the Non-Primary Entitlement (NPE) program to airports with more activity and increase State Apportionment
- Raise the Passenger Facility Charge (PFC) rates at commercial airports
- Develop plans and policies for federal funding to support Advanced Air Mobility
- Increase funding State funding for Connect Oregon
- Increase and stabilize funding for Oregon Department of Aviation by taxing sustainable fuels and other funding sources offset revenue fluctuation from fuel taxes.
- Maintain or increase budgets for operations & maintenance staff, airport fleets and infrastructure.

SOURCES

Federal Aviation Administration

- National Plan of Integrated Airport Systems https://www.faa.gov/airports/planning_capacity/npias
- Airport Improvement Program https://www.faa.gov/airports/aip
- Passenger Facility Charge (PFC) Program https://www.faa.gov/airports/pfc
- Next Generation Air Transportation System https://www.faa.gov/nextgen
- Bipartisan Infrastructure Law - Airport Infrastructure https://www.faa.gov/bil/airport-infrastructure
- Bipartisan Infrastructure Law - Airport Terminals Program https://www.faa.gov/bil/airport-terminals
- FAA Data and Research https://www.faa.gov/data_research

State of Oregon Department of Aviation

- Aviation System Action Program https://www.oregon.gov/aviation/plans-and-programs/ASAP/Pages/ASAP.aspx
- Oregon Aviation Plan https://www.oregon.gov/aviation/plans-and-programs/Pages/oap.aspx
- Pavement Evaluation Program https://www.oregon.gov/aviation/plans-and-programs/Pages/pep.aspx
- Pavement Maintenance Program https://www.oregon.gov/aviation/plans-and-programs/Pages/pmp.aspx
- Statewide Capital Improvement Plan https://www.oregon.gov/aviation/plans-and-programs/Pages/scip.aspx

Oregon Department of Aviation, Aviation Board Presentations

- https://www.oregon.gov/aviation/AVB/Documents/2021/10_06/Agenda%20items%205-7%20%20Resiliency,%20Legislative%20Concepts,%20Aurora%20discussion.pdf
- https://olis.oregonlegislature.gov/liz/2023I1/Downloads/CommitteeMeetingDocument/279352

Aviation

INTERVIEWS (cont.)

Connect Oregon Modal Allocation

- https://www.oregon.gov/odot/Programs/TDD%20Documents/ConnectOregon-Modal-Allocation.pdf

US Department of Transportation, Bureau of Transportation Statistics

- https://www.transtats.bts.gov/Data_Elements.aspx?Data=1

USACE Portland Metro Levee System feasibility study

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Community Air Mobility Initiative, Impact of UAM

- https://static1.squarespace.com/static/5d27bb3e330ac30001dc14fd/t/5f8b55b0e7155637858160b8/1602966961777/ImpactofUAM_CAMI_Q3-2020.pdf

National Association of State Aviation Officials

- https://nasao.org/page/LegislativeAgenda
- https://nasao.org/page/fact-sheets

List of Oregon Airports

- https://en.wikipedia.org/wiki/List_of_airports_in_Oregon

INTERVIEWS

- Conducted interviews and/or received written responses to a survey with representatives Port of Portland, Oregon Association of Airport Managers, State Aviation Board and Oregon Department of Aviation.
- See appendix for list of contributors.

APPENDIX

Interviews and survey contact list

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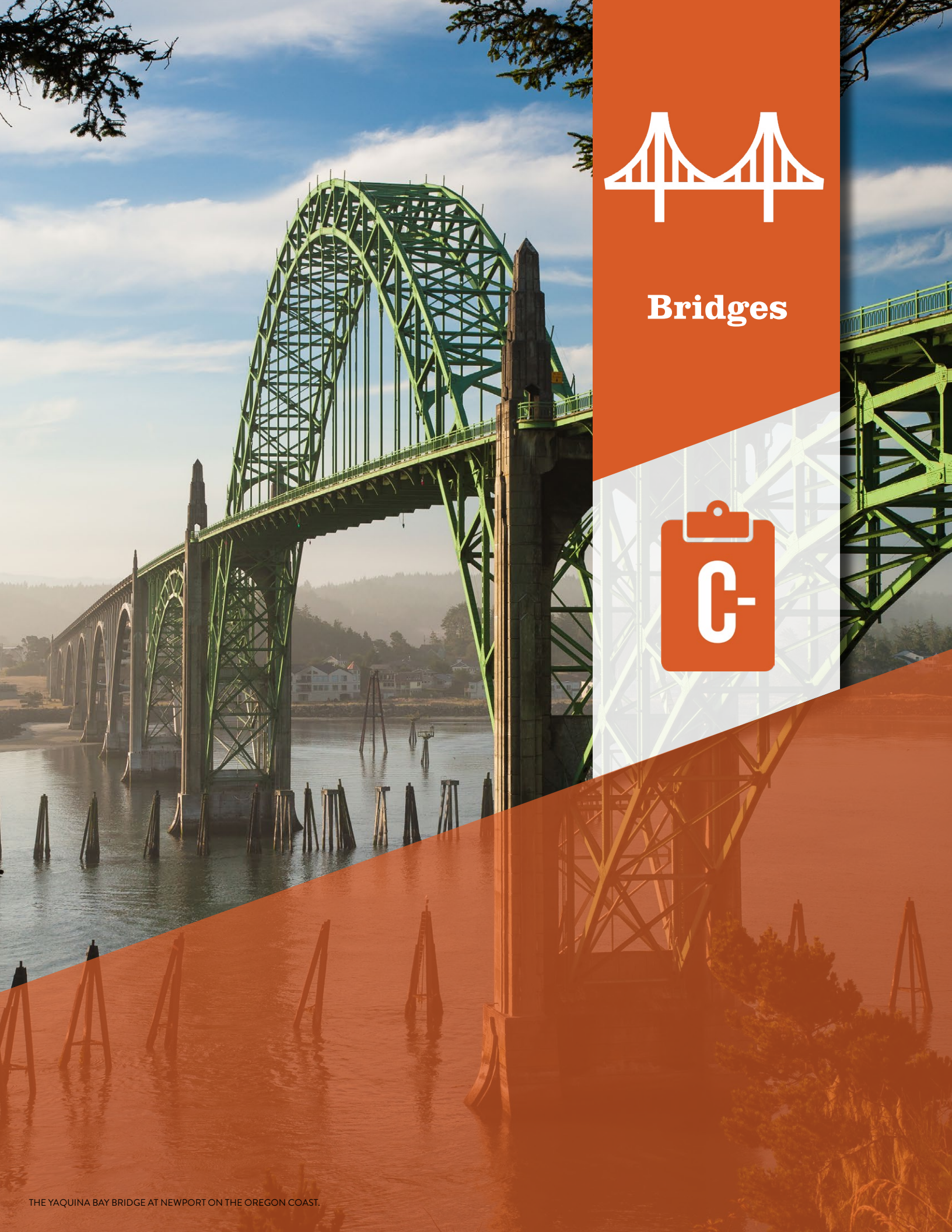

Bridges

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THE YAQUINA BAY BRIDGE AT NEWPORT ON THE OREGON COAST.

EXECUTIVE SUMMARY

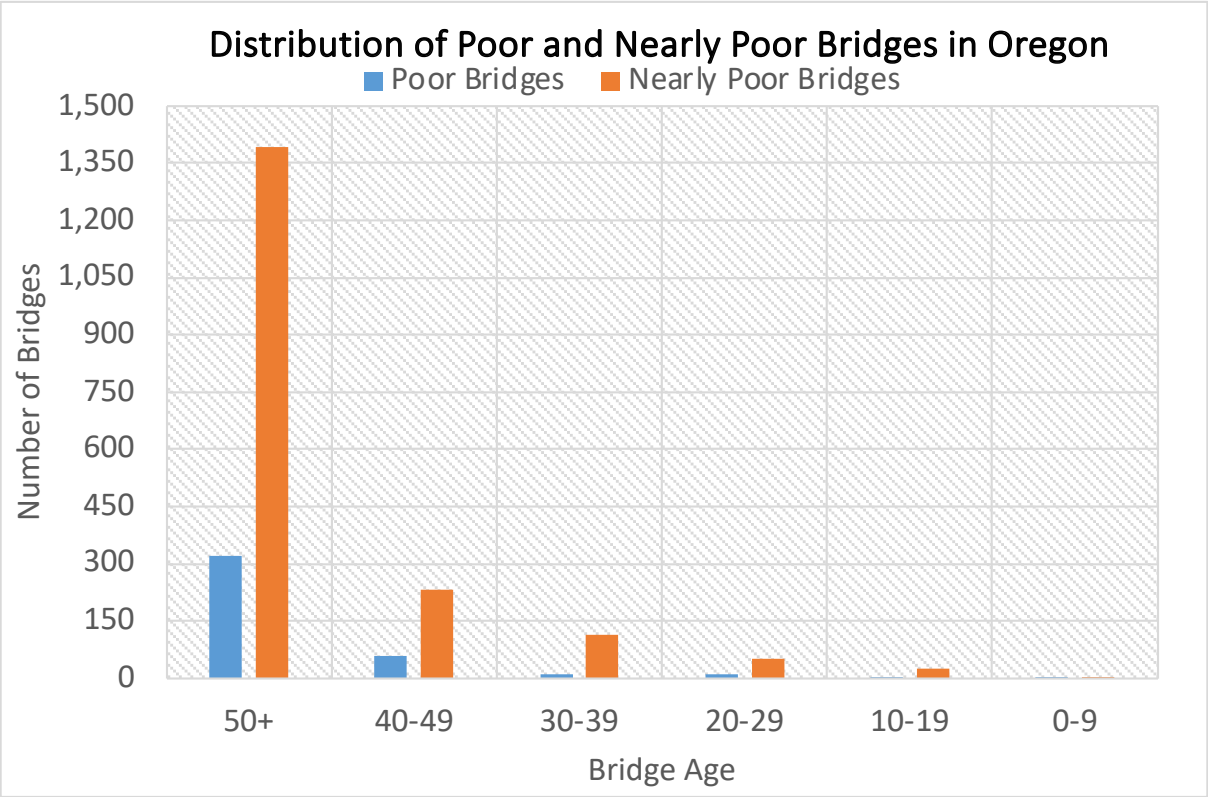
Oregon has a total of 8,292 bridges listed in the National Bridge Inventory (NBI). Some 4.8% of these bridges are evaluated as poor, which is below the national average of 6.8%. However, an additional 21.8% of bridges in Oregon are at risk of being categorized as poor in the near future, and the percentage of Oregon's bridges in good condition (12.9% by deck area) is the lowest among the western states and has remained unchanged since 2019 (2023 ODOT Bridge Condition Report & Tunnel Data). The state bridge program is facing significant budget shortfalls due to inflationary pressures and substantial increased costs associated with delivering the Urban Mobility Strategy. Consequently, available funding to address increasing maintenance needs has been nearly eliminated. The 2022 Oregon Transportation Asset Management Plan (2022 ODOT TAMP) estimates the annual investment needed to maintain the system's current condition is approximately three times larger than the current funding level. This disparity indicates a significant gap in resources that needs to be addressed to ensure the long-term structural integrity of Oregon bridges.

CONDITION & CAPACITY

According to the NBI, Oregon has 2,773 state-owned bridges, 4,108 county- or city-owned bridges, and 1,411 bridges that are owned by federal agencies or other jurisdictions. On average, bridges owned by the state, counties, and cities are in fair condition, with bridges under federal agencies or other jurisdictions ranging from fair to good condition. However, the overall condition of bridges is deteriorating as a large proportion of these bridges continue to age, with approximately 21.8% of bridges being on the cusp of being categorized as poor. Figure 1 illustrates the distribution of bridges in Oregon that are classified as poor and nearly poor. In the context of this report, "Poor" bridges refer to bridges with advanced deterioration that require significant maintenance, rehabilitation, or replacement. "Nearly Poor" refers to bridges where all primary structural elements are sound but may have moderate to advanced deterioration and have the high risk to turn "poor" condition in the next several years.

On average, bridges owned by the state, counties, and cities are in fair condition, with bridges under federal agencies or other jurisdictions ranging from fair to good condition.

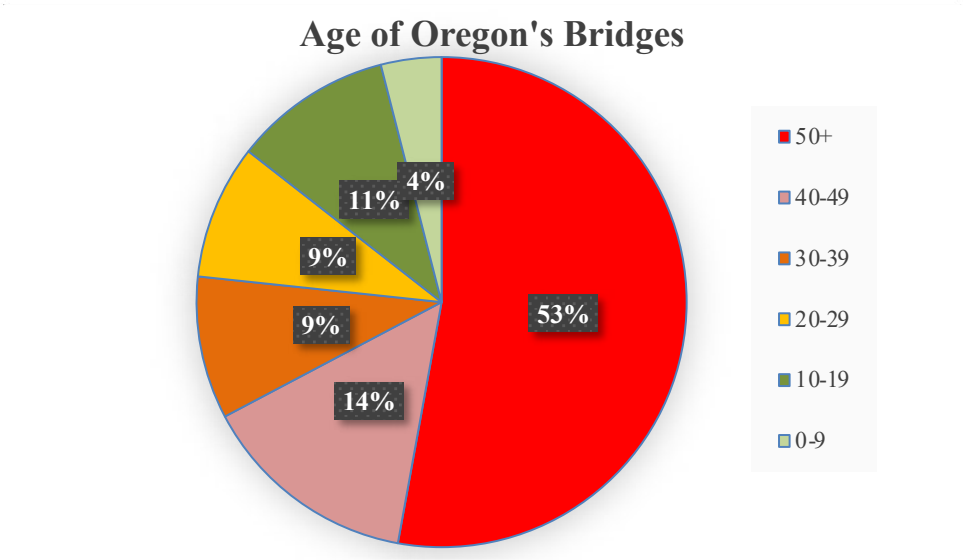
FIGURE 1: POOR BRIDGES AND NEARLY POOR BRIDGES IN OREGON



Every day, bridges in Oregon convey an average of 50.9 million trips, and this number is projected to rise to 68.9 million by 2033. Given Oregon's current population of slightly over 4.2 million people, this equates to 12 bridge crossings per person daily. Of the 8,292 bridges, 401, or 4.8%, are listed as poor. Although this percentage is lower than both the national average of 6.8% and the 2019 total of 5.2% for poor bridges, as infrastructure continues to age, the percentage of Oregon's bridges that are poor could quickly exceed the national average. Currently, 12.9% of Oregon's bridges, by deck area, are in good condition. This represents a 0.5% increase compared to 2022. The increase in the number of good bridges can be attributed to the construction of 5 new NHS bridges and the rehabilitation of 8 existing bridges. While Oregon anticipates a decline in the condition of NHS bridges, levels are expected to remain below the 10% state threshold for poor bridges in the near future. However, given the large number of bridges in fair condition that are on the verge of becoming poor (1,814 bridges), future maintenance of bridge conditions will pose a significant challenge. According to the Federal Highway Administration, the estimated cost in 2022 for replacing all NHS bridges in Oregon that are in poor, condition stands at approximately $122 million.

The average age of bridges in Oregon is 48 years, which is higher than the 2018 average of 46 years. Some 53% of Oregon's bridges are over 50 years old and are approaching the end of their expected service lives. Although regular maintenance has helped extend the service lives of these bridges, it is anticipated that the need for bridge rehabilitation and maintenance will increase over time. Furthermore, according to the 2023 Oregon Department of Transportation (ODOT) Bridge Condition Report, only three new bridges replace outdated structures each year. **At this rate, an Oregon bridge would need to remain in service for over 900 years**, far exceeding the typical service life of 75 to 100 years. Figure 2 presents the age of bridges in Oregon.

FIGURE 2: AGE OF THE BRIDGES IN OREGON



OPERATIONS AND MAINTENANCE; FUNDING AND FUTURE NEED

Oregon Department of Transportation (ODOT) owns slightly more than one-third of the state's total bridge inventory, these bridges constitute nearly two-thirds of the total bridge deck area. Local agencies, on the other hand, are responsible for half of the total bridge inventory and a quarter of the total bridge deck area. Federal and other jurisdictions account for 4% of the total bridge deck area. Given this distribution of ownership, the responsibility of bridge operation and maintenance work in Oregon falls primarily to the state and local governments.

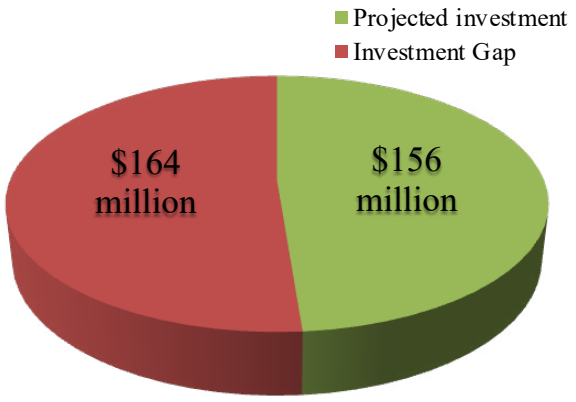
Maintenance and preservation actions can help maintain bridge condition ratings by fixing the most deficient elements on a bridge. However, these actions rarely result in improved ratings. Furthermore, these improvements are merely temporary, as the entire bridge continues to age and deteriorate. Although the HB 2017 and the Infrastructure Investment and Jobs Act (IIJA) have contributed positively to slowing the deterioration of bridges, the continuous decline of the state's bridge inventory will probably surpass these benefits.

Replacing Oregon's oldest and most heavily traveled bridges will significantly enhance the overall condition of the state's bridges and reduce the annual maintenance costs for existing structures. The current funding level of the ODOT supports the replacement of three bridges each year. However, this replacement rate is much slower than the rate of bridge deterioration. Considering a 100-year bridge design life, approximately 27 bridges should be replaced annually to maintain the current inventory conditions.

Oregon receives transportation fundings from three major sources: federal transportation funding, State Highway Fund, and other state funding. Federal transportation funding is provided by the federal government and primarily consists of revenues generated from federal fuel taxes and heavy truck taxes. ODOT annually receives approximately $700 million from the Federal Highway Administration. These funds are allocated for various construction projects on state roads, including interstates, as well as for planning and engineering purposes. State Highway Fund collections come from taxes on motor fuels

and heavy trucks, in addition to fees from driver licenses and vehicle registrations. Other state funding includes a variety of sources, such as a 1% employee payroll tax, a 0.5% vehicle dealer privilege tax on new car sales, a $15 tax on the sale of new bicycles, a fraction of cigarette tax revenues, and fees from custom license plates. In addition to the aforementioned funds, ODOT has been allocated a budget of approximately $4 billion for the period of 2023-2025. This budget is intended for the maintenance of the highway system, bridge and pavement preservation projects, expansion of highway capacity, as well as bicycle and pedestrian projects.

Oregon funds local government transportation projects through two major programs: the Statewide Transportation Improvement Program (STIP) and Connect Oregon. STIP is responsible for identifying significant projects around the state and scheduling them several years in advance. Connect Oregon is a legislatively approved program for investing in multimodal (non-highway) projects.



Despite the existence of numerous funding sources and established programs, ODOT still encounters challenges related to bridge maintenance and rehabilitation. According to the 2022 ODOT TAMP, an estimated $320 million per year is required to maintain the current condition of bridges. However, the projected annual investment falls short at approximately $156 million. This gap suggests that current maintenance efforts is not sufficient to preserve the average condition of the bridges.

Additionally, as previously stated, the primary source of the State Highway Fund for ODOT is the Oregon state fuel taxes (e.g., taxes on motor fuels and heavy tracks). Over time, the combination of inflation and the increasing fuel efficiency of vehicles has posed a risk to the sustainability of these funding sources. For example, the tax rate for motor fuel in Oregon increased by 67% from 2022 to 2024. Oregon's innovative weight-mile tax for trucks and the experimental use of a distance tax for passenger vehicles could potentially counteract this downward trend in funding, provided they are fully implemented in the future. Moreover, under the guidance of Governor Tina Kotek and the Oregon Transportation Commission, the state is currently working on developing new toll programs. The previous toll program, Regional Mobility Pricing Program (RMPP), was terminated on March 11, 2024. As RMPP served as a source of long-term funding for transportation improvement in Oregon, the cessation of the RMPP will affect future bridge maintenance and rehabilitation efforts until the implementation of the new toll programs.

RESILIENCE

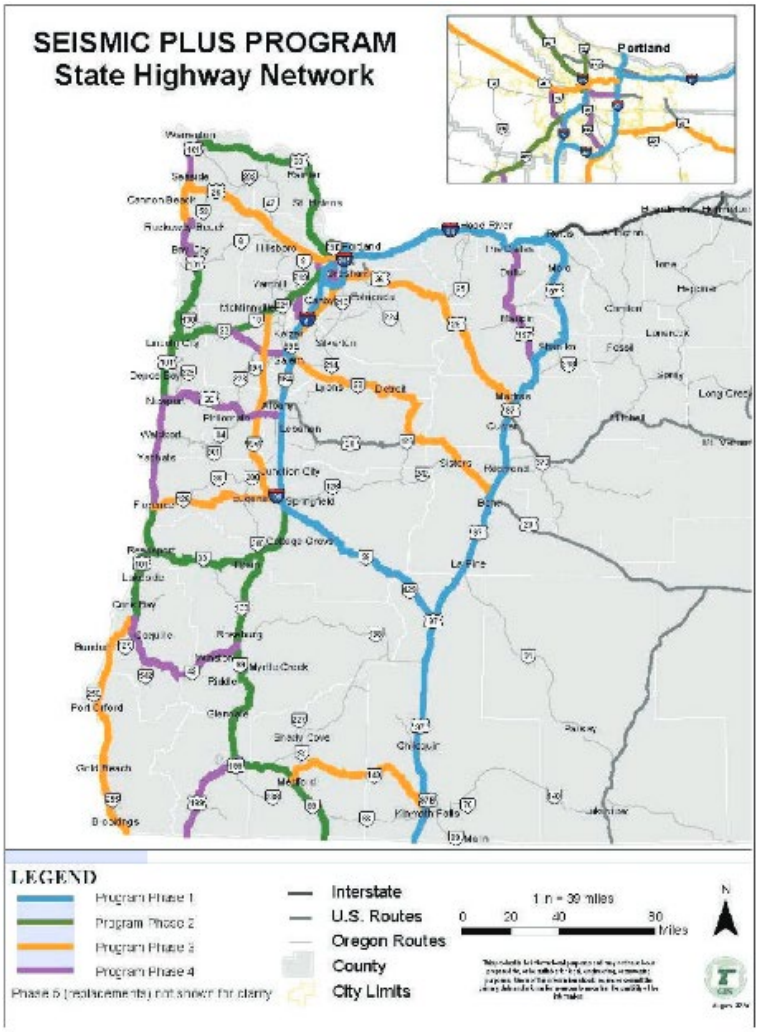
Natural hazards that threaten the resilience of Oregon's bridges include tsunamis in coastal areas, flooding across the state, and earthquakes from both local faults and major offshore seismic zones (e.g., eastern Oregon). Bridges serve as crucial connectors between rural communities and major urban centers and play a key role in the resilience strategy of emergency response efforts following a Cascadia Subduction Zone Earthquake (CSZE). To preserve these connections, ODOT is leading a statewide effort to develop emergency response corridors ("lifeline" routes) that enable a more rapid emergency response after a major seismic event.

There are five phases for this seismic resiliency project. Phase 1, the cornerstone of the program, provides a connection to the Redmond Municipal Airport, which offers quick access to an east-west freight movement and a north-south corridor on U.S. 97. Phase 2 connects the Willamette Valley with the coastal communities and southern Oregon (Rogue Valley). Phase 3 adds redundancy and capacity to the transportation network already strengthened in Phases 1 and 2 Phase 4 finalizes strengthening of 158 proposed Bridges. Phase 5 includes 12 bridge replacements, including Medford Viaduct, the Ross Island Bridge, several historic coastal bridges, and

other large bridges. Figure 3 presents the details of the ODOT seismic program.

The enactment of HB 2017 has allocated funds for several major seismic resiliency projects across the state. Moreover, ODOT is partnering with local agencies in the western region to pinpoint critical lifeline routes and prioritize the retrofitting of bridges along these routes, with considerations for tsunami preparedness where necessary. Nonetheless, without full funding for all bridges along these routes, the objective of establishing a truly uninterrupted lifeline connecting major population centers in Oregon will remain challenging.

FIGURE 3: ODOT SEISMIC RESILIENCE PROGRAM



Sources: 2023 ODOT Bridge Condition Report and Tunnel Data

PUBLIC SAFETY

In Oregon, many Portland residents rely on Broadway Bridge and Morrison Bridge as part of their daily commute. Any failure of these bridges would break the connection between west and east Portland, potentially resulting in the loss of many lives.

Numerous essential bridges in Oregon were built in the 1990s. According to the National Bridge Inventory database, approximately 9.4% of bridges in Oregon are required to post a load limit. As these bridges age, they pose a potential threat to public safety. Although funding has been allocated for maintenance, the increasing deterioration of bridges presents a significant challenge to maintaining their current condition. This situation could potentially undermine public confidence in safety.

INNOVATION

The use of innovative materials such as ultra-high-strength concrete and high-strength rebar is becoming increasingly common in bridge projects across the state. These materials enhance construction quality and lead to lower rates of deterioration over the bridge's service life. Major bridges in the state have been the focus of increasingly innovative preservation methods. Examples include cathodic protection for many of the state's historic coastal bridges and a two-tiered performance-based seismic resiliency standard.

From a project delivery standpoint, ODOT and the Tri-County Metropolitan Transportation District of Oregon (TriMet) are increasingly adopting alternative delivery methods, such as Design-Build and Construction Manager/General Contractor (CM/GC), where appropriate. These methods improve risk, cost and time management for projects. In executing the projects outlined in HB 2017, ODOT is utilizing a diverse range of contracting methods to align each project's unique requirements with the optimal delivery process. Additionally, the impact on public mobility during construction is being minimized through a renewed focus on the use of accelerated bridge construction techniques.

Bridges

RECOMMENDATIONS TO RAISE THE GRADE

- Prioritize replacement of aging bridges as a means of reducing the substantial cost of maintaining existing inventory.
- Achieve ODOT's goal of post-earthquake resiliency by completely funding the retrofit or replacement of bridges along "lifeline" routes.
- Provide funding to replace the growing wave of bridges that are currently or will soon be in poor condition.
- Identify a long-term, inflation-adjusted funding source for replacing Oregon's bridges at a rate of approximately 30 each year.

SOURCES

American Society of Civil Engineers, 2021 Infrastructure Report Card, 2021.

American Society of Civil Engineers – Oregon Section, Oregon's Infrastructure Report Card, 2019.

Oregon Department of Transportation, 2023 Bridge Condition Report and Tunnel Data, 2023.

Oregon Department of Transportation, 2022 Oregon Transportation Asset Management Plan (TAMP), 2022

Oregon Department of Transportation, ODOT's Seismic Implementation: Policies and Design Guidelines, 2021

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Dams

D+

AERIAL IMAGES OF BONNEVILLE DAM, OREGON

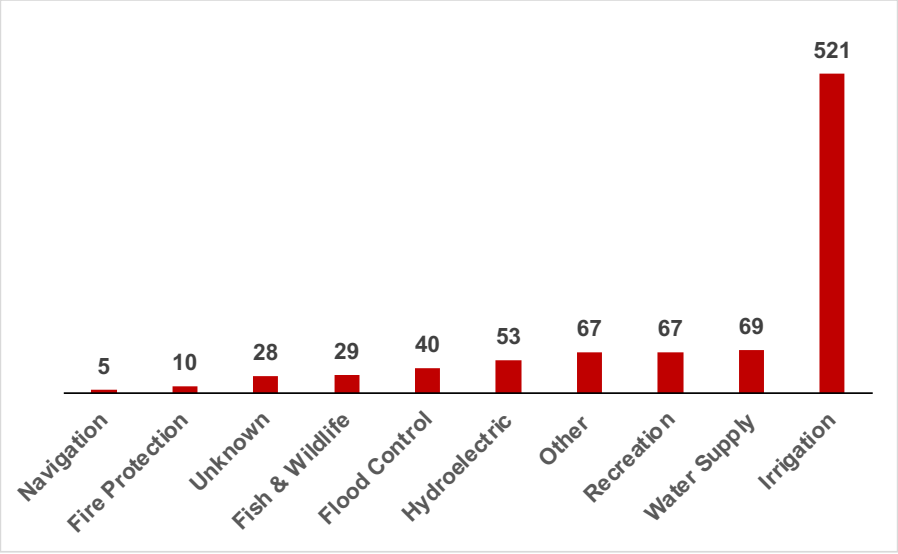
EXECUTIVE SUMMARY

Dams in Oregon provide flood control, drinking water, irrigation, fish and wildlife protection, recreational areas, hydroelectric power, and other social and economic benefits. Oregon has 889 dams recorded in the National Inventory of Dams, of which 721 are regulated by the state. Over the last decade, Oregon has slightly improved funding for safety regulation of existing dams, and implemented Emergency Action Plans for all 76 state-regulated high hazard dams. However, Oregon dams are aging, and limited funds are being allotted for the maintenance, repair, or replacement of state regulated private dams. About two-thirds of Oregon's dams are older than their typical 50-year design life. In the next five years, over 70 percent of these dams will be over 50 years old. Furthermore, Oregon dams remain unprepared for extreme hydrologic and seismic events such as the Cascadia Subduction Zone earthquake.

BACKGROUND

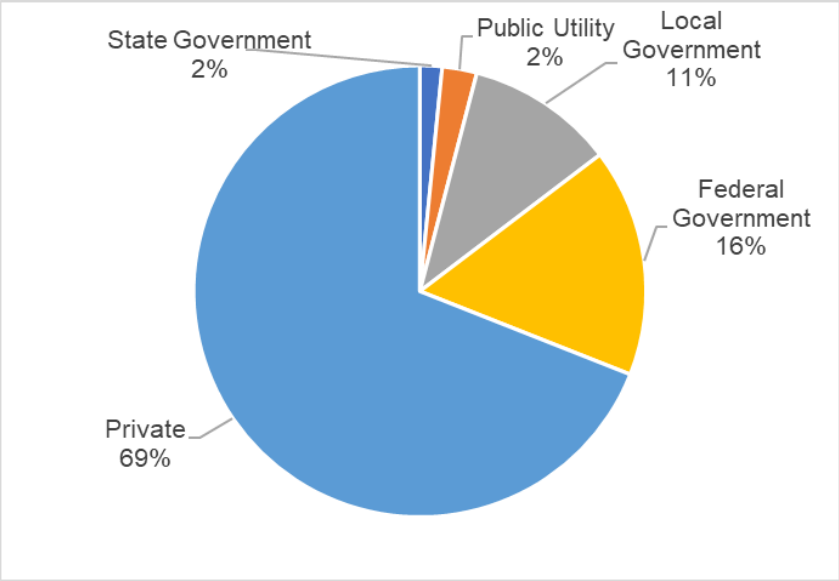
Dams in Oregon serve a variety of purposes that include irrigation, hydropower generation, water supply, fish and wildlife protection, recreation, flood control, fire protection, and navigation. Many of Oregon's dams were originally constructed to support irrigation operations and 521 of them still serve this original purpose.

FIGURE 1- OREGON DAMS BY PRIMARY PURPOSE (Source: NID)



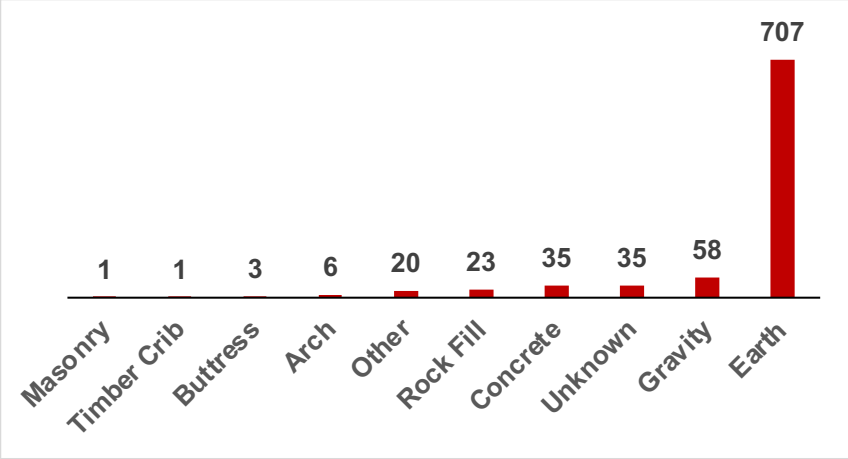
Oregon has both publicly and privately owned dams. Publicly owned dams include federally owned or regulated dams, such as those owned and operated by the U.S. Army Corps of Engineers (USACE) along the Columbia & Willamette Rivers. Hydropower generating dams are regulated by the Federal Energy Regulatory Commission (FERC). The majority of state regulated dams and reservoirs in Oregon are non-federal structures. .

FIGURE 2 – OREGON DAM OWNERS (Source: NID)



Oregon dams are constructed in a variety of sizes and materials, built to different heights with different water storage volumes. A breakdown of dam types is detailed in Figure 3. The smallest regulated dams are at least ten feet high and store over 9.2 acre-feet (3 million gallons).

FIGURE 3- OREGON DAM TYPES (Source: NID)



Except for hydropower or municipal water dams, most of the small dams in Oregon generate little if any revenue. Most dam owners are farmers, homeowner associations, and flood control districts with limited funds. Many communities and agricultural interests depend on them for their livelihood.

CONDITION AND CAPACITY

Both the Oregon Water Resources Department (OWRD) and the USACE keep a database of all of Oregon's dams. These databases differ in their criteria for inclusion of dams but monitor similar physical and safety-related information. The largest reservoir by storage capacity located entirely in Oregon is Owyhee Dam, storing 1.2 million acre-feet.

Oregon law defines a state regulated dam as being greater than ten feet in height and retaining more than 9.2 acre-feet of water. Oregon assigns a condition rating to each dam based on the following guidelines:

Rating	Description
Satisfactory	No dam safety deficiencies recognized or suspected.
Fair	A minor dam safety deficiency exists or is suspected. The minor deficiency can be remediated with maintenance or repair. Lack of maintenance or repair may not threaten the safety of the dam. A suspected deficiency under extreme loading conditions could result in a serious safety deficiency.
Poor	A dam safety deficiency is recognized or considered probable based on engineering review of loading conditions that may occur.
Unsatisfactory	A dam safety deficiency identified that under unusual but reasonably possible loading conditions could cause the dam to fail.
Under Analysis	An engineering analysis for a suspected hydraulic, seismic, or internal erosion deficiency is underway.

In addition, a three-tier classification system is used to prioritize all dams based on the consequence of dam failure.

Classification	Description
High hazard potential dams	A failure would cause probable loss of human life and substantial property damage.
Significant hazard potential dams	A failure would result in no probable loss of human life but would likely cause economic loss, disruption of lifeline facilities or other impacts.
Low hazard potential dams	A failure or misoperation would not likely cause loss of human life or substantial property damage.

The USACE National Inventory of Dams (NID) includes Oregon dams meeting one of the following criteria:

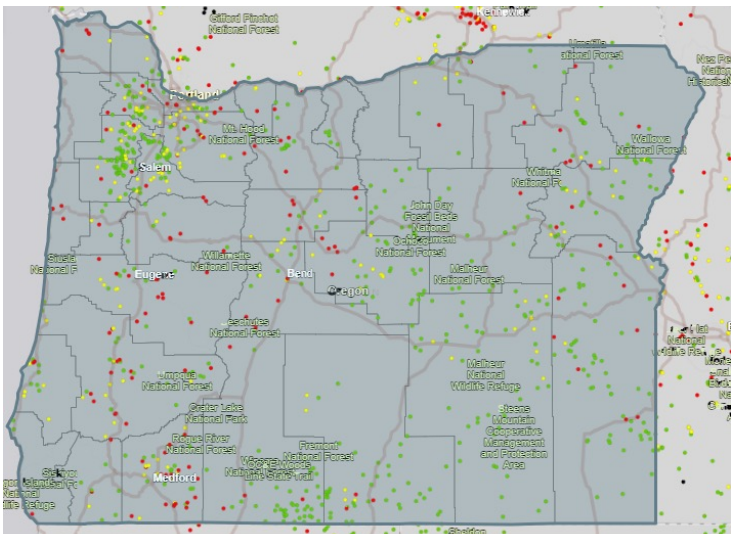
- High hazard potential
- Significant hazard potential
- Equal or exceed 25 feet in height, exceed 15 acre-feet in storage
- Equal or exceed 6 feet in height, exceed 50 acre-feet storage

There are a total of 889 dams in Oregon that meet the NID criteria. Dams that do not meet the NID criteria are not discussed in this report. Currently, 171 dams are rated as having high hazard potential; this however does not necessarily imply poor or unsatisfactory condition. The federal government owns 67 of these dams, private interests own 48 dams, local governments own 42 dams, power utilities own 12 dams, the state of Oregon owns 1 dam, and 1 dam has dual ownership with local government and a public utility. Twenty-eight of these

high hazard dams have a condition rating of poor or unsatisfactory. As of early 2019, all high hazard potential dams are inspected annually and have emergency action plans (EAPs) in place. However, the state of Oregon does not have the authority to require EAPs on low and significant hazard dams, which account for the vast majority of dams in the NID. Neither does the state have the resources to review any EAPs submitted by owners of significant hazard dams. In 2023, there were 3 state regulated, and at least 1 federally regulated, high hazard dams with lowered reservoir elevations due to condition. high hazard dams with lowered reservoir elevations due to condition.

Dams are located throughout the state and are shown in Figure 4 below.

FIGURE 4 - DAMS IN OREGON (Source: NID)



RED indicates high hazard potential dams. There are 17 1 high hazard potential dams in Oregon.

YELLOW indicates significant hazard potential dams. There are 171 significant hazard potential dams in Oregon.

GREEN indicates low hazard potential dams. There are 547 low hazard potential dams in Oregon.

Most of the large federally owned, operated, or regulated dams are in fair or satisfactory condition with a few deficiencies. These include dams owned by the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation and those non-federal hydropower dams regulated by the Federal Energy Regulatory Commission. Municipal water supply dams overall range from fair to satisfactory condition, except those closer to the Cascadia Subduction Zone, where there are special concerns regarding seismic deficiencies. Irrigation dams range from mostly fair and in satisfactory condition to a few in unsatisfactory condition. Reclamation and those non-federal hydropower dams regulated by the Federal Energy Regulatory Commission. Municipal water supply dams overall range from fair to satisfactory condition, except those closer to the Cascadia Subduction Zone, where there are special concerns regarding seismic deficiencies. Irrigation dams range from mostly fair and in satisfactory condition to a few in unsatisfactory condition.

Infrastructure age can be an indicator of overall condition. However, a dam that is properly designed, maintained and upgraded can operate safely longer than the design life. About two-thirds of Oregon's dams are older than the typical design life of 50 years. In the next 5 years, over 70 percent of Oregon's dams will be older than a 50-year design life. Additionally, at least 98 of Oregon's dams are over 100 years old. Many of these older dams require repair, rehabilitation, or, if considered unsafe, removal.

Most of the federal and private hydropower dams in Oregon operate on run of the river conditions, in which there is little to no water storage behind the dam. These dams have minimum flood storage capacity. While many of the state regulated municipal and privately owned dams east of the Cascade Mountains have sufficient spillway capacity, there are some concerns regarding rainfall studies and probable maximum flood (PMF) events west of the Cascade Mountains. The communities along the coast depend almost entirely on surface water storage for drinking water. These areas have the highest risk of overtopping due to an extreme rainfall event. Oregon currently estimates the probable maximum precipitation (PMP) from Hydrometeorological Report (HMR) 57, which was published in 1994. However, a new statewide PMP model is anticipated to be complete in 2026.

OPERATIONS AND MAINTENANCE

Proper operation, maintenance, and annual inspections are important to ensure dams are safe, meet their intended purposes, and reduce the risk of failure.

Federally owned and non-federal hydropower dams are inspected by federal agencies at a level that is considered sufficient to meet national dam safety guidelines. State high hazard dams are inspected every year, while significant hazard dams are inspected every two to three years. Low hazard dams are inspected every 6 years. Oregon has a Watermasters program, which functions as a local contact for landowners and other agencies. The Watermasters are divided into twenty-four districts across six regions. Watermasters work under a Water Resources Director to regulate water distribution. As of early 2023, all significant and high hazard dams are inspected by licensed engineers, while low hazard dams have visual inspections conducted by Watermasters. There is no detailed review of these visual inspections by engineering staff.

FUNDING AND FUTURE NEEDS

Dam failures threaten public safety and can cost the Oregon economy millions of dollars in damages. Failures are not just limited to damage to the dam itself. They can result in loss of life and damage to private property, roads, bridges, water systems, and other critical infrastructure.

The 2021 Oregon Legislature provided $5M in one-time funding for dam safety related engineering analysis. The funding was used to identify and elucidate dam safety related deficiencies for state regulated dams. However, the funding was not available for rehabilitation related work. The source of the funding was the state General Fund ($1M) and the federal American Rescue Plan Act ($4M).

In fiscal year 2024, Oregon was awarded approximately $370,000 through the State Assistance Grant under the National Dam Safety Program. These funds can be used for training state personnel, increasing the number of dam inspections, and creating dam safety awareness outreach materials.

Despite these recent fund acquisitions, additional funds need to be made available so private dam owners can repair, upgrade, or remove aging facilities. The state also needs increased funds to rehabilitate deficient state regulated dams and to provide the staff necessary to manage critical aging infrastructure.

Federally owned dams have dedicated budgets for operation and maintenance, and they include maintenance and repair as annual operating costs. Most non-federal hydroelectric dams also have revenue sources sufficient to meet current safety requirements and upgrades. However, most state regulated dams do not have dedicated revenue or funding to perform repairs, upgrades, or removal. Oregon has no funding program for repair, rehabilitation, or removal of state regulated dams. Oregon lacks a strategy to provide reliable funding to correct progressive deterioration of dams.

PUBLIC SAFETY AND RESILIENCE

Loss of life and property damage are the common results of a dam failure. Oregon recorded 39 significant dam failures in Oregon over the last 122 years. Recently, the Geary Levee in Klamath County failed in 2006, which flooded 2,000 acres of farmland and caused $4.5 million in damages to Highway 140. The Simplot Waste Storage Dam near Hermiston failed in 2005, and washed out a highway and a major irrigation canal, damaged private property, and left mud deposits on agricultural land.

Resilience includes dam safety pre-disaster measures, effective response to emergencies, and rapid recovery from dam failures. Resilience is improved when regulating agencies have the personnel to provide support and enforcement authority to require appropriate risk reduction measures, when seismic and hydrologic hazards are understood so that appropriate risk reduction measures can be implemented, and when Emergency Action Plans are developed for pre-disaster planning.

Seismic and Hydrologic Hazards

Seismic (earthquake) risk in Oregon due to the Cascadia Subduction Zone earthquake event is extremely different from the previous understanding of seismic risks in Oregon. Dams that were designed for a peak ground acceleration of 0.05g, equivalent to light shaking expected to rock parked cars, now must withstand 0.6g to 1.2g, equivalent to violent shaking expected to shift buildings off their foundations. Most dams in Oregon were constructed prior to modern seismic provisions, and several need seismic retrofits. Damage and dam failures are expected at many dams along the Oregon coast during the Cascadia Subduction Zone event.

Seismic and hydrologic studies are urgently needed to understand the risks imposed on a dam and to ensure continued safety of the downstream public. Hydrologic (flood) risk requires assessment and regular re-analysis to accommodate new storms that have occurred. Two state-wide precipitation studies are underway and expected to be completed in 2026. One study is an update to the probable maximum precipitation and the other is an updated precipitation frequency analysis. Some of the dam specific analysis work has been completed for state regulated dams using one-time funding provided by the Oregon Legislature. However, additional resources are needed to complete dam specific studies for the remaining state regulated dams in Oregon. Site specific hydrologic studies for parts of Oregon are needed, particularly in eastern Oregon and the intermountain areas in the southwest, where the 1961 Seymour Falls storm from British Columbia is used to create a design storm. There are questions about data limitations and storm relevance to mountainside geographies. Appropriate pre-disaster remediation measures should be implemented as soon as practicable following the identification of any deficiencies by seismic or hydrologic studies.

Emergency Action Plan

A preferred method for minimizing loss of life and property damage in the event of a dam failure is the establishment of an Emergency Action Plan (EAP), a formal pre-disaster planning document that identifies potential emergency conditions at a dam and specifies response actions for the dam owner and emergency management authorities. Federal dam safety programs require EAPs and periodic testing of EAPs for significant and high hazard federally owned or non-federal hydropower generating dams. Following 2017 legislation in the form of House Bill 3427, all high hazard dams have EAPs in place. Prior to the bill, approximately 77 percent of state regulated high hazard dams in Oregon had EAPs. All Oregon high hazard dams now have an emergency action plan.

Staffing

State dam safety engineering staff perform critical tasks including high hazard dam inspection, review of Watermaster inspections, and support of Oregon dam owners as they manage seismic and hydrologic risks and develop EAPs. The OWRD Dam Safety Engineer provides input to the Oregon Cascadia emergency management playbook and to state flood and drought planning. Currently, the state dam safety program has four full time equivalent (FTE) engineering staff, and one part-time engineer on staff. In comparison, Washington has 9 FTE, Idaho has 3 FTE, and California has 61 FTE staff. Additionally, Oregon has the highest ratio of state regulated dams per FTE ratio at over 300, whereas Washington, Idaho, and California have ratios of approximately 115, 160, and 25. In contrast, federal dam safety programs are generally well funded and staffed. At least two additional state dam safety engineering staff are necessary to lower these ratios to match other states.

Dams

D+

RECOMMENDATIONS TO RAISE THE GRADE

- Enforce Oregon HB 2085 to address state dam deficiencies.
- Provide funding for additional state dam safety staff to improve the dam inspection program and to support enforcement action for deficient dams. At minimum, two additional engineering staff are necessary to match other states with similar dam safety needs.
- The state should continue to develop the formal risk assessment program to prioritize dams in need of repair, rehabilitation, or removal. HHPD grant funds and one-time funding provided by the Oregon Legislature has allowed development of a risk assessment procedure and follow up analyses. Additional resources are needed to apply the procedure to more state regulated dams.
- Implement a statewide awareness campaign to educate individuals on the location and condition of dams in their area and become more "dam aware."

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Drinking Water

C

EXECUTIVE SUMMARY

Oregon's drinking water system includes storage and distribution functions, resiliency measures, and filtration processes that help safeguard the public from waterborne pathogens and toxic pollutants. Safety measures have generally performed well, with 99% of regulated public systems and 99.7% of community systems meeting EPA standards - although 192 water quality violations occurred in 2023. Approximately 3,450 public water systems operate throughout the state, but around 400,000 residents rely on private sources that are often overlooked and unmonitored. While most pipes in Oregon were installed in the past 50 years, other system components across the state are at lifespan or are not seismically resilient; replacing them to seismic standards will add costs. New technologies and funding channels are essential, and systems and policies will need to adapt. Ensuring safe and reliable drinking water throughout the state will require in the order of $10 billion in further funding.

BACKGROUND

The vitality of safe, reliable drinking water has long been recognized in Oregon. Three of the state's 19 Statewide Land Use Planning Goals, adopted in the 1970s, highlight general source protection and a further five focus on distinct water sources. Numerous reports and strategies have been crafted to address issues at all stages, including drought, pollution, and seismic resilience.

Pressure on the state's water system is only rising. Between 2010 and 2022, Oregon's population grew nearly 12% to approximately 4.3 million - mostly in the metropolitan centers of Washington, Multnomah, Clackamas, and Deschutes Counties. Although the Covid-19 pandemic paused growth between 2021-2022, the long-term growth trend is expected to continue.

The United States Environmental Protection Agency (EPA) mandates the requirements outlined in the Safe Drinking Water Act (SDWA) for Oregon's lakes, rivers, reservoirs, and other related ground and surface water sources. These nationally established public health standards are intended to protect all public water resources from manmade contaminants and naturally occurring pathogens throughout drinking water systems. In addition to the basic water system standards, the EPA has also begun to outline useful mitigation strategies to combat current and future climate change impacts on drinking water caused by increasing temperatures and changing precipitation patterns in the region. Climatic changes in Oregon and the wider Pacific Northwest region will continue to impact the rate of natural disasters, issues regarding stormwater mitigation, and alterations to the wildlife that can impact the water quality if not treated correctly.

CONDITION AND CAPACITY

The procurement of safe drinking water requires diligence across three stages: source protection, treatment and storage, and delivery to the end user. A breakdown at any stage can impair the quality (and quantity) of water reaching those who need it. Oregonians are served by a fragmented collage of both public water systems and private wells. Some 4.3 million residents are served by public water systems, leaving around 400,000 Oregonians to source their own primary drinking water. Private water sources are not covered by the SDWA, meaning oversight and upkeep is often limited. The state's large population centers rely mostly on surface water and have experienced relatively stable supplies. However, large swathes, covering approximately 29% of the state's population, rely primarily on groundwater and are served by smaller public systems and private wells; 88% of public water systems in Oregon rely at least partially on groundwater for permanent and backup supplies. The upper Deschutes Basin in Central Oregon is experiencing rapid population growth; this is putting pressure on groundwater systems, as surface water capacity cannot meet these rising demands. This use raises concerns about the water's capacity being sourced and the potential of groundwater pumping reducing streamflow within the area. While overall source supplies are adequate, the limited efficiency of competing water usages, particularly agriculture, threatens the supply of drinking water in the region.

The distribution network in Oregon is relatively young, meaning the threat of lead pipes is relatively low. In 2023, the EPA user provider surveys project that 0.04% of service lines in Oregon, or 3,530, are made with lead. The Oregon Health Authority has given water providers until fall 2024 to report an inventory of all service lines. Federal money has been made available by the Infrastructure Investment and Jobs Act (IIJA) to support the inventory and replacement of lead service lines. No comprehensive, statewide data exists on water pipe materials, but some cities do keep an inventory, and larger cities are making strong efforts to meet reporting requirements. The City of Salem, for example, has no lead pipes that are publicly owned, but is waiting for private systems to fully report.

PUBLIC SAFETY

Drinking water can be contaminated by a variety of sources, including organic and inorganic materials, radioactive materials, pesticides, and sediments and turbidity. It can also become contaminated at multiple stages: at the source, during storage (including after filtration), and during delivery (piping). Detecting and treating each type of contamination requires specific testing abilities and filtration technologies. At the state level, Oregon has a relatively good track record on drinking water safety across contamination types. Multiple municipalities and state agencies such as the Oregon Health Division Drinking Water Program oversee this effort and work to maintain compliance with federally mandated guidelines. SDWA guidelines detail the requirements necessary to protect and monitor drinking water and its numerous sources such as groundwater, rivers, lakes, springs, and reservoirs.

The Source Water Monitoring Rule that is imposed by the Oregon Health Authority applies to all public water systems throughout the state and is intended to address concerns regarding higher levels of microbial contaminants in surface water or groundwater while also addressing uncovered finished water reservoirs. Water source testing requirements vary depending on the population (10,000 or more / less than 10,000) that the water source supplies. Testing of the raw water source is mainly focused on microbial contaminants commonly found in the unfiltered water sources such as E. coli and cryptosporidium as well as testing of the turbidity. Treatment of contaminated water sources exceeding the outlined thresholds is also detailed in the Source Water Monitoring Rule.

In early 2017, low-level readings of cryptosporidium, a microbial contaminant, were detected in the Bull Run River supplying Multnomah County and most of the Portland Metropolitan area. This drinking water source is under the jurisdiction of the Portland Water Bureau and was originally granted a variance from the mandates outlined in the SDWA that lasted from 2012 to 2017. To efficiently filter this contaminant from this water source, a new $2.1 billion

filtration facility is scheduled to be completed by 2027; while the facility will address wildfire resilience needs, it won't filter the per- and polyfluoroalkyl substances (PFAS). Starting this year, however, in accordance with new EPA requirements, Portland will begin testing for 29 PFAS, as health concerns surrounding the so-called "forever chemicals" rise. While PFAS have not been detected in the Bull Run Watershed, statewide 25 PFAS detections were made in 2023, up from just five in 2022. Nearly 900 public water systems serving over 600,000 Oregonians have non-zero scores, which indicate unaddressed violations in the past five years. Fortunately, just 119 of those, serving fewer than 20,000 people, have reached priority non-complier status.

Source: Portland.gov - About the Bull Run Filtration Project

Delivery infrastructure has been improving. In 2023, measurements of lead in Portland's water supply reaching 90% of served households fell to the lowest since recording began in 1992. The spring and fall measurements of 6 parts per billion and 8 ppb, respectively, were well below the federal action level of 15 ppb. In 2024, Portland Public Schools, which serves over 44,000 students, completed a rollout of lead-filtering drinking water stations at all 93 of its sites. The program, begun in response to finding high levels of lead in schools in 2016, reached its goal of providing water averaging just 1 ppb.

With less ability to test and treat, unregulated private wells are facing larger issues. Long-polluted underground aquifers in the eastern Morrow and Umatilla Counties continue to expose residents to nitrate levels well beyond the federal limit. There, the Port of Morrow was fined by the Oregon Department of Environmental Quality (DEQ) in June 2024 for continued wastewater violations. Crook County well owners are organizing around high levels of manganese in their water supplies. Many of these Oregonians live in disadvantaged communities with no better options, highlighting the need for improved monitoring and protective policies at the state level.

RESILIENCE

Publications assessing the resilience of Oregon's drinking water system have been released in the past decade, such as the Oregon Resiliency Plan (2013) and the 2023 Advisory Report. Both detailed reports focused on the current drinking water system's overall resilience and emphasized potential natural disasters and their impacts on the drinking water system. Resiliency has many aspects, extending to environmental risks brought on and exacerbated by climate change (wildfire, flooding, drought, among others), as well as social factors such as cybersecurity and threat actors.

Seismic resilience, specifically for Western Oregon, is

an ever-present concern for residents and government officials. As the understanding of possible seismic impacts on the state's drinking water system has become more apparent, multiple municipalities, cities and counties to the west of the Cascade Range have begun to invest funding into projects that emphasize a seismic strengthening component during the design and construction process. An excellent example of this effort is the Willamette Water Supply System (WWSS) project that is currently under construction in Washington County and is intended to serve as one of the most seismically resilient water systems in Oregon and will service the growing cities of Tualatin, Hillsboro, Beaverton, and unincorporated Washington County by 2026. In addition to the construction of new seismically resilient water treatment facilities, pipelines, reservoirs, and pump stations other projects have been recently designed to fortify or replace existing systems, such as the new Washington Park Reservoir in Portland. This reservoir, originally constructed in 1894, is currently under construction and will replace the existing facilities with a new 12.4-million-gallon seismically reinforced underground reservoir intended to provide a resilient water source to roughly 360,000 residents, businesses, hospitals, and others. Substantial completion of this project is scheduled for spring of 2025.

Source: Portland Water Bureau - Washington Park Reservoir Improvement Project

While the addition of new seismically resilient water supply systems and improvement to existing facilities does improve the overall resiliency of drinking water in Oregon, there is still an existing water pipeline network and other critical infrastructure facilities that are at risk for catastrophic failure should a natural disaster occur. Older cast iron water pipelines, coastal regions of Oregon that are at risk of potential natural disasters, and drinking water related facilities built before potential seismic risks were considered still pose a risk to drinking water for Oregon. Significant investment to upgrade and fortify the existing water system is still needed throughout the state to ensure that potential impacts to this critical supply are mitigated as much as possible.

INNOVATION

As in many Western states, historical inertia continues to be a barrier to innovation in the apportioning of water in Oregon. Antiquated water rights regimes have been a major sticking point. Creative partnerships, such as land trusts and conservation districts that link public and private groups and funding pools, may be a solution for many locales. Some Oregon cities have implemented rate surcharges to increase funding for watershed restoration and stewardship; other locales may consider adopting similar methods of increasing funding.

Even within existing legal frameworks, certain locales have found ways to simultaneously reduce conflicts between water users and expand access. In Central Oregon, for example, efforts to pipe irrigation canals have substantially reduced evaporation loss, in turn increasing the supply for surface water and surrounding ecosystems. However, measures are needed to protect groups using groundwater fed by canal leakages.

Canal piping project. Source: Central Oregon Irrigation District

Alongside the improvement of legal frameworks is technological innovation. The development and adoption of improved water treatment and reuse technologies is vital to a secure drinking water future. Underlying these are significant funding needs and implementation frameworks to facilitate the use of new technologies. Continuing to improve our overall understanding of Oregon's geography and innovation in the world of seismic design will help increase the fortification of the drinking water supply as upgrades are continuously made throughout the system. Seismic anchorage, improved monitoring devices, and shake table testing for critical pieces of equipment are examples of innovation in the world of seismic resiliency that are factored into the design phase of projects to withstand the occurrence of potential catastrophic seismic events.

OPERATION AND MAINTENANCE

Since 1976, the Oregon Health Authority (OHA) has outlined operation and maintenance requirements for all public water systems to ensure efficient production and delivery of potable water. These requirements have been continuously updated and modified as recently as January 2020. The scope of these requirements can range from general operations of drinking water facilities, replacement of malfunctioning or damaged equipment, development of contingency plans during emergencies or interruptions to drinking water supply, and more. Through these requirements it is also outlined that current records must be kept regarding the number of service connections and their location, raw water quality (both chemical and microbiological), chemical and dosage rates used in the treatment of water, as well as customer complaints regarding water quality and the follow-up action undertaken to resolve such issues.

Dosages of chemicals such as ammonia, chlorine, or corrosion-control chemicals that are added to water during

the treatment process must be monitored and maintained in accordance with manufacturer's specifications for treatment equipment as outlined by the OHA. Compliance ensures that clean and safe drinking water can be provided throughout Oregon.

In 2021, the OHA reviewed and updated the Oregon Capacity Development Strategy, one phase of the state's Water System Capacity Program. Getting public water systems to develop and implement asset management plans is currently a high priority for the OHA - including providing training for water system managers, board members, and administrators. The state's Circuit Rider program - which offers free technical and monitoring assistance to small community systems - is planning to include asset management assistance.

The City of Salem is spending $9.7 million on seismic upgrades to its water system in its 2024-2028 Capital Improvement Program; another $4.3 million is going towards reservoir safety improvements, with millions more funding water main improvements and treatment plant infrastructure. The City of Eugene is planning the replacement of three water storage tanks that serve over 200,000 people. This project will supplant the seismically deficient tanks with six smaller storage tanks, with the aim of improving water quality, as well as operational and maintenance flexibility should a natural disaster occur. Eugene is also working to restore watersheds in the wake of wildfires.

FUNDING AND FUTURE NEED

Oregon's population has grown by nearly 1% per year for the last 12 years. Should that pace continue, the state is projected to have over 5 million residents by 2040. The League of Oregon Cities *2021 Infrastructure Survey Report* estimated that $23 billion is needed in the next 20 years for drinking water quality and quantity improvements. That figure was extrapolated from an identified need of $9.7 billion, up from the $7.6 billion that survey respondents identified five years prior. The aforementioned 2023 EPA survey identified a similar $10.1B in needs over the next two decades.

Rising research, construction, and procurement costs will continue to expose issues of equity, as disadvantaged communities struggle to raise necessary funds for infrastructure improvements. For some communities that rely on groundwater, particularly in the eastern half of the state, shrinking water tables are increasing extraction costs, which may eventually necessitate the importation of water, as is being observed in other states. This is likely to affect rate setting in the future.

The IIJA has provided nearly $55 billion for investment in water infrastructure, including more than $35 billion for drinking water; over a dozen projects in Oregon have secured related Bureau of Reclamation funding since its passage. The state's Drinking Water State Revolving Fund (DWSRF) provides low-cost loans for planning, design, and construction projects; as of late 2023, 33 projects around the state requesting a combined $352 million were on the program's priority list. At its November 2023 commission meeting, the Oregon Water Resources Department granted nearly $14 million to six water projects around the state, by far the most since its Grants and Loans Program was started in 2016. Many of these projects target irrigation efficiency in rural areas, which will increase drinking water supply.

The City of Ashland in southern Oregon is pursuing a $75 million loan through the EPA's Water Infrastructure Finance and Innovation Act program for a new water treatment plant. The effort is facing challenges from some residents, as the loan would be paid back through rate increases. Yet Ashland's existing plant lacks modern filtration technologies that inhibit the ability to respond to fluctuating water conditions, including toxic algae blooms. Further, the plant is susceptible to damage from flooding, fire, and landslides, with events disrupting the water supply on multiple occasions historically.

Despite movement for multiple projects and a variety of funding channels available, it remains clear that the state's drinking water needs are still underfunded. In the future, the time will come when sufficient quantities of safe and readily available water will be as critical to Oregon's wellbeing and continued existence as the air we breathe. As the population grows, the attention to preserving safe drinking water will be essential.

Drinking Water

RECOMMENDATIONS TO RAISE THE GRADE

- Continue to conduct seismic resiliency risk assessments of all key water system components throughout the western part of the state.
- Implement seismic resiliency recommendations to improve drinking water infrastructure.
- Continue to increase public awareness and knowledge of planned water system improvements to water filtration processes and their impact on public safety.
- Increase the research and development of sustainable and policy solutions to water shortages throughout the less populated areas of the state.
- Continue to implement innovative technologies to help mitigate water loss and efficient filtration practices.
- Develop stable local and state funding mechanisms to supplement federal funding sources, with an emphasis on providing parity for disadvantaged communities.
- Implement and institutionalize asset management programs and provide support to smaller communities.
- Identify opportunities to consolidate small utilities and expand public services to those relying on unsafe wells.
- Identify future challenges including cybersecurity and monitoring requirements and put in place plans to address these challenges.

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Oregon Health Authority - Public Health Division

Oregon Water Resources Department

US EPA Safe Drinking Water Act (SDWA)

Willamette Water Supply - Our Reliable Water Future

Cities of Portland, Eugene, and Salem

League of Oregon Cities

Tualatin Valley Water District

United States Geological Survey (USGS)

Energy

C-

EXECUTIVE SUMMARY

Oregon benefits from abundant renewable energy resources and ranks among the top five states in terms of renewable energy production. Excellent strides are evident in energy efficiency, renewable energy expansion, reduction of fossil fuel consumption as well as energy sector innovations. While renewable energy infrastructure is generally newer and in good condition, the existing energy grid is aging. Electrical transmission capacity has less reserve capacity than in the past, causing bottlenecks and constraints on the grid. Most petroleum transmission systems and equipment are over 50 years old and storage tanks average around 70 years old. Additionally, a major concern is the ability of the energy network to perform in the instance of a major Cascadia earthquake. Large portions of the energy system would be rendered unusable, as transmission and distribution networks lack redundancy and were not designed to withstand earthquake forces. Efforts to enhance public safety and resilience are underway, including the development of the Oregon Energy Security Plan and implementation of new regulations requiring seismic vulnerability assessments and mitigations for large (>2 million gallons) fuel handling facilities in Multnomah, Columbia, and Lane Counties. These measures aim to mitigate risks from severe weather, climate variability and seismic hazards to ensure a stable and secure energy supply for the future.

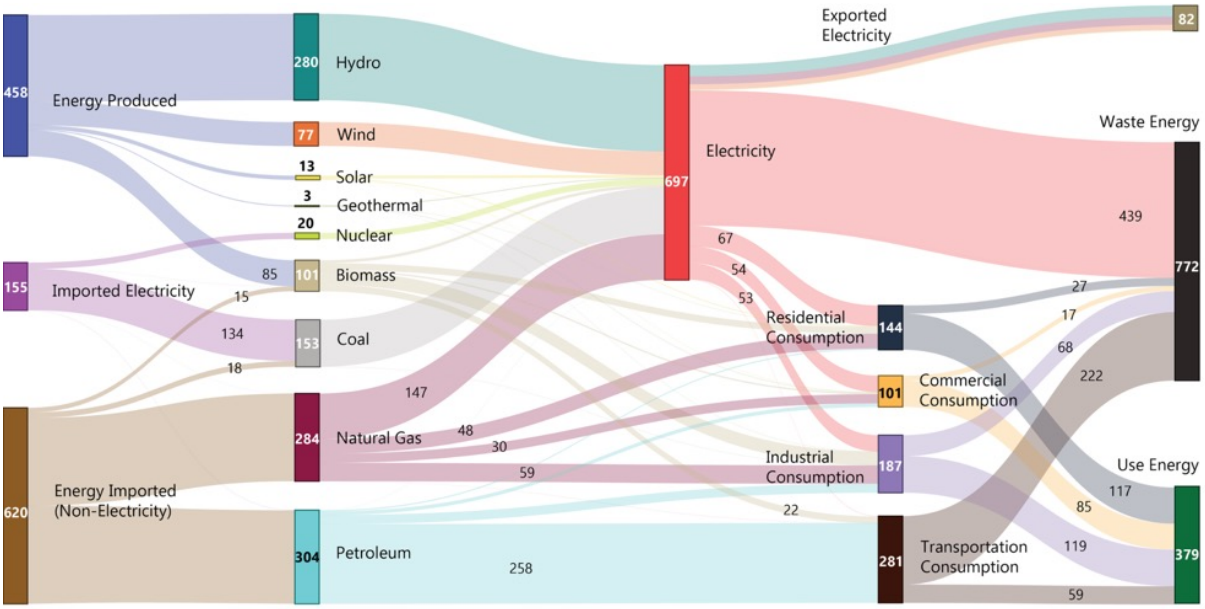
BACKGROUND

Oregon's primary energy sources can be categorized into four areas: electricity, natural gas, liquid petroleum-based fuels, and biomass. The infrastructure required to deliver energy to homes and businesses include generation or supply, long-distance transmission, and local distribution. Virtually all Oregon commerce and industry, as well as all other infrastructure categories, rely on an adequate and stable energy supply. State-level governing bodies in the energy sector include the Oregon Department of Energy and Oregon Public Utility Commission (PUC), which regulates investor-owned electric and gas utilities.

Oregon's renewable energy resources are closely tied to geographic features and climate conditions. The Columbia River cuts through the Cascade Range forming the Columbia Gorge, creating conditions which have proven ideal for wind power generation. Large dams along the river, fed by runoff from the Rocky Mountains, generate most of the hydroelectric power, not only in Oregon, but throughout the Pacific Northwest. The high desert in central and eastern Oregon is well-situated for wind, solar and geothermal energy devlopment. The mild temperatures and abundant rainfall in the western part of the state contribute to rapid tree growth, which, along with agricultural waste-products, are sources of biomass

for power generation. Woody biomass is a prevalent fuel source as a byproduct of Oregon's timber processing industry, often in the form of combined heat-and-power (CHP) facilities serving commercial applications such as industrial facilities or schools. While the state is endowed with many natural resources that support renewable electricity generation, it lacks resources in the areas of natural gas and liquid fuels; virtually all those energy supplies are imported from out of state. Figure 1 illustrates Oregon's energy flow as of 2022 including the proportion of imported and state generated power.

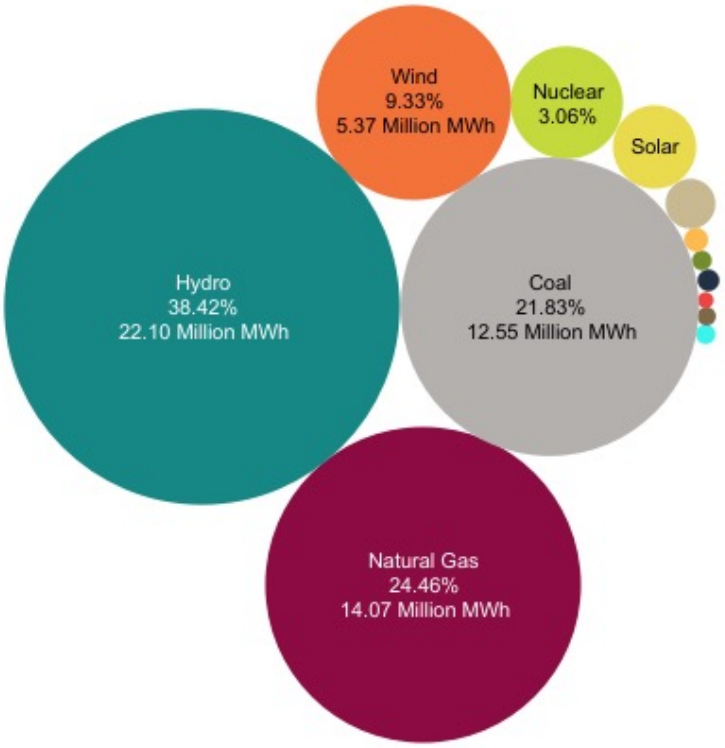
FIGURE 1: 2022 OREGON ENERGY FLOW DIAGRAM - Oregon Department of Energy



CAPACITY

Oregon's current capacity for electricity generation and natural gas has largely been able to meet demand, but the capacity for petroleum is strained. Oregon's primary source of electricity is hydroelectric power generation, and the state is one of the top three hydroelectric power producers in the nation, accounting for more than 12% of U.S. hydroelectric generation in 2022. Imported natural gas fuels are the second largest share of the state's electricity mix. The Boardman Coal Plant, located in north-central Oregon, was the state's only coal-fired power plant until it was decommissioned in 2020. As of 2021, nearly half of Oregon's current energy resources are imported through coal and natural gas. Oregon's electricity generation resources are expected to continue transitioning to a larger share of renewables as wind and solar projects come online. Figure 1 shows the 2021 distribution of the state's energy use, including generated and imported energy, by source.

FIGURE 2: 2021 OREGON ENERGY USE RESOURCE MIX - Oregon Department of Energy



The capacity of the energy delivery system is dependent on both the transmission, the infrastructure which transports power from power plants over long distances to intermediate facilities in various communities, and the distribution, the portions of the network which deliver power from those facilities into individual homes and businesses.

Additional electrical transmission infrastructure is necessary to meet future growth. Electrical transmission system has less reserve capacity than in the past, causing bottlenecks and constraints regarding operation of the grid, particularly when hydro production capacity is low. In contrast, the distribution delivery capacity is adequate to meet current demands.

For natural gas, additional transmission assets may be needed to meet future growth, whereas distribution capacity is adequate. Gas storage is limited to peak shaving facilities, meaning facilities only have enough natural gas capacity to minimize the peak electric demand but not enough to power full operations. As such, existing natural gas storage would be unable to meet the overall demand in Oregon.

Oregon has neither crude oil resources nor crude oil refineries, and as such imports 100 percent of the crude-based liquid fuels used in the state. Due to this, Oregon is dependent on the largely linear and non-redundant liquid supply chain, which has a strained capacity. Similar to larger, heavier trucks that strain older, under-capacity bridges, petroleum terminal operations involve use of marine vessels that are larger than originally intended. Some small-scale biofuel refineries exist within the State, but only serve niche markets and are not considered a significant contributor to the State's overall supply of liquid fuels.

CONDITION

Overall, Oregon's existing infrastructure is aging, but new energy projects are coming online each year, including renewable energy projects. The condition for the electricity, natural gas and petroleum infrastructure is largely controlled by the age of the assets (e.g., Puget Sound refineries and pipeline capacity).

FIGURE 3: WIND GENERATION IN OREGON
(Photo: Blaine Wruck)

For electricity, the majority of the transmission grid and equipment are greater than 50 years old, although generation and transmission capacity upgrades generally maintain these facilities in a serviceable condition. Bonneville Power Administration (BPA) owns and operates the majority of the transmission grid in the Pacific NW, including Oregon. BPA began building transmission infrastructure in the late 1930s and continues to do so today. In contrast, most renewable energy infrastructure is less than 15 years old and it is still dependent on the existing transmission grid.

The majority of natural gas transmission infrastructure was constructed in the 1960s and 1970s. When maintained properly, these assets can remain in service for many more years. Of concern is the infrastructure that is 60+ years old and the increasing expense of maintaining older facilities. Gas storage facilities in Oregon have undergone modernization projects over the past two years.

The earliest age of petroleum infrastructure dates back to the early 1900s. The transmission pipelines were largely constructed in the 1960s. A major concern for the condition of the state's fuel infrastructure is the Critical Energy Infrastructure Hub (CEI). Oregon's critical energy infrastructure (CEI) Hub is a six-mile stretch on the lower Willamette River that contains a significant percentage of the State's liquid fuel, natural gas, and electrical infrastructure facilities. Over 90% of the liquid fuel supply for the entire state of Oregon comes by pipeline or vessel into the CEI hub. The infrastructure at the hub includes electrical substations and transmission lines, 3 pipelines and 630 Tanks, and approximately 359 million gallons of oil. Of the tanks assessed in the hub, less than 2% were built after 1993 when the State seismic code was updated, 5% of the tanks are over 100 years old. Based on observations, the facilities are in poor condition and current mitigation techniques are insufficient. Most storage is on dredged fill, which is susceptible to liquefaction in the event of a seismic event.

Another vulnerable energy generation source is Oregon's hydroelectric power facilities. Many of these facilities, which were constructed primarily between 1911 to 1949, are nearing or have already reached the end of their intended useful lives and are in need of modernization to

continue capitalizing on hydrodynamic energy sources. Certain facilities are at risk of damage or failure in the event of a seismic event without significant retrofitting or replacement. For hydroelectric facilities which are prominent generators, efforts are focused towards retrofitting these facilities to improve the condition and resilience, or conducting long-range planning activities to replace the facilities in the future. Public sentiment towards dams is also shifting in recent years, as pressure for dam removals from environmental groups and tribal organizations increases. Most notably, the largest privately-owned dam removal project in the United States recently took place along the Klamath River in southern Oregon and northern California, which removed approximately 169 megawatts of generating capacity. However, most of the future dam removal proposals in Oregon are fixated on facilities that are not prominent generators toward the State's hydroelectric power capacity.

FUTURE NEED

Oregon's energy consumption reached a peak in 1999 and has since been moderately decreasing, both as a measure of total energy consumption and per capita energy consumption. From 2000 to 2020, though Oregon has had a steady population increase, the amount of total energy used in the state declined by 13.4 percent. That said, the Pacific Northwest Utilities Conference Committee (PNUCC) which annually provides an assessment of the electric utility industry in the region is anticipating a surge in demand for electricity in the next decade due to factors such as data center expansions, high tech manufacturing growth, and building and vehicle electrification. This anticipated surge in demand is currently projected to be a 30% increase over the next 10 years. Growth of this magnitude would be a significant change from the modest changes to energy demands of the past 40-years

Looking ahead, Oregon has significant opportunities for increased energy generation capacity, particularly with wind, solar, geothermal, biomass, and tidal/wave generation. Two recently adopted policies, State Executive Order 20-04 and House Bill 2021, will also push Oregon to advance the state's clean energy and climate policy and commit the state to deep decarbonization by mid-century. Executive Order 20-04 established the Climate Protection Program, aiming for significant reductions in greenhouse gas emissions by 2050, while HB 2021 mandates the elimination of emissions from electricity providers by 2040, with interim reduction targets. Additionally, in Oregon HB3630, the legislature directed ODOE to develop a State Energy Strategy. The development process began in July 2023 and has a final report due by November 1, 2025.

For natural gas, the transmission pipeline capacity is limited, but conservation and storage help offset new demand. Additional pipeline capacity and alternate sources of supply may be required to meet future demand and ensure continuity of service.

For petroleum, the supplier options and existing transmission pipeline capacity is limited. Conservation, newer and advanced technologies, and further innovation may help offset new demand. Improving conditions at existing facilities is needed. New transmission pipelines and storage facilities will be required to improve public safety and disaster resilience. Improved distribution options may also be needed.

FUNDING

Funding for energy capital projects, operation, and maintenance is largely controlled by private utilities, as well as regulators for the six investor-owned utilities. A Climate Protection Program from Oregon DEQ which adopted a cap-and-trade program for carbon was recently invalidated by the Oregon Court of Appeals, but the program is expected to move forward this year.

Regional power plants built in past decades, including hydro and fossil fuel plants, continue to provide service at legacy prices. However, new power plants and power lines are needed to serve growing energy demand and will pressure prices upward.

End-user electricity prices in Oregon are generally low with prices nearly 20% below the national average. Natural gas prices are typically comparable to the national average. However, the State's largest natural

gas and electric utilities have raised rates upwards of 15% and additional rate hikes are anticipated. Average gas prices in Oregon are among the highest in the country, nearly 16% above the national average.

Additional funding towards research into development of renewable energy and alternative fuel technologies should be sought to help refine technologies for future implementations in Oregon and abroad.

OPERATION AND MAINTENANCE

As Oregon's existing infrastructure ages and regulations change, maintaining the infrastructure's condition while complying with regulations has its challenges.

Oregon's electricity and natural gas companies generally maintain their existing infrastructure through continued prioritized maintenance and capital improvement programs, resulting in systems which are generally in adequate-to-good condition. All natural gas providers are regulated by the Oregon Public Utility Commission and must meet regulatory compliance standards to operate. The Oregon PUC regulates investor-owned electric utility rates, and enforces electric safety standards for all electric utility providers in the State.

For petroleum facilities, operations and maintenance practices vary widely depending on the owner and operator. This information is generally not publicly available and there's very little, if any, regulatory oversight.

In 2022, Oregon's electricity delivery system reliability ranked #25 of U.S. states. Oregon had 86.2% of customers with reported outages, a 10% increase over the national average that year. That said, both times-per-year and minutes-per-year of outages were below the national average. In 2022, the average outage duration was 323 minutes per year, which represents a sharp decline from 2021 when a major ice storm caused the average duration to reach nearly 1,500 minutes per year.

Despite this bounce back to average reliability in 2022, there is a trend of increasing outages year by year, both when assessed as average minutes per year, and average times per year. Most of the outages tend to be associated with weather or natural events and not necessarily with generation capacity or transmission. As such, reliability is likely to continue this downward trend as fire and climate risks become more frequent and severe.

PUBLIC SAFETY & RESILIENCE

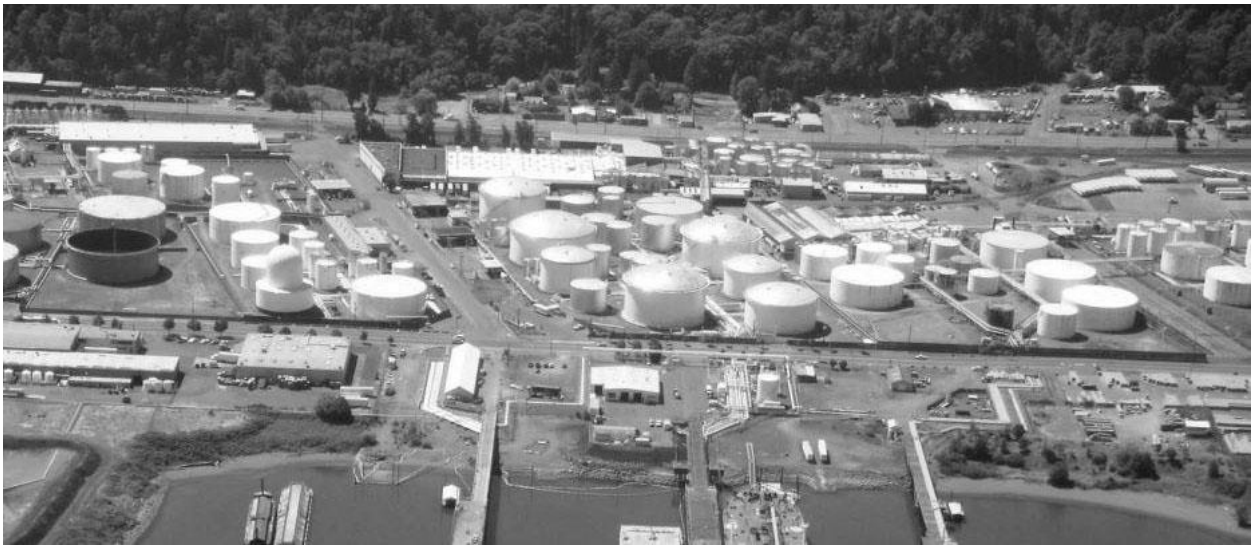
In general, the energy sector has consistently maintained a high level of public safety with normal day-to-day conditions widely considered to be satisfactory. However, with the increasing risks posed by extreme weather, climate variability, and seismic hazards, there are concerns about the public safety and resilience of our energy system.

Following direction from the Infrastructure Investment and Jobs Act (IIJA) and State Bill 1567, the Oregon Department of Energy has begun developing and implementing Oregon's Energy Security Plan. Plan development is ongoing and a draft Security Plan is currently available. A final Oregon Energy Security Plan will be completed by September 30th, 2024. The Oregon Department of Energy intends to maintain the report periodically as a living document. The Plan includes risk assessment and analysis of threats to Oregon's energy systems and aims to address some of the prior recommendations by ASCE. Hazards to be assessed in this plan include the Cascadia Subduction Zone earthquake, extreme weather events, climate variability, and man-made hazards such as cyber or physical attacks.

Natural gas transmission lines located in High Consequence Areas receive integrity assessments at regular intervals to maintain public safety. Safety designs in the network are included, such as valve control automation, which can be used to isolate areas mitigating possible negative consequences.

Natural gas transmission facilities are at risk due to natural hazards such as land movement from seismic activity. The distribution system is designed for redundancy and resiliency. Underground gas storage facilities are expected to perform adequately. Existing LNG facilities are designed to contain spills, but a return-to-service would likely take an extended period of time.

FIGURE 4: TANKS AT THE CEI HUB ALONG THE WILLAMETTE RIVER
(Photo: Multnomah County)



Petroleum is the state's most vulnerable and least resilient energy sector due to the system's low redundancy, existing conditions, and lack of seismic safety preparedness. Oregon 2022 Senate Bill 1567 gave the Oregon Department of Environmental Quality the authority to develop a program that evaluates the vulnerability of fuel tank systems to earthquakes and requires facilities to develop a plan to minimize risk. The developed rules require large capacity fuel handling facilities in Columbia, Lane, and Multnomah counties to conduct Seismic Vulnerability Assessments and develop Risk Mitigation Implementation Plans. The rules should enhance public safety and state resilience by reducing the risk of fuel spills and fires during earthquakes, thereby protecting surrounding communities and the environment. Improved planning and preparedness will also lead to more effective emergency response and resource management during disasters.

Interstate pipelines are regulated by the U.S. DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA), but the agency does not require seismic evaluations or mitigations for existing seismic deficiencies. Existing equipment and components at Portland fuel terminals used for storage and distribution are seismically vulnerable and pose significant public safety concerns.

INNOVATION

Future innovation needs to involve both increasing system capacity and resilience, and improving efficiency of existing facilities. Further advancing innovative projects involving smart grid, microgrid projects, battery storage, biofuel and possibly hydrogen fuel are warranted. Oregon has abundant opportunities for pumped storage, a hydroelectric energy storage solution consisting of two connected reservoirs, which may provide an excellent source of backup renewable energy, further enhancing grid resiliency.

Oregon is continuing to be a leader in harnessing its hydrokinetic energy resources. Since 2008, Oregon State University has been conducting research on wave energy technologies. In conjunction with OSU, PacWave is currently building the second of two open ocean wave energy testing facilities off of the Port of Newport. The existing facility, PacWave North, supports testing of smaller prototypes in state waters with streamlined permitting. PacWave South, the second facility which is currently in construction and expected to begin operations in 2025, will be the first pre-permitted and grid-connected test facility for wave technologies in the continental U.S. Primary funding for PacWave South comes from the US Department of Energy, the State of Oregon, and Oregon State University.

Energy

RECOMMENDATIONS TO RAISE THE GRADE

Oregon's energy needs will need to be met by continual updating of energy infrastructure, expansion to accommodate demand growth, and advancements to meet clean energy targets and evolving needs. Below is a list of priority recommendations that improve the eight categories: capacity, condition, funding, future need, operations and maintenance, public safety, resilience and innovation:

- Continue to invest in operations and maintenance, public safety and resiliency, including multi-hazards, Cascadia earthquake preparedness, and cybersecurity.
- Mitigate Oregon's petroleum supply chain vulnerabilities, including transmission, storage and distribution. This will improve Oregon's most significant energy sector vulnerability.
- Implement a systems approach for resilience, including for rehabilitation projects as well as new projects. As an example, evaluate life cycle costs and disaster preparedness when making decisions for components, systems, and systems-of-systems.
- Increase new investment in public safety, reliability, and resiliency of Oregon's energy sector; specifically, ASCE Standards and Manuals of Practices should be followed for the electric delivery infrastructure. Initiate new transmission projects promptly to meet anticipated demand, as these projects require significant time to become operational.
- Maintain or increase state-level incentives for research and development of renewable energy and/or alternative fuels technologies.

Energy

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Oregon Department of Energy

Northwest Power and Conservation Council

Public Utility Commission of Oregon

Oregon Department of Forestry, Biomass

State of Oregon Department of Geology and Minerals Industry, Mineral Land Regulation & Reclamation

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National Conference of State Legislatures (NCSL), Energy

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Oregon State University: OSU-led wave energy testing facility reaches key construction milestones

Inland Waterways

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EXECUTIVE SUMMARY

Oregon is home to two major waterways– the Columbia and Willamette rivers – that are used to move goods and agricultural products. In addition, there are 12 coastal harbors and waterways for Oregon's coastal ports that support cargo, commercial fishing, and recreational marinas. In 2021, waterborne commerce via Oregon's five deep draft ports was 18.6 million tons valued at $13.8 billion. Oregon's inland waterway network and harbors has sufficient capacity, and is in adequate condition to accommodate current cargo and vessel movements. Current funding has maintained the status quo and partially addressed the repair of the deteriorating jetties, locks, and pile dike structures in recent years. However, there is still significant aging infrastructure in need of repair or upgrades. For instance, there are inadequate turning basins, anchorages, and stern buoys to accommodate the larger vessels transiting the Columbia River. With industry trends to move cargo in larger and deeper draft vessels, Oregon's deep draft channels cannot fully accommodate these large vessels and will likely require additional deepening to accommodate the larger ship and remain viable in the future. The most significant risk to the waterways and harbors' continued viability would be a Cascadian earthquake's impacts. In addition to the potential blockage of the channels and harbors due to collapsed bridges, the depth of the channel would likely be compromised from the earthquake and subsequent tsunami on the coast.

In 2021, 121 million tons of exports shipped through Oregon's deep draft ports.

Oregon is the 18th largest exporter of goods in the US United States.

Over 80,000 jobs were supported by goods exported from Oregon.

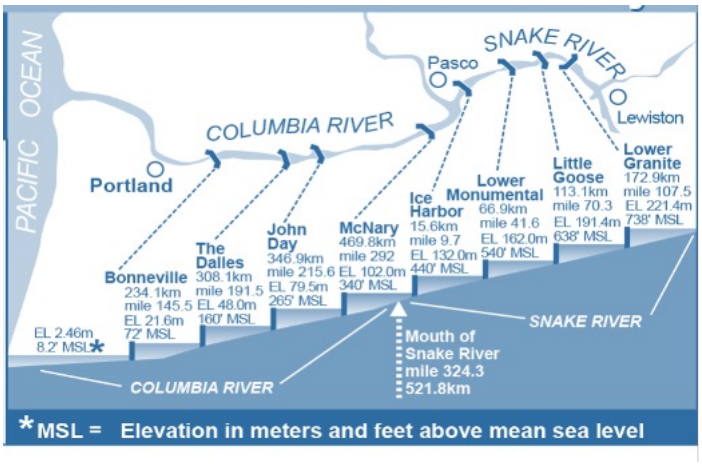
Business Oregon,
Economic Benefits and Needs of Oregon Public Ports Report
January 2024

COLUMBIA RIVER
Photo Courtesy of Port of Portland

BACKGROUND

Oregon's primary navigable waterway is the Columbia River and the lower section of the Willamette River that makes up Portland Harbor. The Columbia Snake River system is a critical inland waterway system for a large geographical area of the U.S. that includes Oregon, Washington, Idaho, Montana and Wyoming. The Columbia River is the nation's largest export gateway for wheat, the second largest export gateway for corn and soybeans, and the third largest grain export gateway in the world. It is also the West Coast leader for dry bulks, mineral bulk, wood exports, and auto imports and exports. The Columbia River trade corridor plays a significant role in the regional economy for both Oregon and Washington, supporting approximately 56 million tons of foreign trade valued at over $21 billion annually.

COLUMBIA SNAKE RIVER SYSTEM MAP
Courtesy of U.S. Army Corps of Engineers (USACE)



Deep Draft Channel Fast Facts:

- Deep Draft Channel Fast Facts:
- 105 miles, 43 feet deep from the mouth of the Columbia to Portland/Vancouver
- Over 51 million tons of international trade in 2020
- $22 billion in cargo value
- 40,000 local jobs dependent on this trade

Inland Navigation Fast Facts:

- 360 miles, 14 feet deep, Portland/Vancouver to Lewiston, Idaho
- 8 Navigation locks
- Over 8.2 tons of commercial cargo in 2020
- Over 25,000 cruise passengers in 2019

Courtesy PNWA Fact Sheet

The 12 waterways systems along the Oregon coast provide access to the Pacific Ocean for the 14 coastal ports and commercial fishing and recreational marinas located along the coastal rivers and bays. The coastal waterways include large scale jetties or breakwater structures, channels, harbors, turning and boat basins of varying depth and width needed to provide ship and boating access to the marinas and ports along the Oregon coast.

YAQUINA BAY
Photo Courtesy of US ASCE

CAPACITY

Overall, Oregon's waterways have sufficient shipping capacity for the current cargo volumes. The lower Columbia River's current depth of 43 feet is accommodating most cargo ships. Ship traffic has been consistent with approximately 1,500 vessels annually the past few years, but cargo volumes continue to increase due to larger vessels. The current channel depth is becoming a constraint for many of the larger cargo ships. Some anchorages and turning basins have yet to be deepened to 43 feet. The expansion of existing and additional turning basins is needed to accommodate the larger ships, many of which beam length exceeds the 600 ft width of the Columbia River's current channel.

There is currently no way to accurately evaluate the Columbia's waterway capacity to meet future demands. The current river data only evaluates the load and there is not a study that has evaluated all waterway systems' carrying capacities. Coos Bay's deep draft channel of 37 foot deep and 300-foot-wide channel will not be able to accommodate larger ships, however engineering and design work is progressing to modify the channel to 45 depth and 450 wide.

CONDITION

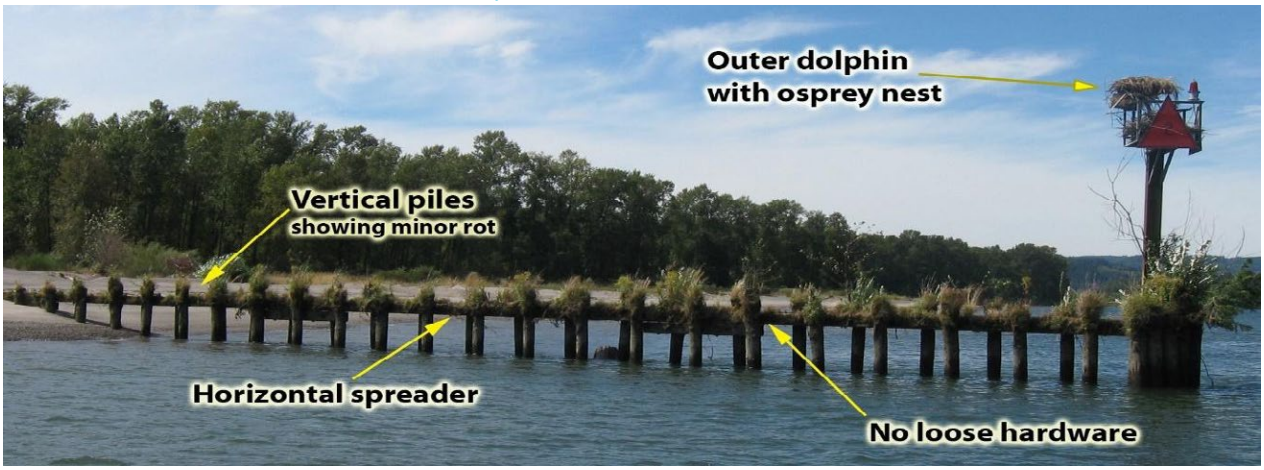
The condition of infrastructure on both the Columbia River and the Willamette River varies. In general, the Columbia River channel is in good condition, due to adequate funding appropriations in recent years for channel maintenance dredging. However, many of the deep draft channel turning basins (which are used for ships that exceed the 600-foot channel width to turn around) were not deepened to 43 feet and cannot accommodate the larger ships. Also, there are a limited number of deep draft 43-foot anchorages and stern anchor buoys along the channel that allow ships to anchor outside the channel and not restrict vessel movement in the channel. Existing dredged material placement sites are nearing capacity and new sites may be needed for the estimated 6 to 8 million cubic yards of materials to be dredged each year. Overall, the locks on the Columbia River are in good condition, primarily due to recent progress by the USACE to repair and upgrade the aging locks.

The 11.5-mile Portland Harbor on the Willamette River was not deepened to 43 feet, nor has there been any recent channel maintenance dredging in the Harbor, due to environmental restrictions for placement of hazardous sediments from the harbor. This will continue to be a constraint for the terminals in the Harbor until resolution of the Lower Willamette Harbor Clean Up project. The Willamette Falls lock is currently closed, restricting vessel movement up the Willamette River beyond Oregon City.

The USACE has been working to repair and restore the jetty structures to acceptable levels of reliability in recent years. The repair of the mouth of the Columbia River North jetty is complete and repair of the South jetty is underway. USACE has authorized funding for repair of jetties at Coos Bay and Tillamook Bay. Some progress has occurred with repair of 200 pile dike structures on the lower Columbia deep draft channel. Repairs are underway at Sand Island and funding has been authorized for Cottonwood and Skamokawa. The coastal waterways are in adequate condition but continue to be underfunded for the ongoing maintenance and repairs needs.

Good progress continues with maintenance and upgrades to the locks on the Columbia River Dams. The USACE asset management program has helped ensure adequate funding and ongoing maintenance and upgrades are planned and implemented promptly.

PILE DIKE STRUCTURE
(Photo Courtesy USACE Portland District Website



FUNDING AND FUTURE NEEDS

The funding for Oregon's inland waterways maintenance and construction is primarily dependent on the annual federal budget authorizations to the USACE and two other federal funding sources, the Harbor Maintenance Trust Fund (HMTF) and the Inland Waterways Trust Fund (IWTF). In recent years USACE funding has been sufficient for ongoing maintenance of the deep draft channels. Additional funding has been authorized to address other needs to repair jetties, pile dikes, and turning basins.

The HMTF supports dredging and other waterside infrastructure maintenance for coastal harbors but does not fund construction or major rehabilitation projects like the jetties. In recent years, the HTMF has begun to appropriate funds for their intended purposes, which had not been the case previously. Meanwhile, the IWTF supports necessary repairs to locks and dams along the nation's inland waterways and is funded by a fuel barge tax but does not fund operation and maintenance. Despite an increase in revenue from a fuel barge tax, which has helped address the significant backlog of needed projects along inland waterways, IWTF and related appropriations are still insufficient to meet needs.

Many of the ports that are local sponsors for harbor and channel maintenance projects are financially constrained and will require funding from state or local property taxes to satisfy federal funding match requirements. Business Oregon administers Oregon's Marine Navigation Improvement Fund that provides partial funding for federally authorized navigation improvement projects on channels and harbors on the Oregon coast and along the Columbia River. The fund is administered by the Oregon Business Development Department for the Oregon Infrastructure Finance Authority and funding is subject to state budget authorizations. Recent funding authorizations are well below the anticipated needs. Funding through Connect Oregon, which has been a supplemental funding source for ports, is significantly below the anticipated needs.

Significant future funding is still needed to address Oregon's waterways and harbors backlog of projects. The Columbia River Channel Deepening Project completed in 2004 spurred significant private investments in bulk handling terminals along the Columbia River and has allowed for larger ships to transit the river. But the additional improvements necessary to support the larger vessels have yet to be fully addressed. In recent years funding has been authorized to begin addressing these issues. At some point, the deep draft channel may need deepening to accommodate larger vessels.

The two USACE hopper dredges, Yaquina and Essayons, as well as the Port of Portland's pipeline dredge Oregon, perform most of the annual maintenance dredging on

the Columbia River and coastal waterways. Keeping the Columbia River channel at depth requires continuous maintenance dredging for approximately 7 months each year with annual sediment removal 2 to 3 million cubic yards. For users of the river system, it is essential that capable and reliable dredges are maintained and operated with a home base on the river system. This is not only critical to assure reliable availability of the dredges as needed, but has kept maintenance dredging costs down, an important aspect considering the extremely high mobilization cost of bringing a large pipeline dredging plant into the river system. A serious current vulnerability to the Columbia River however is that the dredge equipment that it relies on, are at or beyond their service life. The Corps dredges are over 40 years old and the Oregon is over sixty years old and at increasing risk of serious malfunctions. Funding that maintains a dredge base on the Columbia River will be critical for the future viability of Oregon's waterways.

OPERATIONS AND MAINTENANCE

Ongoing maintenance, repair, and improvements to Oregon's waterways and locks are primarily the responsibility of USACE. USACE's asset management program for its infrastructure, has improved operations and management in the inland waterway network.

The USACE and Columbia River Ports are developing the Lower Columbia River Dredged Material Management Plan (DMMP) to ensure the ongoing maintenance and operations of the Navigation Channel. This plan will address the need for future dredge material placement sites and evaluate alternatives to reduce dredging and minimize environmental impacts.

Map Courtesy of USACE Columbia River Maintenance Plan

Vessel operations on Oregon's waterways is a coordinated effort between the Corps, the Coast Guard, pilots, automated data information systems, pilots, and vessel operators. Adequate USACE funding in recent years for ongoing channel maintenance dredging and continual hydrographic surveys help ensure vessels have the authorized water depth available and waterway operations have not been adversely affected. Shallow anchorages and turning basins have created challenges for vessel operations on the deep draft channel. The Corps has begun to address this problem, but additional funding in the future is needed to improve vessels operations and address these challenges. Recent channel maintenance on coastal waterways and harbors has been adequate, but the current channel depths are becoming a constraint for larger ships to access deep draft coastal ports. Repairs to the damaged coastal jetties and aging pile dike systems which stabilize channels are in progress. Completion of the repairs to the North and South jetties on the Columbia River should also reduce shoaling and maintenance dredging needs at the mouth of the Columbia.

Closures of the locks on the Columbia for major repairs and improvements, while strategically planned to limit impacts, can significantly impact vessel operations on the Columbia inland waterway. Annual closures are anticipated in the coming years as the Corps continues to repair and upgrade the aging locks.

Height restrictions on the deep draft channel of the Columbia River for ships transiting under the Astoria and Longview bridges may become a constraint for larger ships in the future.

PUBLIC SAFETY

Other than bar conditions and commercial vessel movements can be a safety risk for recreational boating, Oregon's inland waterway conditions do not currently present a significant safety risk to the general public. Commercial shipping and investments in training and navigational technology by USACE, U.S. Coast Guard, and the Columbia River Steamship Operators' Association (CRSOA), Columbia River Pilots and Columbia River Bar Pilots, and the tug and towboat industry have increased the safety of vessel operations and movements. Recently completed repairs to the Columbia North Jetty and the repair underway to the South Jetty should help minimize the current shoaling hazard and improve vessel passage safety through on the Columbia River Bar. Damaged coastal jetties continue to be a potential hazard for safe passage of vessels transiting the coastal harbors for boaters and the fishing industry.

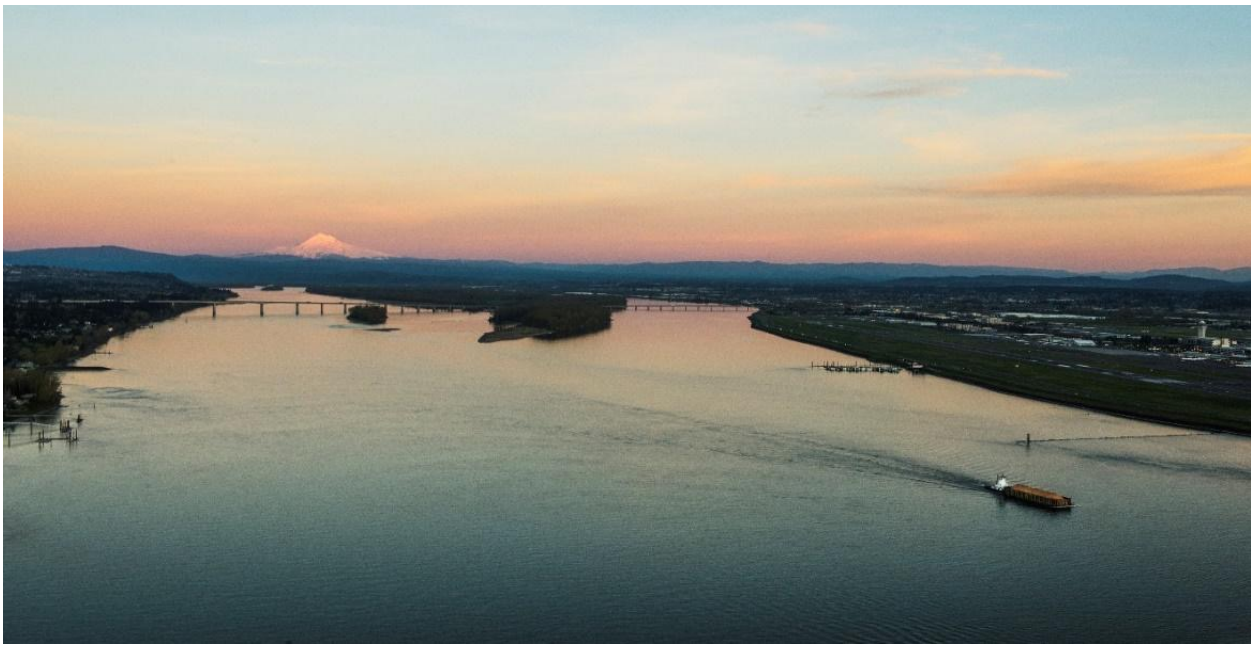
RESILIENCE

Oregon's waterways are affected by winter storms that can damage jetties and result in flooding. Flooding from storms and annual high-water spring freshet on the Columbia River results in shoaling in the channels, which if not dredged, can lead to draft restrictions for larger vessels. Ongoing channel maintenance dredging helps minimize the shoaling effects but is subject to federal funding authorizations. Repairs to the jetties are also subject to federal funding. Recent funding has been sufficient to address most storm related impacts and most storms have minimal impact on the waterways ability to resume vessel traffic. Continued investments to repair and maintain damaged jetties and pile dike structures will improve overall resilience of the waterways.

The Corps has two dredges with their home base in Portland, Essayons and Yaquina, and the Port of Portland's Dredge Oregon can be readily mobilized for emergency dredging if necessary. Catastrophic failure of these Columbia River based dredges would severely comprise efforts for ongoing maintenance or in the event of an emergency to restore the channel depth. Given the age of these dredges there is a higher risk of this occurring.

The greatest risk to Oregon's waterway systems is a Cascadia subduction zone earthquake that would create significant damage to the coastal waterways, jetties, and the 43-foot Columbia River channel. The channels will likely experience significant shoaling due to lateral spreading within the channels, and failures of pile dike structures and jetties. The coastal waterways could also be impacted by landslides and will be impacted by the resulting tsunami. Additionally, most of the coastal bridges that span the waterways are anticipated to collapse, as well as the Long View Bridge on the Columbia River. The repairs needed to resume all navigation operations could take several years. The upper Columbia River inland waterway and associated locks are significantly inland from the Cascadia subduction zone off the Oregon coast and are not anticipated to experience significant damage from a Cascadia earthquake.

COLUMBIA RIVER (Photo Courtesy of Port of Portland)



INNOVATION

The USACE continues to implement innovative materials and processes as they become available, usually after a period of testing and evaluation by the Engineering Research and Design Center. The USACE dredges and the dredge Oregon have been upgraded with more efficient pumping capabilities and state of the art controls.

There have been significant technological improvements related to data collection that have improved safety and efficient vessel movement. Transview 32 Automated Identification System (AIS) data on vessel traffic, Water Management System CWMS hydrological data forecasting, the Corps E-hydro system, and the LOADMAX numerical hydraulic analysis stage prediction tool optimizes available navigational depths and allows river pilots to plan the optimum time to move loaded vessels on the river. In addition, this technology has improved environmental and ecological planning and analysis, including hazardous material spill response and river flow management and flood warnings.

Inland Waterways

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RECOMMENDATIONS TO RAISE THE GRADE

- Increase Connect Oregon and Oregon Marine Navigation Improvement funding and allocations for Oregon ports sponsoring USACE waterways projects in Oregon.
- Promote additional USACE funding to adequately address the deteriorating jetties, pile dikes, and locks; increase Columbia River anchorages and turning basin capacity, additional stern anchor buoys; and implement coastal channels deepening projects.
- Promote and implement state and federal grants to specifically address failing infrastructure and/or seismic upgrades to critical lifeline facilities.
- Ensure Harbor Maintenance Trust Fund continues to be appropriated, and increase the amount spent on operations and maintenance of coastal harbors each year.
- Ensure full use of the Inland Waterways Trust Fund continues to be appropriated, and increase the amount spent on operations and maintenance of the inland waterways each year.
- Protect the water flows provisions in the Columbia River Treaty so navigation on the Columbia is not adversely impacted.
- Promote additional USACE funding needed to address the aging dredges and maintains a comparable dredge base on the Columbia River.
- Advocate and implement cleanup of the Portland Harbor on the Willamette River in a timely and cost-effective manner.

Inland Waterways

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Inland Waterways

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Inland Waterways

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Austin Deanhardt, Structural Engineer, USACE

GLOSSARY OF TERMS

Turning Basin, A wider body of in a canal or river channel that allows cargo ships or long narrow barges to reverse their direction of travel or turn a sharp corner. Turning basins are typically located the end of a channel or at Ports.

Anchorages, Locations outside the channels where anchors are lowered for resting ships waiting to enter ports or to transit waterways.

Stern Bouy, An anchorage buoy that securely holds the vessel's stern to prevent the vessel from turning or swinging into a channel or grounding.

Freshet, Mass delivery of water to streams and rivers due to heavy rains and/or melted snow.

Ports

C-

EXECUTIVE SUMMARY

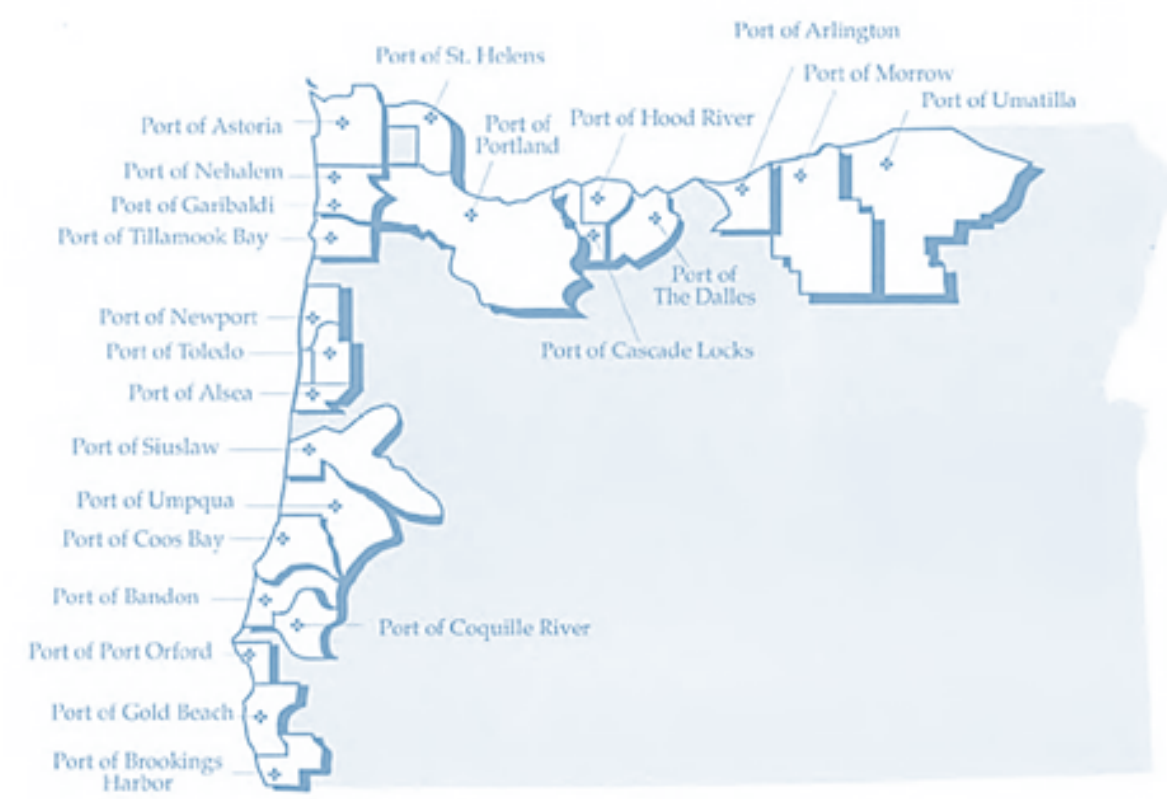
Oregon's 23 public ports are critical components of the state's multimodal freight transportation system. Its ports facilitate the movement of timber, agricultural products, and manufactured goods to regional and international markets. Each port faces unique challenges due to varying waterway conditions, surrounding transportation infrastructure, and goods shipped. The condition of port infrastructure varies from poor to good and ongoing maintenance continues to be a challenge. Funding boosts from the Infrastructure Investment and Jobs Act (IIJA) and the increased allocation to ports in the Oregon Department of Transportation's Connect Oregon initiative are helpful, but the current backlog of needed upgrades and maintenance requires significantly more funding. Many ports are operating with facilities that are decades past their design lives and which need upgrading to accommodate the current and future larger next generation cargo ships designed to meet growing demands. Many ports also face significant resiliency issues and as such Oregon may not be able to effectively respond to disasters such as the Cascadia subduction zone earthquake.

BACKGROUND

Oregon has twenty-three public ports which includes fourteen coastal ports and nine river ports on the Columbia and Willamette Rivers. In addition to the private terminals, the public ports serve as state, national, and international transportation gateways and provide recreational, commercial, and economic services to both residents and businesses within the state. Most public ports own industrial parks and commercial property, and in some instances, also operate the nearby airport. Ports are a key component in sustaining Oregon's economy and quality of life, and support thousands of family wage jobs.

Annually, imports exceeding $8 billion and exports of $5 billion traverse the state's marine ports, contributing $4.5 billion in total output to its economy. A total of 5,550 Oregonian businesses exported goods, supporting more than one out of every ten jobs - directly or indirectly. All of Oregon's ports have been incorporated as special districts and are regulated under the Oregon Revised Statutes. Most ports are run by locally elected boards of commissioners, except for the Port of Portland and the Port of Coos Bay, whose boards are appointed by the governor and confirmed by the state senate.

OREGON PORT DISTRICTS
Source: Business Oregon



Coastal ports are critical to the economic health of their surrounding communities, contributing 5,880 direct/indirect jobs and $704 million to the state GDP. NOAA's 2020 Fisheries of the United States report ranked Oregon fourth in the nation for 2020 domestic fish landings, with 335 million pounds, valued at $164.1 million. Coastal ports exported approximately 368,700 tons of wood products in 2021.

Port of Coos Bay is Oregon's busiest coastal port, and the largest deep draft coastal harbor between San Francisco and the Puget Sound

Source: https://www.portofcoosbay.com/channel-modification-project

The Columbia and Willamette River system have three 43-foot deep-draft ports and six ports along the 14-foot deep inland navigation channel. The Port of Portland imports and exports over 300,000 motor vehicles annually, making it a top West Coast automotive port. Additionally, 11 states rely on ports on this river system to process over 60% of U.S. wheat exports. Oregon's inland ports also play an important role in serving our rural communities as a point of collection and distribution for commodities and food products.

Port of Morrow is Oregon's second busiest river port. This port's location is near the Snake River mouth, and provides quick access to multiple highways and railroads as well. Access to these transportation networks makes this port an ideal place for processing goods from other states.

Source: https://www.portofmorrow.com/east-beach-industrial-park

CAPACITY

Oregon's port facilities can accommodate current shipping demands, but they risk becoming insufficient in the near future due to increasing demand on the aging infrastructure. Existing tenants of port industrial properties are expanding their operations and are anticipated to use up the remaining berth days. Further demand increase is expected from new tenants attracted by the rezoning of some vacant properties.

The age of facilities throughout the state is the most significant limiting factor on capacity. Oregon's deep draft ports have inadequate draft depth for the large modern ships when fully loaded, resulting in ships arriving and departing with partial loads to reduce the required water depth. The large vessels can generate lateral berthing loads that surpass the load capacity of these older docks, and can cause damage when ship speed is not carefully controlled while berthing. Additionally, these larger vessels exceed the dimensions that our current ship-to-shore cranes operate within. Break-bulk facilities are also in need of upgrade to meet demand to ship large cargo that does not fit in shipping containers. Our current break-bulk capabilities affect both commercial shipping and disaster response (emergency response equipment is often shipped as break-bulk, requiring berths and mobile harbor cranes), making break-bulk cargo improvements essential for Oregon's resiliency.

Recreational and commercial fishing port facilities are currently insufficient. Many marinas are near or at capacity with a limited supply of available slips. Wait times for new applicants can exceed several months. At selected ports, additional fish processing facilities are needed.

CONDITION

On the land side, most of the state's marine terminals are in relatively good shape. However, on the water side, the condition of the docks varies widely. Generally, the facilities at the larger ports are in better condition than those at smaller ports. The coastal ports reported their facilities as being in fair to poor condition. Recreational facilities are in a state of disrepair, with docks, floats, and piles needing extensive repair.

Some ports have improved and modernized their facilities through federal and state grants and the passage of local bond measures. However, the ability to maintain and replace outdated facilities is an ongoing challenge and the condition of many facilities is expected to continue deteriorating. Most port facilities were constructed more than 30-years ago and have reached the end of their expected design lives. Some facilities are operating with docks that are 80 or more years old, far exceeding useful design life. These older structures struggle to meet modern live loads often requiring strengthening with new steel or concrete piles and other berth improvements. Most of these older structures were constructed from wood, and the condition of their pilings and mooring structures require ongoing attention. The escalating maintenance and current regulatory requirements of marine facilities continues to be a major challenge.

Port Westward Beaver Dock showing its age. This wood structure is over 80 years old and is challenged by horizontal loads from large ships and unknown seismic resiliency. With two berths and deep drafts varying in depth from 45-ft to 73-ft, this 1,600 feet long dock is used to load over three million barrels of renewable fuel per year. Renewable fuel production at this rural facility is expected to increase significantly making it essential to Oregon's fuel network.

Port Westward Beaver Dock

Source: https://www.portofcolumbiacounty.org/business-and-development/page/port-westward-industrial-park

FUNDING AND FUTURE NEED

Oregon ports receive property taxes from residents and businesses within the port districts. Revenue from leases, dockage fees, and other fees make up the rest of the revenue the ports collect. In general, revenue does not cover the costs to adequately maintain or modernize port cargo facilities. Most port districts rely on grants from federal and state programs to fund modernization or expansion efforts. Although most ports have received these competitive awards, the available funding from federal and state investment programs is insufficient to meet all the anticipated needs. Often, ports compete for limited grant opportunities, and smaller ports are particularly challenged due to requirements for matching funds from the local level.

Recently, approximately $160 million from the Infrastructure Investment and Jobs Act (IIJA) was allocated to Oregon ports, $70-million of which is through the Port Infrastructure Development Program. Business Oregon manages two funds for port infrastructure improvements, the Port Planning and Marketing Fund and the Oregon Port Revolving Fund. Harbor and berth dredging needs are supported through the Harbor Maintenance Trust Fund, and Business Oregon provides

support through the Oregon Public Ports Dredging Partnership. Connect Oregon, managed by ODOT, has typically awarded about $13 million per biennial round to ports, or roughly 20% of total funds. There have been eight rounds of Connect Oregon funding since its start in 2005. This latest round dedicated more funds to ports, moving the categories of multimodal transit, bike, and pedestrian to other funding sources. With this change, ports received nearly $25 million, or 54% of the $46.2 million total funds in this round of funding. For ports with marinas, the Oregon State Marine Board funds roughly $10 million per biennium in grants.

Funding is improving, but the needs still exceed fund allocations to ports. According to a Business Oregon report on the economic needs of ports published in 2024, the total port infrastructure needs exceed $500-million. The current funding available to ports is significantly more than what has been offered previously, but it still falls short of the huge need created by thistoric underfunding.

The clean up of the Portland Harbor Superfund Site also presents a financial challenge for the Port of Portland and the terminals located along the Portland Harbor. Approximately 3-million cubic yards of contaminated sediment needs to be addressed over a 4.4 mile stretch of riverbank. With an estimated cost of $1-billion over 30-years, funds for this project will be challenging for the Port of Portland, City of Portland, and all other responsible parties.

OPERATIONS AND MAINTENANCE

Most marine facilities are able to sustain day-to-day operations. However, berth and slip maintenance continues to be a serious challenge due to aging infrastructure. Many of the state's facilities have exceeded their design lives and require ongoing repairs. Funding constraints often prohibit proper replacement, resulting in minimal "band-aid" repairs.

Due to ever-changing weather conditions and their impacts on waterways, berth maintenance costs are difficult to budget for. In-water work is complicated by the regulatory processes driving up costs and extending schedules.

PUBLIC SAFETY

Public marinas are subject to Oregon State Marine Board oversight which helps them maintain public safety. This said, the aging docks at recreational facilities present trip and fall hazards.

Most commercial marine facilities are located within and adjacent to industrial areas not frequented by the general public. On the other hand, while port tenants, operators, and contractors adhere to OSHA and other safety protocols, outdated facilities present an enhanced safety risk. Additionally, coastal ports with wave attenuators that are in poor condition create hazardous waves at docks.

RESILIENCE

Oregon's coastal ports are subject to the unique climate patterns of the Pacific Ocean. Sea levels can elevate for months during El Niño weather events, generating damaging high waves, storm surges, and flooding of coastal rivers. Sea level rise in the coming decades is anticipated to create more flooding at the coastal ports. Additionally, a Cascadia subduction zone earthquake will cause parts of the coast to drop 3 to 8 feet in elevation and relative sea level to suddenly rise, compounded by the resulting tsunami. Inland ports are subject to less severe storms than coastal facilities, but flooding events can affect the Columbia River ports.

Most of the port cargo facilities were not designed to withstand current earthquake standards. A Cascadia subduction zone earthquake would have significant impacts to the coastal ports and the lower Columbia River ports. Seismic upgrades have been implemented for a few facilities, but most ports' seismic resilience is unknown. Oregon Senate Bill 1567, passed in 2022, requires seismic assessments of docks and other critical fuel infrastructure. However, current funding is not adequate for the upgrades to meet the anticipated recommendations from these studies.

With unknown resiliency throughout our port facilities, which are critical to emergency response and recovery of operations, planning for inaccessible ports following a significant seismic event is essential. Until facilities have been upgraded to withstand seismic events, stockpiling key resources such as floating docks and Bailey bridges and identifying beach landing sites for naval vessels that do not require port facilities would ensure some emergency response capabilities regardless of port conditions.

INNOVATION

Ports that have constructed new facilities are being engineered with the innovative techniques, materials, and technologies that are within project budgets. Some ports have implemented innovative stormwater treatment features, such as the use of permeable pavements at auto storage yards in lieu of conventional stormwater collection methods. Recycled plastics are used for some marine applications. Soil additives are used to retain moisture at wetland mitigation sites, minimizing watering needs for new plants during the summer months. Some coastal ports host facilities for power generation from waves and offshore wind, and the Port of Newport is home to research facilities of the National Oceanic and Atmospheric Administration (NOAA) and Oregon State University's Hatfield Marine Science Center. Renewable diesel and sustainable aviation fuel refineries and storage tanks are located at some Oregon ports.

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Ports

RECOMMENDATIONS TO RAISE THE GRADE

- Continue to increase federal and state funding for ports to address outdated and failing infrastructure and the maintenance backlog.
- Provide additional funding mechanisms for ports to meet the local fund matching requirements of federal grant programs.
- Prioritize projects that improve resiliency at port facilities critical to Oregon's disaster response and recovery. Plan locations for temporary docks and other structures for immediate response to a Cascadia subduction zone seismic event.
- Formation of connections and collaboration among ports and other state agencies to efficiently utilize limited resources.
- Develop consistent approach of land use and regulatory processes and assist ports with limited resources in navigating the complex regulations and permitting processes for their projects.
- Ensure funding to maintain and expand container service.

Ports

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Roads

C

EXECUTIVE SUMMARY

While Oregon's public road system is considered well-functioning, recent data suggests that there is significant room for improvement. Oregon public agencies have nearly 80,000 public roadway miles to maintain to facilitate the safe transport of people and goods. Of the roadways in the state's network, over 25% have Poor pavement condition, while local agency-managed roadways have less than 20% in Poor condition. This marks a decline in condition from the 2019 Report Card, when less than 10% of pavements were in Poor condition, despite average Vehicle Miles Traveled (VMT) remaining nearly the same. Emphasis on safety improvements is warranted, as the reported crash history on Oregon's public roads from 2017-2021 indicates an average annual increase of 33 vehicular fatalities per year, while pedestrian fatalities increased by three per year on average. This increase has resulted in 599 deaths in 2021 compared to 439 deaths in 2017, representing a 36% increase in fatal crashes during this period. Investments into over 140 transportation projects over the last five years were initiated via House Bill (HB) 2017. As this funding expires, many public agencies across the state anticipate funding challenges in the near future. Swift action is needed by legislators and transportation agencies in order to address shortcomings in safety, preservation, and maintenance of roadway infrastructure, while also accommodating sustainability and equity concerns to achieve a better quality of life for all residents and visitors of Oregon.

CONDITION & CAPACITY

Within Oregon, there are approximately 79,523 miles of public roads, according to the Oregon Department of Transportation's (ODOT) 2022 Oregon Mileage Report. State, Federal, and local government jurisdictional entities are responsible for operations and maintenance of these roadways. A summary of the public road centerline mileage in Oregon by jurisdiction is presented below in Table 1.

Most of Oregon is made up of rural communities with relatively low population densities and sparse road networks. The majority of centerline miles in the state are rural roads, including county roads, rural state highways and roads on Federal lands. Total county road mileage in the state comprises about 34% of public road centerline miles, while city road mileage makes up only 14%.

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TABLE 1. SUMMARY OF PUBLIC ROAD MILEAGE BY CENTERLINE MILES.

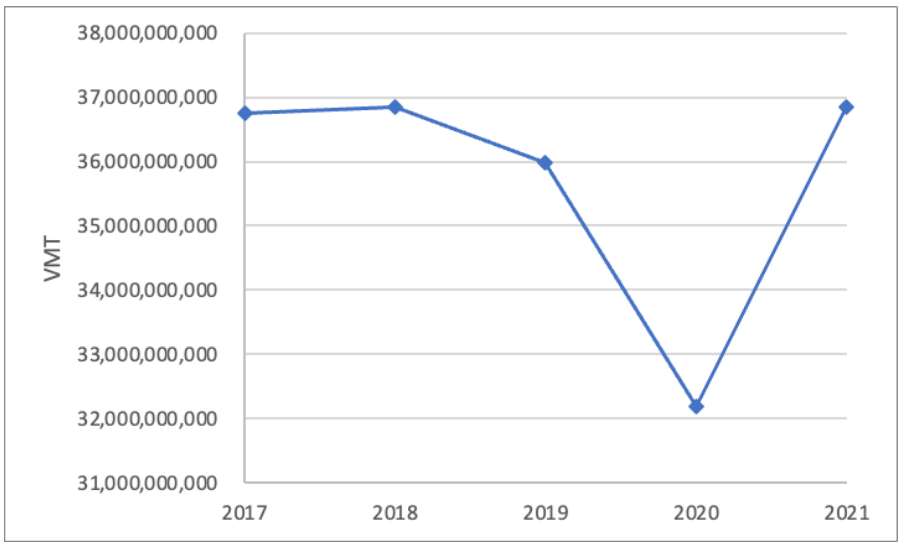
Type	Jurisdiction	Mileage	Percentage
State Highway	Oregon Department of Transportation (ODOT)	7,242.90	9.1%
Federal Highways (Interstates)	Oregon Department of Transportation (ODOT)	729.56	0.9%
Local Agency	City	11,408.60	14.3%
	County	26,749.49	33.6%
	Local Access	5,949.98	7.5%
Federal Agencies	Bureau of Land Management (BLM)	18,815.53	23.7%
	U.S. Forest Service	5,707.10	7.2%
	Other (Military, U.S. Army Corps of Engineers, National Park Service)	529.29	0.7%
Tribal Governments		1,750.58	2.2%
Other State (Fish & Wildlife, Campus, Parks, etc.)		639.97	0.8%

Oregon's population is concentrated within metropolitan areas. Some 52% of Oregon's population is located within the three largest metropolitan regions of Portland, Salem-Keizer, and Eugene-Springfield. Oregon's main population center, the Portland metropolitan area, accounts for approximately 47% of the state's population, while only accounting for approximately 15% of the total road network by centerline mile.

The state highway system in Oregon is managed by ODOT. There are five regions within the state of Oregon, with Region 1 encompassing the whole of the Portland metro and surrounding areas and making up approximately 11% of the state highway network.

Oregon has 4.4 million registered vehicles and 3.6 million licensed drivers. VMT levels have remained relatively consistent from 2017-2021. Due to the COVID-19 pandemic, VMT dropped drastically in 2020; however, VMT has recovered to pre-Covid levels. Figure 1 summarizes VMT in Oregon between 2017-2021.

FIGURE 1. SUMMARY OF OREGON VMT BY YEAR.



The peak congested areas are in the Portland metropolitan area. In 2022, this area ranked 22nd in total congestion cost and 15th in cost per auto commuter out of all large U.S. urban areas, according to the Texas A&M Transportation Institute's Urban Mobility Report, with $1,616 per individual commuter for travel time delay and excess fuel consumption per year. Causes of congestion in the state vary by region and roadway context.

ODOT's 2022 Oregon Statewide Congestion Overview summarizes the level of congestion on the National Highway System (NHS) in several key areas in the state. This information is presented in Table 2 below.

TABLE 2. CONGESTED NATIONAL HIGHWAY SYSTEM (NHS) LANE MILES BY REGION, 2019 AND 2021 (Courtesy of 2022 Oregon Statewide Congestion Overview).

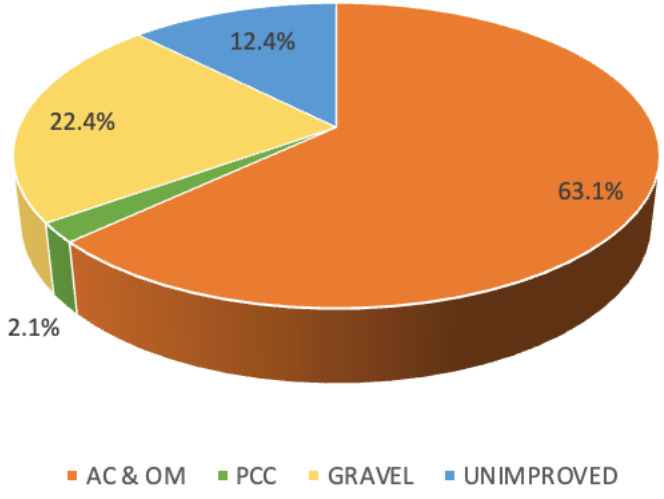
Region	Total NHS Lane Miles	Congested Lane Miles 2019	Congested Lane Miles 2021	Percent Change between 2019 and 2021
Albany	93	3.9	3.3	-17%
Bend	76	4.0	4.1	2%
Corvallis	59	0.6	0.6	0%
Eugene/Springfield	199	16.5	13.4	-19%
Grants Pass	169	3.5	4.7	32%
Medford	253	0.7	2.4	257%
Metro	1,070	400.8	246.5	-38%
Salem/Keizer	190	17.8	14.0	-21%
Other Urbanized	1,125	15.1	13.5	-11%
Rural	7,877	31.4	20.0	-36%
Total Oregon National Highway System (NHS)*	11,111	494.3	322.4	-35%

*Excludes lane miles in Oregon that are part of Longview and Walla Walla MPOs in Washington

Note: Metro = Portland metropolitan area.

Public roads in Oregon are surfaced with different materials depending on roadway classification, volume, and other location-specific factors. Figure 3 below shows the average proportion of surfacing types for all public roads in the state.

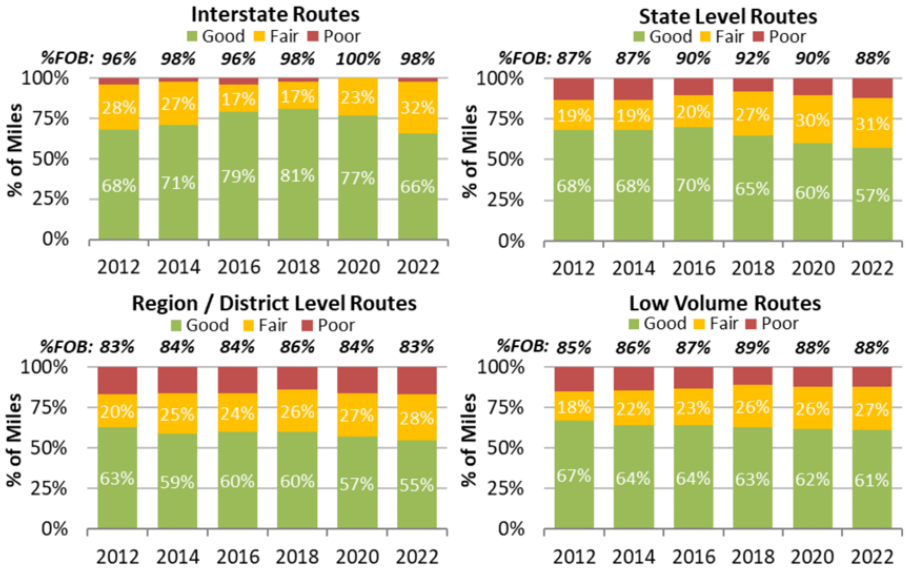
FIGURE 3. AVERAGE PERCENTAGE OF PUBLIC ROAD SURFACING TYPES (AC = Asphalt Concrete; OM = Oil Mat; PCC = Portland Cement Concrete).



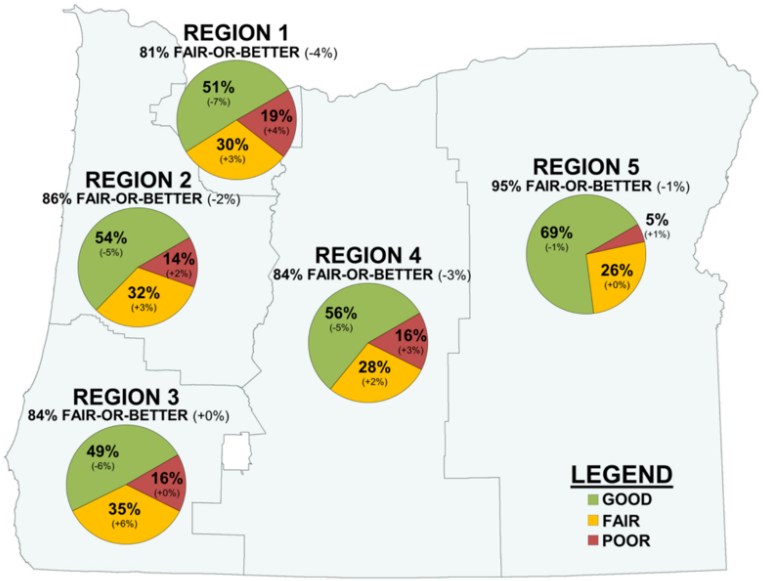
Pavement condition information is regularly collected and updated by road officials within each agency or jurisdiction, including local agencies. State and federal highway pavement conditions, which are operated and maintained by ODOT, utilize the Good-Fair-Poor (GFP) rating system. ODOT reports this information on a biennial basis in the State Pavement Condition Report. On the state and federal highway system, the pavement condition by GFP category is summarized below in Figure 4.

FIGURE 4. SUMMARY OF PAVEMENT CONDITION ON STATE AND FEDERAL HIGHWAYS IN OREGON BY (A) HIGHWAY CLASSIFICATION AND VOLUME AND (B) ODOT REGION

(Infographics Courtesy of ODOT 2022 State Pavement Condition Report).

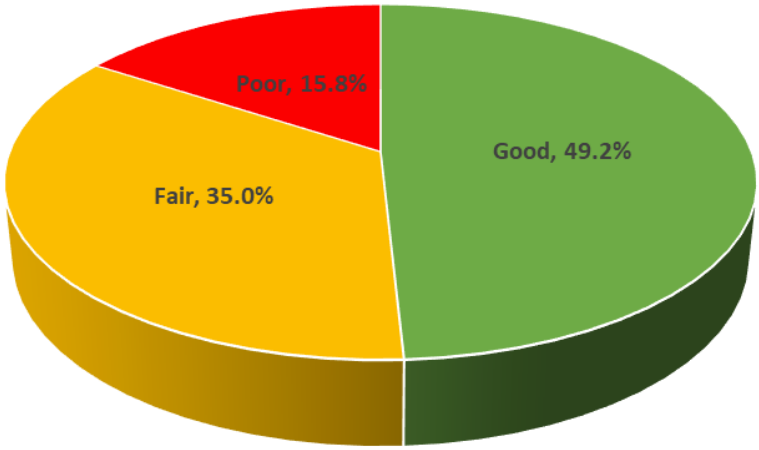


(a)



(b)

FIGURE 5. AVERAGE CONDITION OF LOCAL AGENCY FEDERAL-AID ROADS.



Agencies use pavement condition information to make informed decisions about pavement maintenance and rehabilitation. Preservation treatments applied at the optimum time can prolong the life of pavements and help agencies avoid more costly repairs if conditions are left to decline. Chip seals are a common pavement preservation strategy that are employed by ODOT and several local agencies to maintain the surface condition of asphalt pavements on rural highways.

CYCLISTS ENJOY A FRESH CHIP SEAL APPLIED TO SKYLINERS ROAD NEAR BEND, OR (Photo courtesy of Deschutes County, OR)

Other third-party organizations track pavement conditions within Oregon. Third-party data analysts such as the national transportation research group (TRIP) report that approximately 26% of major roads in Oregon have a condition of Poor or Mediocre. According to TRIP, Oregon motorists pay $266 per person in extra vehicle repairs and operating costs due to driving on roads in need of repair. This is a cost of $780 million per year for Oregon motorists.

OPERATIONS AND MAINTENANCE

ASPHALT PAVING WORK OCCURRING ON NORTHEAST NEGUS WAY NEAR REDMOND, OR (Photo courtesy of Deschutes County, OR)

Substantial investment is required (approximately $280 million per year) to make major repairs on routes with poor pavement conditions, while providing for timely preservation and maintenance. Even without considering inflationary effects, funding levels have fallen well short of this target. Between 2012-2021, funding levels averaged $140 million per year, which was sufficient to keep up with less costly pavement preservation and maintenance projects, but not major repairs. Funding from HB 2017 has stimulated investment in transportation infrastructure, but this funding expired in 2024 and there has not yet been another transportation bill introduced. Without additional funding for the Statewide Transportation Improvement Program (STIP) and maintenance programs, adequate funding for new projects and the optimal maintenance of state highways is uncertain.

ODOT regularly projects anticipated asphalt paving by year, which is a metric that gives insight to the amount of pavement rehabilitation that occurs annually. In the most recent projections, asphalt tonnage is anticipated to increase by 36% in 2024 compared to 2023. While this is encouraging, budget projections do not support an anticipated increase in future years. As such, additional funding needs to be implemented to maintain this level of tonnage placement.

Pavement preservation and maintenance efforts are also hampered by rapidly rising construction material costs. According to the Oregon Association of County Engineers and Surveyors (OACES), the Construction Cost Index, which is a metric used to assess the changes in cost of construction materials over time, has risen 44% since 2017. This sharp increase in construction costs results in agencies having to drastically reduce or eliminate planned preservation and maintenance projects in their capital improvement plans.

Snow removal can be difficult for municipalities to accomplish due to a lack of adequate equipment, personnel, or funding. Some rely on ODOT for the removal; however, ODOT has publicly announced that winter operations and maintenance is expected to decline, especially in the rural part of the state. Also, with decreasing revenue and increases in costs, a further reduction in winter maintenance can be expected.

Drivers in Oregon often install studded tires on their vehicles for winter travel. While this provides a safety benefit, it can also have severe impacts to the condition of pavements in the state. ODOT and other local agencies have identified wheel path rutting due to studded tire wear as the most prominent pavement distress in certain regions of the state, particularly east of the Cascade Mountain Range. Investment in winter weather driver education should be considered as an alternative to studded tires in the future to help alleviate expenditure of maintenance funds on this issue.

In a 2016 transportation needs study of its members, the League of Oregon Cities determined that $3.7 billion was needed to fully address the street and road maintenance needs of Oregon cities.

ROAD BASE PREPARATION WORK OCCURRING IN CORVALLIS, OR
(Photo courtesy of Levi Warriner)

FUNDING AND FUTURE NEED

Oregon is just now beginning to bounce back from impacts to its funding sources during the COVID-19 pandemic. The increase in projects we have seen over the last five years primarily stems from the Keep Oregon Moving Law, and Infrastructure and Investment Jobs Act (IIJA) funding sources.

ODOT manages funding through its STIP for projects on both state and federal roadway facilities, with an operating budget of about $6 billion. for the 2023-25 biennium. It is through this program that local agencies apply for funding if they have the administrative staff to submit applications or see the project through to completion.

Since the state's last report card, the tax rate on a gallon of gas has increased by 6 cents, which is on track with the two-cent annual increases set forth in HB 2017. From this increase, the state has seen an 8% growth in fuel tax revenue. As of now, 2024 is the last year the state anticipates seeing an increase in gas tax revenues. Unfortunately, the immediate and long-term solutions to address transportation safety and roadway maintenance backlogs are uncertain without additional transportation funding from legislative action.

The Federal Highway Administration (FHWA) is responsible for managing and distributing IIJA funding and has estimated $3.4 billion will go to Oregon over the five-year investment period. Of this, over $1.8 billion has been obligated for agencies in Oregon between 2021-2023, a 30% increase in federal funding in just the last two years. Several projects are underway from federal funding related to the IIJA; however, many of these projects are not expected to be complete for several years.

The Oregon Transportation Commission has distributed $412 million of IIJA funding to programs that improve the building and maintenance of roads, sidewalks, and bridges, that increase community safety and accessibility.

The state's department of transportation faces a significant long-term deficit in their operations and maintenance (O&M) budget. O&M includes highway maintenance activities like patching potholes, plowing snow, and other day-to-day operations. The roughly $4 billion O&M budget also pays for the Department of Motor Vehicles (DMV), truck safety and regulation, and administrative functions. The state says that the IIJA funding helps address increasing staffing costs for delivering federally funded projects and will help cover the cost of some O&M programs currently funded by state dollars, partially offsetting negative impacts and reducing future cuts to maintenance and operations programs.

The increases in federal funding do not keep up with ODOT's operational costs, which are increasing at about 6% annually, while total revenues are only growing at 2%. The state estimates the gap between revenues and expenditures will create a $720 million budget deficit by 2027 if we do not implement diverse long-term funding solutions now.

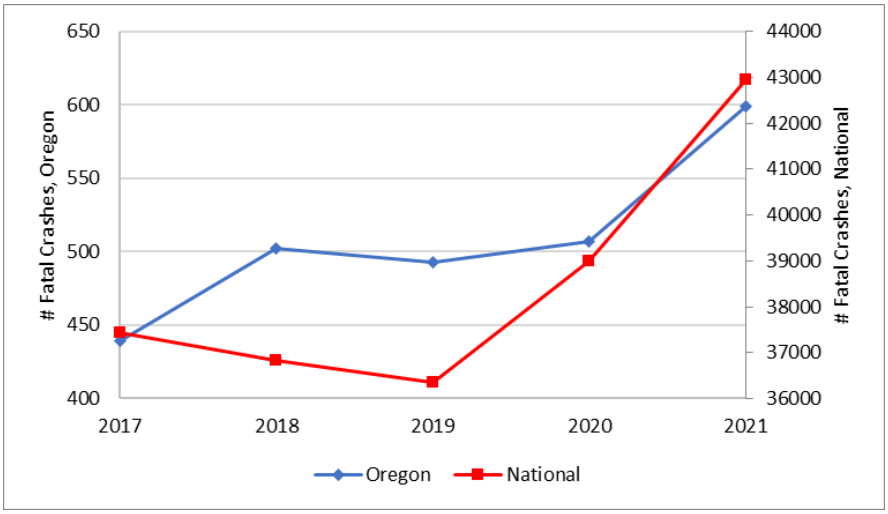
The IIJA and HB 2017 are some of the larger funding bills that have helped the state make progress in upgrading the condition and capacity of its facilities for people commuting across Oregon, with over 140 HB 2017 projects completed and IIJA projects underway or anticipated within the next five years. Even with this progress, these funding sources are not enough to get to, or maintain, a state of good repair given current financial forecasts.

The percentage of poor pavement miles along Oregon's roadways will double in the next decade if we continue to neglect the care of this vital state asset. The statewide pavement condition report estimates an annual need of $280 million dollars.

PUBLIC SAFETY

In the five-year period between January 1, 2017 to December 31, 2021, there were a total of 192,559 fatal crashes nationwide, according to the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS). Of these, 2,540 occurred in Oregon, accounting for approximately 1.3% of the nationwide total. Oregon's total fatalities for the five-year period, and represent an average of approximately 508 fatalities per year. The year-to-year fatal crash data for the above-mentioned time period is shown below in Figure 6.

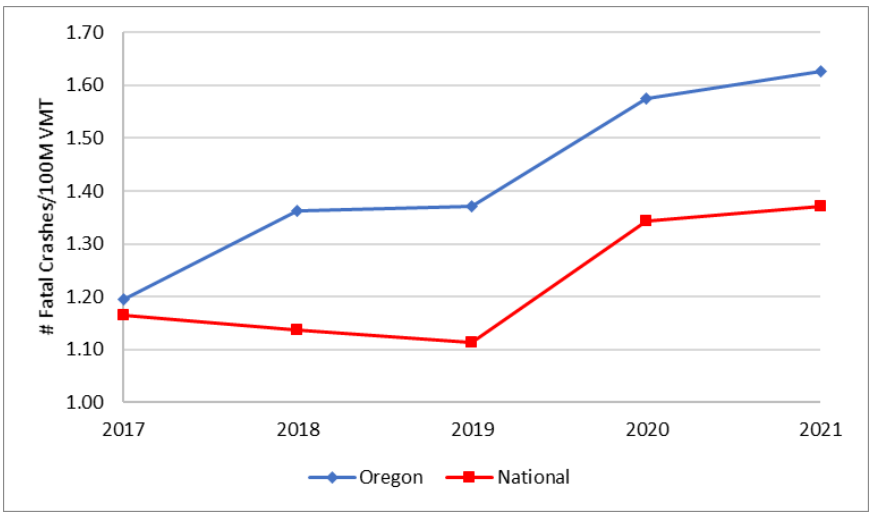
FIGURE 6. REPORTED FATAL CRASHES, 2017-2021.



As shown above, the number of fatal crashes in both cases generally trends upward over the five-year period. Oregon's fatal crash trend represents an average increase in annual fatalities of approximately 33 per year.

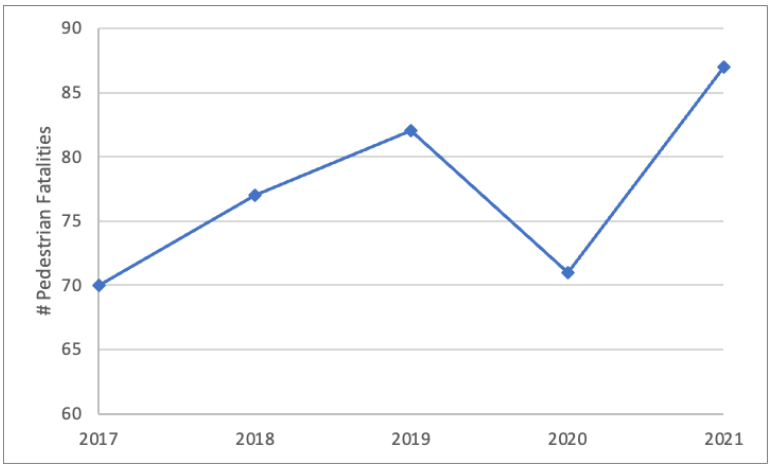
Normalizing the fatal crash data by VMT allows for meaningful comparison to national average fatal crash statistics. Figure 7 shows the five-year fatality data for Oregon and nationwide normalized by VMT.

FIGURE 7. REPORTED FATAL CRASHES PER 100 MILLION VMT, 2017-2021.



Unfortunately, there has also been an increase in fatalities for vulnerable road users (e.g. pedestrians and bicyclists). Between 2017-2021, the average number of pedestrian fatalities has increased by three per year. The pedestrian fatality data for years 2017-2021 is summarized below in Figure 8.

FIGURE 8. REPORTED PEDESTRIAN FATALITIES, 2017-2021.



Since a high proportion of fatal and serious injury crashes occur at intersections, many agencies in the state, including ODOT and local agencies, are responding by reconfiguring intersections to promote multimodal safety. Roundabouts are a common strategy to reduce crash frequency and severity, since they tend to slow vehicle speeds on approach and reduce vehicle conflict points by a factor of four. According to ODOT, installation of a roundabout can result in a 90% reduction in fatal crashes at a given intersection. ODOT has constructed more than a dozen roundabouts on the state highway system, and local agencies have also adopted roundabouts as an intersection improvement strategy. Other intersection improvement strategies are chosen based on site conditions and roadway context.

CONSTRUCTION OCCURRING ON A TWO-LANE ROUNDABOUT ON U.S. ROUTE 20 NEAR BEND, OR
(Photo courtesy of Deschutes County, OR)

A UNIQUE SIX-WAY INTERSECTION IMPROVEMENT ON OLD BEND-REDMOND HIGHWAY NEAR REDMOND, OR
(Photo courtesy of Deschutes County, OR)

Oregon has also made strides to address the increasing fatality rate through integration of Intelligent Transportation Systems (ITS) features along public roads. Dynamic speed feedback signs are being implemented on public roads to address speed-involved crashes, and improvements to pavement markings and roadside delineation also contribute to reducing roadway departure crashes. With its bicycle and pedestrian facilities, Oregon also strives to improve vulnerable road user safety through improved geometric design, traffic calming, and mode separation. These types of improvements are commonly implemented on both state and local agency-managed facilities.

State funding initiatives promote safety improvements along roadways in Oregon. Several competitive funding opportunities are available to local agencies for roadway safety improvements, including the All Roads Transportation Safety (ARTS) Program, which provides recurring funding to local agencies on a five-year interval. The Safe Routes to Schools (SRTS) funding program also promotes improvements on roadways and pedestrian facilities near schools. These funding opportunities are utilized heavily by local agencies, with a total of $123 million in improvements funded within their last funding cycles.

RESILIENCE AND INNOVATION

Oregon's unique geography and variety of climates present challenges for road maintenance, especially when faced with natural disasters. Given Oregon's disparate climates, heavily forested areas and unique geology, natural disasters such as earthquakes, landslides, wildfires, and severe winter weather events can threaten principal highway connections between regions in the state. For example, highways connecting communities along the Oregon coast to the metropolitan centers are termed as "lifeline highways" and are a key consideration for ODOT when planning maintenance and improvement budgets. Repairing damage to these important facilities can strain funding and over-exert construction crews when disasters occur.

A STABILIZED ROCK SLOPE ALONG U.S. ROUTE 20 NEAR EDDYVILLE, OR
(Photo courtesy of Blaine Wruck)

Perhaps the most imminent and anticipated threat are earthquakes related to the seismically active Cascadia Subduction Zone west of the Oregon coast. In response to this threat, the state has developed the Oregon Resilience Plan, organized by the Oregon Seismic Safety Policy Advisory Commission (OSSPAC), which outlines pathways to respond to a catastrophic seismic event. This plan identifies likely impacts caused by an earthquake, outlines necessary timeframes for repair of critical infrastructure, and recommends policies and initiatives that agencies should consider to safeguard communities. With respect to roadway infrastructure, the plan encourages capital investments in key areas that are prone to damage in the event of a seismic event. These include slope stability improvements, soil liquefaction mitigation, and foundation improvements for roadway structures and appurtenances. Overall, the plan prioritizes roadway facilities and regions that are most vulnerable in order to optimize phased seismic improvements over a 50-year period.

Additionally, partnerships between contractors

and agencies are being formed to improve disaster response. The Asphalt Pavement Association of Oregon (APAO), a non-profit trade organization, has spurred discussion between asphalt paving contractors and agencies regarding how to best respond to disaster events with the goal of restoring damaged roadways as quickly as possible. APAO encourages agencies to build relationships with their local contractors and have a plan for disaster response, including how to mobilize equipment and material to repair roadways in short order. Agencies are also encouraged to cooperate with one another and share resources in order to optimize their timing and performance of critical maintenance in response to severe weather events or natural disasters. Many local agencies currently employ this practice, but continuing these partnerships will help ensure the transportation system can meet demands in the face of environmental challenges.

THE HISTORIC COLUMBIA RIVER HIGHWAY CORRIDOR AFTER A WILDFIRE NEAR CASCADE LOCKS, OR
(Photo courtesy of Blaine Wruck)

Oregon dedicates funding to transportation research and implements pilot projects to test innovative approaches to roadway construction. In pursuit of a safer state highway network, ODOT has implemented or programmed multiple projects that leverage new or unique designs and traffic control devices that may not be common in other areas of the county. For example, ODOT constructed the state's first Diverging Diamond Interchange (DDI) on Interstate 5 in Phoenix and has planned another DDI implementation in Aurora, where construction is expected to begin in 2024. ODOT has also constructed or programmed at least six roundabouts on the state highway system, most recently on U.S. Route 20 in Deschutes County, where multilane roundabouts replaced conventional stop-controlled intersections with a history of fatal or serious injury crashes.

The state is home to one of seven national University Transportation Centers funded by the U.S. Department of Transportation (DOT), the Transportation Research and Education Center at Portland State University, which has the goal of conducting interdisciplinary research on transportation issues. ODOT also commonly invests in research with public and private universities through the Statewide Planning and Research (SPR) Work Program. Oregon State University has participated in dozens of SPR research projects in recent years, and this program is expected to continue in the future.

Oregon also implements FHWA's Every Day Counts initiative for pavement, roadway design, and construction innovations. ODOT is part of a pooled fund study that includes intelligent compaction, thermal profiling, ground-penetrating radar, and pavement smoothness.

Due to diminishing fuel tax returns from more fuel efficient and electric vehicles, in 2015 Oregon created the first in the nation pay-per-mile program called OReGO Drivers pay for the miles they drive instead of gallons of fuel consumed. The money goes into the State Highway Fund for construction and maintenance of roads and bridges. Currently, there are 2,100 vehicles enrolled in the voluntary program.

ODOT has also implemented the Innovative Mobility Program to improve underserved communities' access to public and active transportation. The goal of the program is to reduce the number of trips Oregonians make by car as well as greenhouse gas emissions. "Microgrants" are available to local, regional, tribal, and state governments, school districts, non-profits, and transportation providers. The grants are awarded up to $15,000 for new and existing projects to support historically underserved communities. Examples include reduced or free transit fare and the purchase of bicycle safety equipment, such as helmets, locks and lights.

Roads

RECOMMENDATIONS TO RAISE THE GRADE

The key elements that need to be addressed in Oregon are as follows:

- Increase funding through legislative mechanisms that will secure revenue for transportation safety improvements on state and local agency roadways.
- Address congestion in metropolitan areas.
- Prioritize and carry out multi-faceted approaches to address roadway maintenance and preservation at both the state and local agency levels.
- Obligate funding to optimize operations and maintenance of existing facilities, particularly seasonal maintenance.
- Seek opportunities to form public-private and interagency partnerships to promote resilience in the event of natural disasters.
- Promote investment in new transportation technologies that will improve the safety and sustainability of Oregon's public road systems.
- Phase out sale of studded tires and educate on alternatives, such as winter weather driver education.
- Educate public on the use of new intersection and roadway safety improvements which may be unfamiliar.

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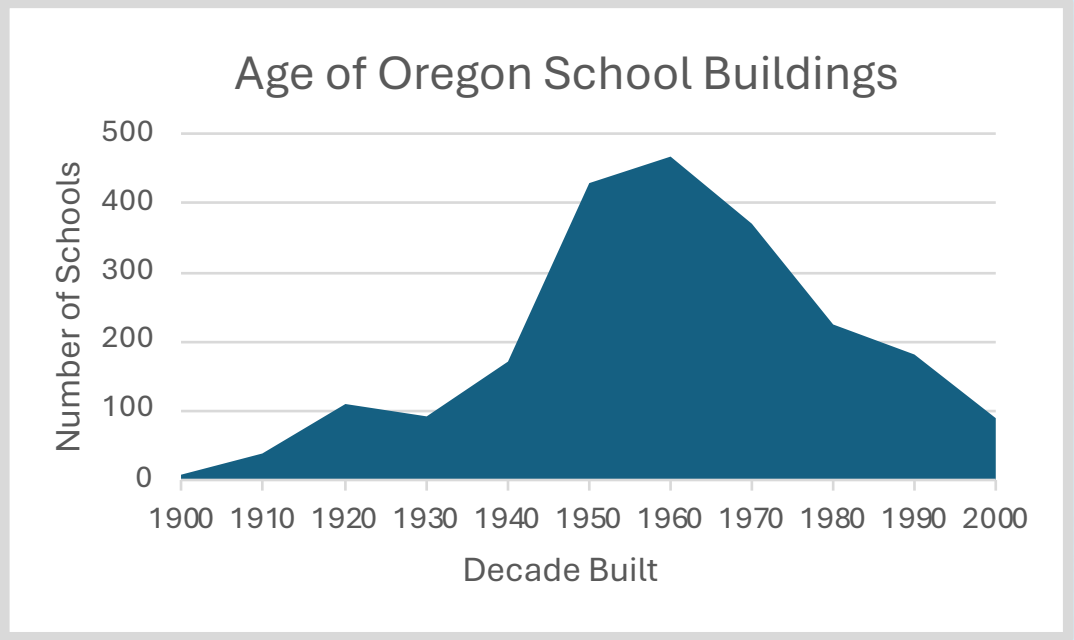
Schools

EXECUTIVE SUMMARY

Oregon has 197 K-12 school districts with 552,380 students in approximately 1,300 schools and over 2,000 buildings. Enrollment has decreased by 30,300 students, about 5.2%, since the pre-Covid-19 level in 2019-20. Management of K-12 education heavily relies on local control at the district level. A statewide facilities condition committee in 2014 reported a backlog of $7 billion in deferred maintenance at that time. While operational funding is equalized per student statewide, infrastructure capital funding for schools is mostly the responsibility of individual districts, which are dependent upon community support of bond measures. Significant differences exist across the State, which generally mirror regional household income data, in districts' ability to pass construction bond measures. Oregon schools are often designated as emergency shelters for the public, but systematic assessments of their ability to serve this purpose after natural disasters, especially major earthquakes, is lacking. Some Oregon schools remain vulnerable to collapse or considerable damage due to a major earthquake.



CONDITION

Oregon has a wide range of school buildings by type and age. Some are very new and meet modern building code requirements with a few of these having been designed to rigorous seismic standards beyond code requirements. Others are quite old, some over 100 years of age.

Some assessments have been conducted to characterize the condition of schools statewide, but much of the available data is not current. In 2007, the Oregon Department of Geology and Mineral Industries (DOGAMI) published a report that included a graphic displaying the age of school buildings based upon the year they were constructed with data through the year 2000. At that time, the median age of school buildings was about 38 years. Relevant to school building age, Oregon did not have a seismic building code until 1971. In addition, the risk associated with the Cascadia Subduction Zone mega-earthquake was not recognized until the 1990s.

In 2007, DOGAMI conducted a Statewide Seismic Needs Assessment employing the FEMA 154 Rapid Visual Screening (RVS) methodology. A total of 2,018 educational facilities were reviewed and rated for their collapse potential. The results demonstrated a significant safety gap that needed to be addressed.

2007 Assessment of K-12 School Building Collapse Potential	
12%	Very High
35%	High
23%	Moderate
30%	Low

Recognizing the need for seismic retrofitting work in schools, the Oregon Legislature passed a bill in 2001 mandating that schools be rehabilitated to a life-safety performance level by 2032, subject to available funding. State grants to help finance the needed retrofits were first distributed in 2010. Through 2023, grants for seismic retrofits in K-12 schools have totaled over $500 million. School districts are required to advise DOGAMI when schools are rebuilt or renovated. However there has not been funding to support an effort to integrate this data into a statewide database that could be used to evaluate the beneficial impact of the grant program. Thus, overall progress toward accomplishing the total retrofit needs is not available.

Some assessments have been conducted to characterize the condition of schools statewide, but much of the available data is not current.

The maintenance backlog is also important. Because of Oregon's decentralized management system for K-12 schools, much of the needed data to analyze this issue resides at the school district level and is not estimated in a consistent manner across the state. Since there is no common set of standards to develop the backlog, compiling the existing district data would not provide a useful statewide perspective. Consequently, the state lacks a clear understanding of deferred maintenance in school facilities. To remedy this, a Statewide Facility Assessment (SFA) has been initiated by the Oregon Department of Education (ODE) to conduct district-by-district individual facility condition assessments with reports detailing deferred maintenance. This work is scheduled to begin in 2024 and will provide assessments and reports over a 5-year cycle. The goal of the SFA is to help the state effectively advocate for equitable distribution of state funds for school facility improvements.

Current funding for school facility maintenance at the district level is also difficult to determine. The ODE webpage provides a tool for researching operating expenditures by district. Infrastructure maintenance funding is a subset of the reported *Operation and Maintenance of Plant Services* expenses but does not seem to be separable from other costs such as utilities and custodial services.

CAPACITY

Assessing existing school student capacity vs. need (enrollment) has several challenges. There are different approaches to estimating capacity including: a calculation based upon the maximum number of students-per-classroom, or application of a maximum square-feet-per-student number to the total gross square footage of a school building. Both have disadvantages, and there is no statewide common approach for estimating capacity.

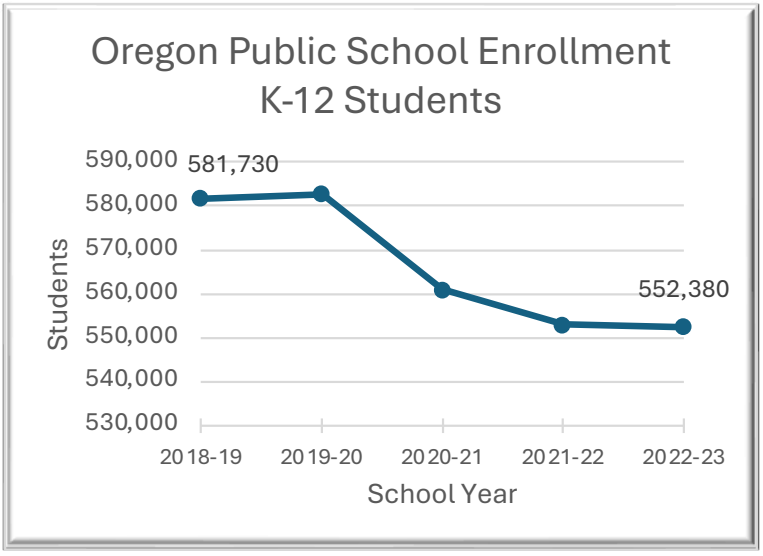
The ODE has a lookup tool that contains square footage data for individual school facilities and their corresponding student capacities. However, since each district develops this data using its own methodology, it is difficult to compare district capacities. A cursory review of the data in this lookup tool has revealed some data errors and some facilities that no longer exist yet have square footage and student capacities in the data. Also, square footage data is listed for some non-educational spaces such as sports stadiums and concessions buildings.

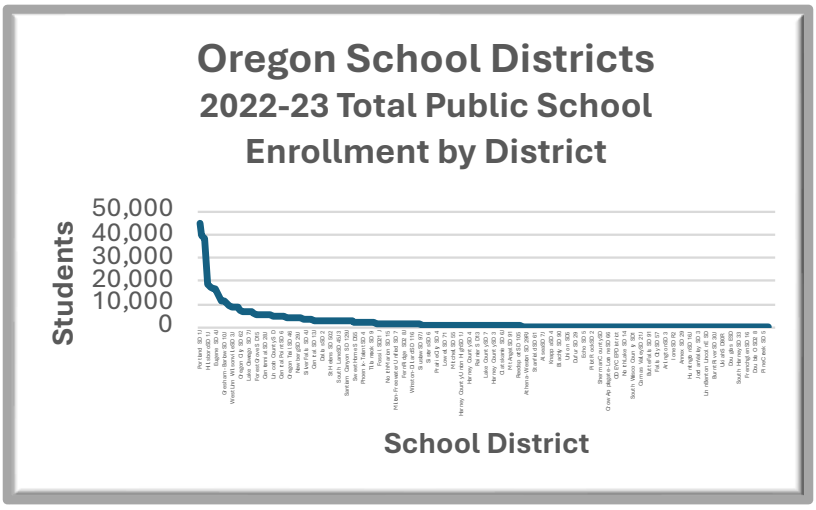
ENROLLMENT

There were 552,380 students enrolled in Oregon public schools in October 2022. Oregon's K-12 public schools experienced an unprecedented enrollment decline during the 2020-21 school year which has been attributed to the COVID-19 pandemic.

Over the four-year period displayed in the Oregon Public School Enrollment chart, K-12 enrollment dropped by 5.2%. Although that trend appears to have leveled off, the State Department of Administrative Services predicts the school-age population in Oregon will decline during the next few years by an average of 1.0% annually.

The distribution of students across the state among the 197 school districts is very uneven, reflecting the general population density statewide, and is striking. State data indicates that over 50% of all students are enrolled in the largest 16 school districts. A dozen districts have 10, or fewer, students. According to ODE, 9% of districts are considered large, with 55% considered small.





CLASS SIZE

Class size is a function of enrollment, the number of teachers on staff, and the number of physical classrooms plus other teaching spaces. Class sizes throughout Oregon are near their lowest point in years, however statewide averages do not represent reality in many locations. Some classrooms, particularly in wealthier middle and high schools in urban and suburban areas, are more crowded than others. Statewide, the median class size is currently 22 students. The numbers for the Portland-area are higher. At the granular level, the differences are pronounced. For example, Beaverton has seven of the eight Portland-area schools with the largest median class sizes with counts ranging between 31 and 35 students.

Some school districts allocate resources based upon an equity budgeting approach, essentially keeping class sizes low in high-poverty schools with the highest percentages of students who are falling behind in reading, writing, math and emotional regulation.

For all these reasons, drawing a direct connection between class size and available infrastructure is not possible.

CLASS SIZES IN THE LARGEST PORTLAND-AREA DISTRICTS

MEDIAN CLASS SIZES IN 2022-23

Centennial	21
David Douglas	22
Forest Grove	22
Gresham-Barlow	23
Hillsboro	24
Lake Oswego	25
North Clackamas	25
Oregon City	25
Portland	26
Reynolds	26
Sherwood	26
Tigard-Tualatin	26
West Linn-Wilsonville	26
Beaverton	28

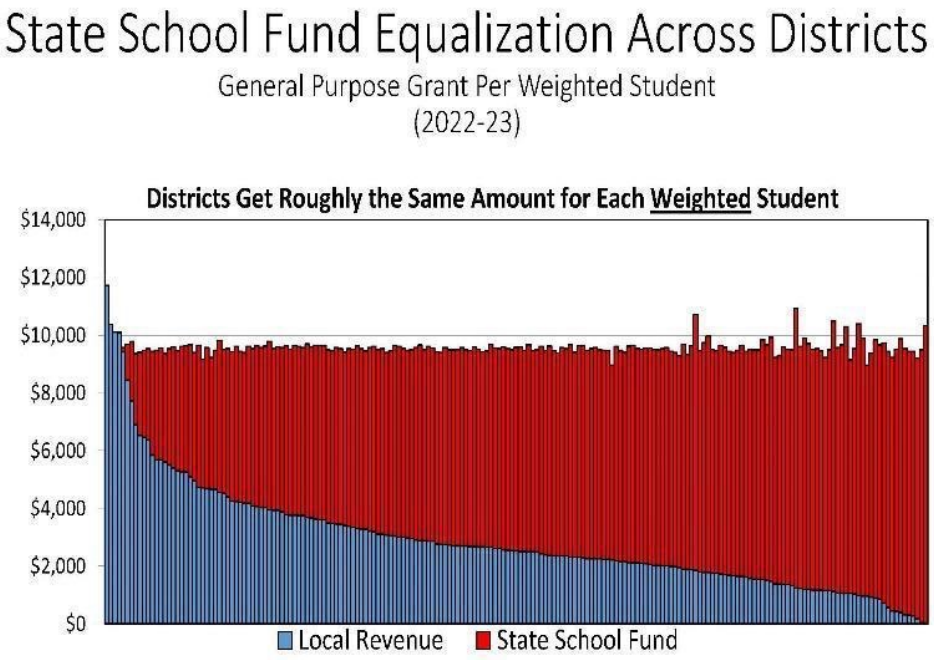
Source: Oregon Department of Education

FUNDING

History and Methodology

Prior to 1990, the largest source of revenue for public schools in Oregon was local property taxes. The passage of statewide citizen-initiated ballot measures in 1990 and 1997 limited local property taxes for schools. The state was required to offset lost property tax revenue with money from the state general fund, which is composed primarily of income tax revenue. As a result, Oregon schools are increasingly supported by state, not local, dollars for operational costs. With few exceptions this has resulted in inadequate funding for school districts. This funding approach particularly affects resources available for school facilities maintenance, as it is a subset of districts' operating budgets, resulting in a growing backlog of deferred maintenance based upon anecdotal evidence.

Oregon uses a formula to provide financial equity among school districts for operations. Each school district receives (in combined state and local funds) an allocation per student, plus an additional amount for each student enrolled in more resource intensive programs such as Special Education or English as a Second Language. Some federal funding is also available which amounted to 11.8% of total operational funding statewide in 2021-22.



Capital Funding

In contrast to operations, infrastructure capital funding remains largely a local school district responsibility. The success districts have had in passing construction bond measures varies widely across the state and appears to correspond with economic conditions in different regions. Comparing bond measure pass/fail data over an eight year period (2016-2023) to county-by-county median household income in 2020 illustrates this trend. For Oregon's 36 counties, the 18 at the top income level had a 72% success rate in passing bonds. The bottom 18 counties' passage rate was only 45%. Available bond funding is also tracked with income level. In contrast to Oregon's funding strategy that equalizes operational resources statewide, there remains a significant gap of capital investment per student which aligns with regional income data.

Another concern is that small school districts typically do not have continuous capital programs that warrant in-house staffing with experienced project management teams.

The state supplements local bond funding with several grant programs, but together they represent only about 10% of statewide capital funding resources for schools. Five key Oregon grant programs that support school infrastructure needs are:

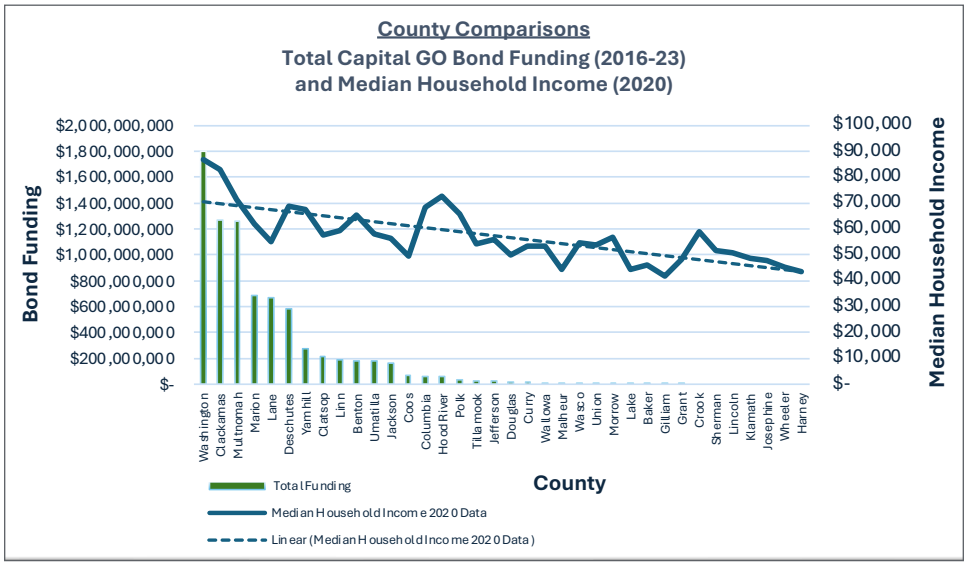
Oregon School Capital Improvement Matching (OSCIM) Program. Provides grants to districts that pass a local general obligation bond.

Seismic Rehabilitation Grant Program (SRGP). This is a competitive program that provides funding for the seismic rehabilitation of critical public buildings including schools.

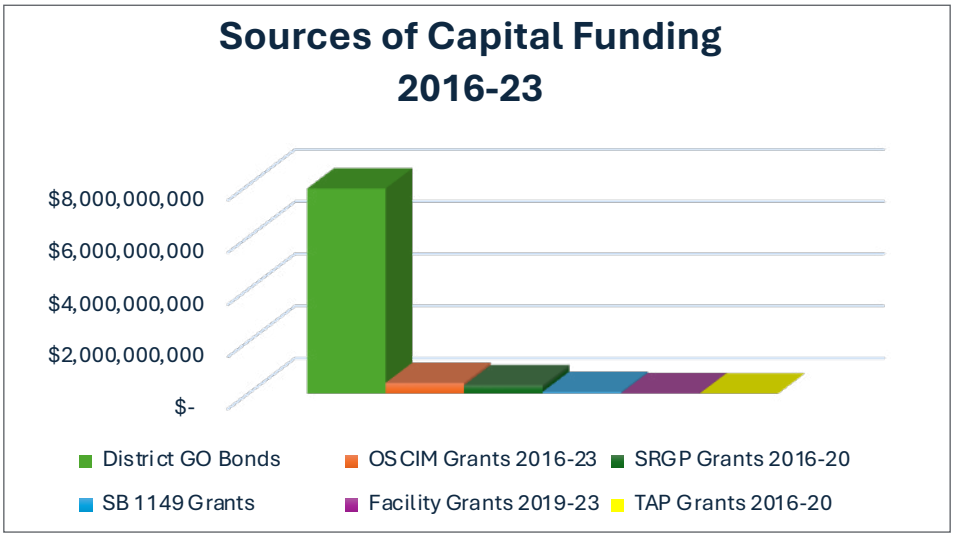
Senate Bill 1149 Grants (SB 1149). Provides funding to offset the extra costs of installing efficient replacement equipment above energy code requirements.

Facility Grants. Provides funding to school districts to help offset the costs of outfitting new school building capacity with equipment, furniture, and technology.

Technical Assistance Program (TAP). Helps districts plan for capital improvements and expansion.



The Sources of Capital Funding chart displays data for these grant programs contrasted with total statewide district-level bond funding. Although the time periods are not identical for each source, this perspective provides a scale that is instructive.



Data: Oregon Department of Education

PUBLIC SAFETY AND INNOVATION

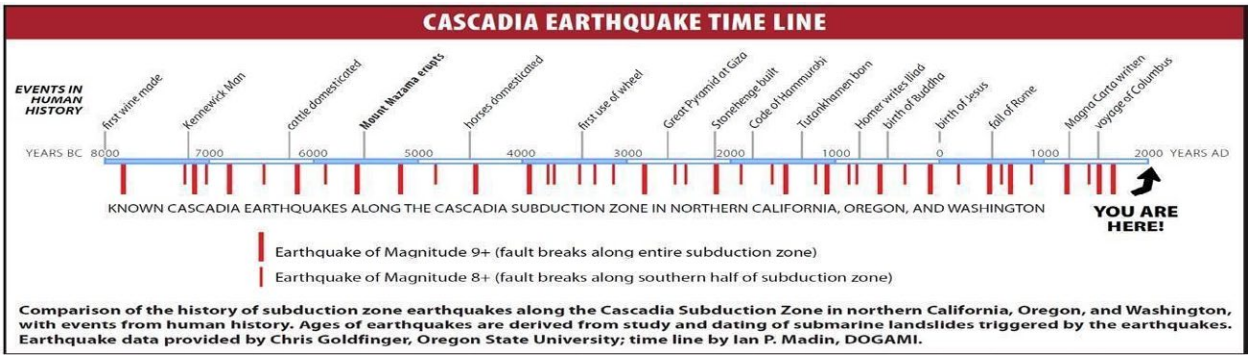
Seismic Hazard

One of the most significant risks facing Oregonians is due to the Cascadia Subduction Zone (CSZ) fault near the coastline. Research into the seismic history of this earthquake fault over the past 10,000 years has shown that there have been 41 earthquakes greater than 8.0 on the Richter scale, with a recurrence interval of 250 years, and 19 of those being over 9.0 in magnitude . The most recent 9.0 quake occurred 324 years ago. There are various probable predictions for when (not if) the next mega-earthquake will strike. One prediction has reported a 30% chance of a 9.0 earthquake on the CSZ fault within 50 years.

The Oregon Resilience Plan (2013) recommended that schools be prepared to resume teaching students within 30 days after the next CSZ earthquake. Yet, the ORP also found that on average, schools in the Willamette Valley and coastal areas would be out of service for 18 months. The Legislature has provided funding for a grant program to support seismic retrofits of existing school buildings to reduce the number of schools at risk of collapse and to improve safety for students and staff. This work is important but meeting the seismic life-safety code standard does not ensure retrofitted buildings will be serviceable within 30 days, or be economically repairable. Furthermore, many schools have been designated as emergency shelters but may not be capable of operating after the mega-earthquake.

It is notable that a handful of new school buildings constructed after the Oregon Resilience Plan was published in 2013 have been voluntarily designed by a few school districts to meet emergency shelter standards in order to support their communities after the mega-earthquake or natural disaster. These strategies are important since new school buildings in Oregon have historically been in service for many decades, certainly exceeding a 50-year recurrence probability of the next CSZ earthquake. Experience in applying these resilience features in schools ranging from a large high school to K-5 buildings demonstrated that the cost impact was minimal, adding between 1% and 2% to the building costs.

During 2023, the Oregon Legislature considered a bill that would have mandated these seismic and resilience designs for new K-12 school construction projects in western Oregon where the impact of the CSZ earthquake will be most severe. Although that effort was not successful, it appears that the bill may be revived during the next regular legislative session in 2025.



Comparison of the history of subduction zone earthquakes along the Cascadia Subduction Zone in northern California, Oregon, and Washington, with events from human history. Ages of earthquakes are derived from study and dating of submarine landslides triggered by the earthquakes. Earthquake data provided by Chris Goldfinger, Oregon State University; time line by Ian P. Madin, DOGAMI.

ENERGY CONSERVATION

Some districts have been proactive in pursuing high levels of energy efficiency and have been recognized for their achievements. The Environmental Protection Agency together with the U.S. Department of Energy manages an Energy Star program that provides certifications for high performing products and buildings. Oregon has 107 Energy Star certified schools, about 5% of its K-12 schools. A few schools (22, which includes some with applications in process) are LEED certified by the U.S. Green Building Council. Oregon requires that 1.5% of the capital cost of new school buildings be devoted to renewable energy infrastructure.

Schools

RECOMMENDATIONS TO RAISE THE GRADE

- Utilize the statewide facilities condition assessment when it is completed to characterize the maintenance backlog by district, by building, and category of work to provide actionable results. Since large facilities projects are usually bond funded requiring years to plan and execute, a forecast of major maintenance requirements should be part of this work. Predictable life expectancies of existing building equipment, roofs, etc. should be incorporated into the backlog of needs.
- Using the statewide facilities condition assessment, determine the need for capital investments in school buildings to address major maintenance needs.
- Develop a capital investment funding model to equitably support districts statewide based upon facility condition and school needs.
- Provide technical assistance to small districts for capital program development, consultant hiring, and construction management services.
- Enact legislation mandating seismic and emergency shelter resilient designs for new school buildings that respond to the Cascadia Subduction Zone earthquake risk and the Oregon Resilience Plan recommendations.

Schools

SOURCES

DOGAMI Open-File Report O-07-02; Statewide Seismic Needs Assessment

DOGAMI data as reported in The Oregon Resilience Plan, 2013; Critical and Essential Buildings

Oregon Department of Education web page posting, October 2, 2023

Oregon Department of Education 2018-2019 District Operating Expenditures Comparison Tool

ODE School Facilities Building Collection Database Building ID Number Lookup Tool, Updated 2/8/24

Oregon Department of Education, Oregon Statewide Report Card 2022-23

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Data from ODE Fall Membership Report for 2023

The Oregonian, October 28, 2023

Source, Oregon Department of Education

2020 US Census Data

Chris Goldfinger, Oregon State University

The Oregonian, June 2019

FEMA P-1000 June 2017, page E-16

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EPA Registry of Energy Star Certified Buildings and Plants, October 2023

Stormwater

D+

EXECUTIVE SUMMARY

There is great variability across the state in local jurisdictions' ability to maintain and replace aging stormwater infrastructure. New regulatory requirements to protect stream health from the impacts of stormwater runoff are typically paid for by new development due to a shortage of other funding sources. This means innovative approaches such as green infrastructure for managing stormwater runoff are implemented in new communities, while neighborhoods and roads built before 1990 typically send their runoff directly to local streams without treatment or detention. The state has not invested in stormwater retrofits, leaving communities looking to individual ratepayers and federal funding sources to meet regulatory mandates to improve water quality. Most state agencies with a stormwater utility have populations greater than 3,000 and are located in the Portland Metro, Willamette Valley, and North Coast regions, where many have seen steady increases in their rates. However, despite rising rates, most agencies surveyed indicate a lack of sufficient funding for growing maintenance needs and a backlog of necessary system improvements. As a result, infrastructure failures and lack of maintenance often cause localized flooding in Oregon's rainy climate and contamination impacting water quality, affecting drinking water sources and aquatic life.

BACKGROUND

Stormwater is runoff due to precipitation and snowmelt. Impervious surfaces like streets, sidewalks, rooftops, and parking lots generate more runoff than would occur under natural conditions. If not properly managed, stormwater can cause threats to public health, buildings, transportation and utility service infrastructure. It can lead to urban flooding and cause streambank erosion. Unmanaged stormwater is also a major source of pollutants in waterways, including excess nutrients, bacteria, sediment, oils, and toxins from vehicles and landscaping chemicals. Managing stormwater properly can recharge groundwater and protect land and streams from erosion, flooding and pollutants.

Stormwater infrastructure consists of drainage systems with pipes, inlet grates, ditches, canals, channels, stormwater ponds, and runoff treatment devices to capture stormwater before releasing it to nearby receiving waterbodies. Stormwater may also be discharged into the ground via drywells, which are designed to collect surface water and discharge it into the ground allowing natural disbursement of collected water. Drywells have been effective at using soil media to naturally filter pollutants and also to recharge groundwater sources. In recent decades, green infrastructure (GI) has become more common in urban settings to maximize the benefits of natural hydrologic cycles using vegetation, soils, and natural filtration processes. Green infrastructure reduces runoff, minimizes erosion, and improves water quality.

Stormwater management in Oregon is driven primarily by the requirements of the municipal separate storm sewer system (MS4) permit conditions. As a Delegated Authority

to the US Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (DEQ) is the lead regulatory agency for regulations associated with the MS4 permits as required by the Clean Water Act. Local governments are in charge of constructing and managing stormwater infrastructure within their jurisdictions. More than 30 different local governments and the Oregon Department of Transportation have MS4 permits. Smaller communities that do not have MS4 permits must still adopt implementation plans if they discharge stormwater runoff into a waterway that has impaired water quality. The MS4 permits are renewed by DEQ every five years, resulting in evolving requirements to protect water quality and hydrology. These regulatory requirements have become critical to providing improved water quality.

The stormwater infrastructure status noted in this report are responses from a brief questionnaire provided to agencies around the State. The interviews were not comprehensive but representative of the regions of Oregon as a whole. Agency-specific information has purposely been excluded from this report.

CAPACITY AND CONDITION

Land use planning in the State of Oregon plays a pivotal role in addressing the capacity of stormwater systems. Oregon's state legislature signed Senate Bill 100 into law in 1973, creating a unique land use planning program and establishing the Land Conservation and Development Commission (LCDC) and the Department of Land Conservation and Development (DLCD). State law resulting from Senate Bill 100 requires each city and county to adopt a comprehensive plan accompanied by zoning and land-use ordinances to enact the plan. Most larger agencies address capacity and future growth with master plans, but some smaller agencies continue to suffer from lack of resources to create master plans. Oregon Drainage Laws are used as default standards when utility-specific design criteria in city or county codes don't exist.

Much of the stormwater infrastructure in Oregon was constructed prior to current water quality requirements required by the MS4 permits. The majority of the stormwater infrastructure is constructed as land is developed for housing and other urban uses. Local jurisdictions must maintain and eventually replace this aging infrastructure, construct retrofits to better manage stormwater runoff, and ensure that new development meets the latest stormwater management standards. There is great variability across the state in the financial and staffing resources dedicated to local stormwater programs. While some jurisdictions have recently developed asset management programs to assess the condition of their stormwater infrastructure and invest in its maintenance, others lack the capacity to do so.

There is great variability across the state in the financial and staffing resources dedicated to local stormwater programs. While some jurisdictions have recently developed asset management programs to assess the condition of their stormwater infrastructure and invest in its maintenance, others lack the capacity to do so.

Unmanaged stormwater runoff has had a negative impact on water quality and stream health, especially in urban streams. DEQ's 2022 water quality assessment found that 37% of assessed streams statewide are not meeting water quality standards. However, the most common violation is for high stream temperatures during summer months, which is not attributed to stormwater runoff. Newly identified contaminants, such as 6PPD found in vehicle tires, contribute to stormwater's toxicity to fish and wildlife. Several Oregon cities have combined sewer systems (CSOs), using the same pipes for stormwater and sanitary sewage. These pipes can overflow during

storms, discharging sanitary sewage directly into streams. In recent decades, substantial progress has been made in reducing the frequency of combined sewer overflows by investing in GI and building larger capacity pipes, resulting in significant water quality improvements.

FUNDING

All Oregon MS4 Phase 1 permitted communities fund their system improvements and maintenance using stormwater utility rates. According to the *2020 Water Rates Survey Report* from the League of Oregon Cities, 40% of cities charge for stormwater services. Most agencies with a stormwater utility have populations greater than 3,000 and are located in the Portland Metro, Willamette Valley, and North Coast regions. Many have seen steady increases in their rates, but most agencies surveyed indicate a lack of sufficient funding for growing maintenance needs and a backlog of necessary system improvements.

The 2020 System Development Charges Survey completed by the League of Oregon Cities indicates nearly half of the cities surveyed use System Development Charges (SDCs) to fund stormwater infrastructure related to new growth. Revenues generated from SDCs range widely – from $0 to $1 million per year – among these cities. But the SDC revenues constitute a relatively small portion of potential revenue sources for stormwater infrastructure needs.

Recently, more federal funding opportunities have become available, i.e., State Revolving Fund (SRF), American Rescue Plan Act (ARPA), Infrastructure Investment and Jobs Act (IIJA), etc. These funding opportunities continue to be very competitive and many small agencies don't have skilled staff to apply for grants and low-interest loans to support their needs.

Some communities have heavily invested in addressing the CSOs within their jurisdiction. These communities are still paying the costs of these major investments. All communities interviewed expressed a lack of sufficient funding needed to meet regulatory and programmatic investments.

Most agencies surveyed indicate a lack of sufficient funding for growing maintenance needs and a backlog of necessary system improvements.

FUTURE NEED

Almost all of the agencies interviewed have unfunded capital improvement needs. Many of the interviewed agencies have stormwater master plans that identify comprehensive program and infrastructure needs. Those that do not are working on developing a system inventory for their agency.

Water quality and quantity needs don't always align and sometimes conflict. To compound this issue, natural resources, like wetlands and vegetated corridors are under a constant threat of development to increase housing in the area. Often when wetlands and vegetated corridors are used for development needs, the benefits these natural assets offer for attenuating flooding and improving water quality cannot be replaced with built stormwater infrastructure.

Some agencies interviewed expressed their frustration with having to address additional regulatory requirements such as the temperature Total Maximum Daily Load (TMDL) on multiple water bodies in the state with no additional funding.

OPERATIONS AND MAINTENANCE

There are six MS4 Phase 1 permitted communities – the Portland Group, the Gresham Group, the Clackamas Group, Multnomah County, and the cities of Salem and Eugene. In addition, Oregon Department of Transportation (ODOT) also has an MS4 Phase 1 Individual Permit. All MS4 permits specify required O&M functions. These are specified in respective Stormwater Management Plans (SWMP) for each permittee.

Depending on the governing structure of each agency, there are private facilities that are maintained by private owners. Almost all of the MS4 SWMP includes some degree of oversight requirements to ensure the maintenance of these privately owned and operated facilities.

One challenge experienced by many communities is the boundary between public and private facilities. That line can sometimes be gray, and many public agencies have difficulty addressing drainage complaints from private land owners.

PUBLIC SAFETY

Risks to public safety caused by failing stormwater infrastructure include flooding and sinkholes caused by failing pipes, which can impact roadways, nearby properties, and emergency response. Cities often experience nuisance flooding when stormwater inlets clog during rainstorms. More significant threats to public safety can be prevented by investing in the maintenance and repair of aging stormwater infrastructure before it fails. Local jurisdictions typically have less robust asset management programs for stormwater than for other types of infrastructure.

Potential public safety issues caused by stormwater quality are addressed through additional treatment required through the MS4 permit conditions, for those covered under the permit. Unmanaged stormwater can be a source of pollutants in surface waters which can impact the water quality of significant drinking water sources for Oregon communities and have detrimental effects on aquatic life.

RESILIENCE

Storms are becoming more intense due to climate change, which makes flooding more likely as a result of overwhelmed stormwater infrastructure. Additional research is needed to identify the storm sizes that should be used as a basis for system design in the future. Increasing the use of GI can make systems more resilient by infiltrating runoff into the ground and reducing the volume of runoff that needs to be conveyed in pipes. However, hotter and drier summers can make it challenging for plants to survive in green stormwater infrastructure facilities without irrigation.

Some communities are investing directly in the creeks and streams that receive stormwater runoff and recognizing them as stormwater assets. Enhancing the natural functions of these systems that have been harmed by urbanization reduces the risk of streambank failures, improves water quality and fish and wildlife habitat, and increases cooling shade.

INNOVATION

Stormwater systems that were once designed to simply move water away from built structures as quickly as possible are now required to provide water quality treatment and slow down discharge rates to mimic natural hydrology. This relatively recent, fundamental shift in philosophy requires the stormwater industry to be rich in innovation. The increasing adoption of green infrastructure brings with it an evolution in design standards. Oregon communities are at the forefront of testing innovations in stormwater management. To support the needs of local jurisdictions and new developments, there is a growing industry of companies manufacturing proprietary stormwater management devices, from green roof tray systems to filtration cartridges and underground detention chambers.

Stormwater

RECOMMENDATIONS TO RAISE THE GRADE

- Provide additional funding for replacement of aging infrastructure to address the significant percent of stormwater infrastructure reaching the end of life. Incorporate capacity needs that are congruent with changing rainfall patterns resulting from climate changes.
- Develop an asset management program that includes life-cycle costs, inspection, and operations and maintenance plans to assess the condition of existing infrastructure, identify critical system components, and maintain priority assets. Asset management plans should plan for the ongoing maintenance of natural and green infrastructure using state-level or ASCE standards.
- Expand integration of natural resources to stormwater infrastructure to address hydromodification. Provide programs that will support resilient streams and simplify the implementation of green infrastructure by adopting state-level standards.

SOURCES

Oregon Department of Transportation

Oregon Legislative Assembly

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City of Lake Oswego
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City of West Linn
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City of Salem
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Oregon Seismic Safety Policy Advisory Commission
https://www.oregon.gov/oem/documents/oregon_resilience_plan_final.pdf

Oregon Department of Environmental Quality
https://www.oregon.gov/deq/wq/pages/epaapprovedir.aspx

City of Newport
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City of Gresham
https://www.greshamoregon.gov/globalassets/city-departments/environmental-services/capital-improvement-program/capital-improvement-program-stormwater.pdf

Clackamas County
https://www.clackamas.us/wes/wes-projects

Transit

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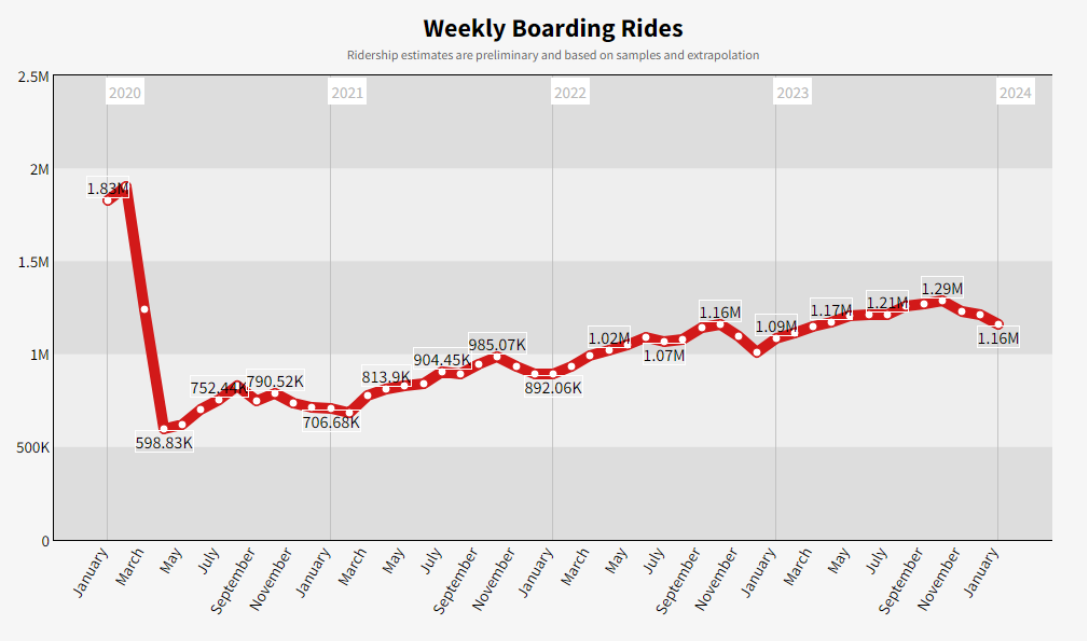
EXECUTIVE SUMMARY

Public transit is an essential component of life in Oregon, providing mobility for Oregonians who are unable to or choose not to drive, reducing congestion and greenhouse gas (GHG) emissions, and driving the economy. For every $1 invested in transit in Oregon, there is $4 in economic return. In 2023, the Portland Metro region alone saw 49.3M boarding rides on TriMet's buses and light rail systems. While ridership across the state has not completely rebounded from pre-pandemic levels, TriMet's ridership has grown steadily in the past few years.



As demand for transit returns, agencies have struggled to operate and maintain their systems at pre-pandemic service levels due to agency and/or jurisdiction budget deficits, operator and supply chain shortages, inflation, fuel prices, and aging infrastructure. At the same time, an influx of federal funding has provided a lifeline for many agencies to make capital improvements and provide more frequent service and coverage.

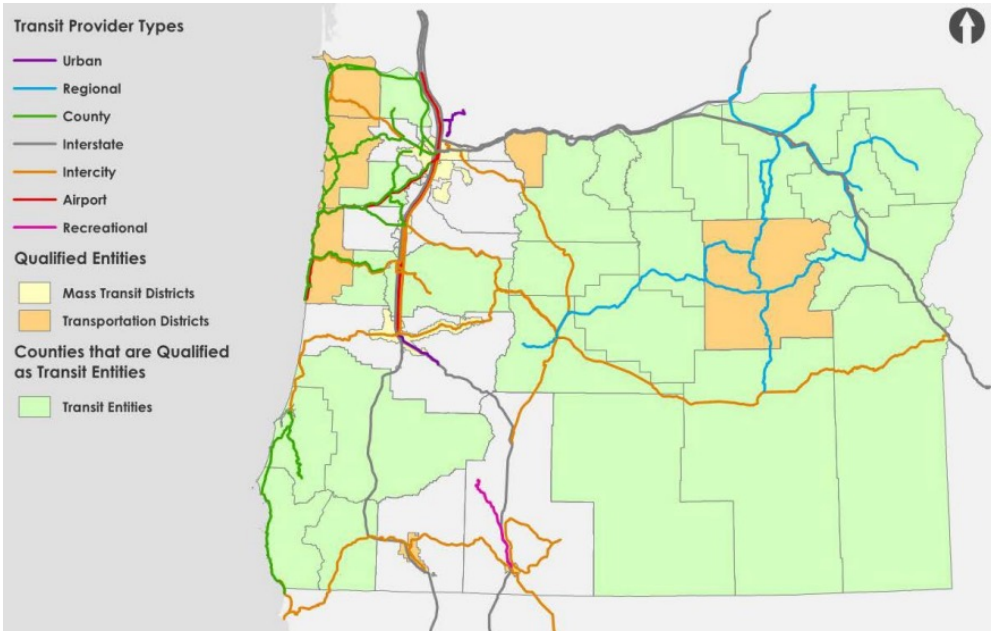
BACKGROUND

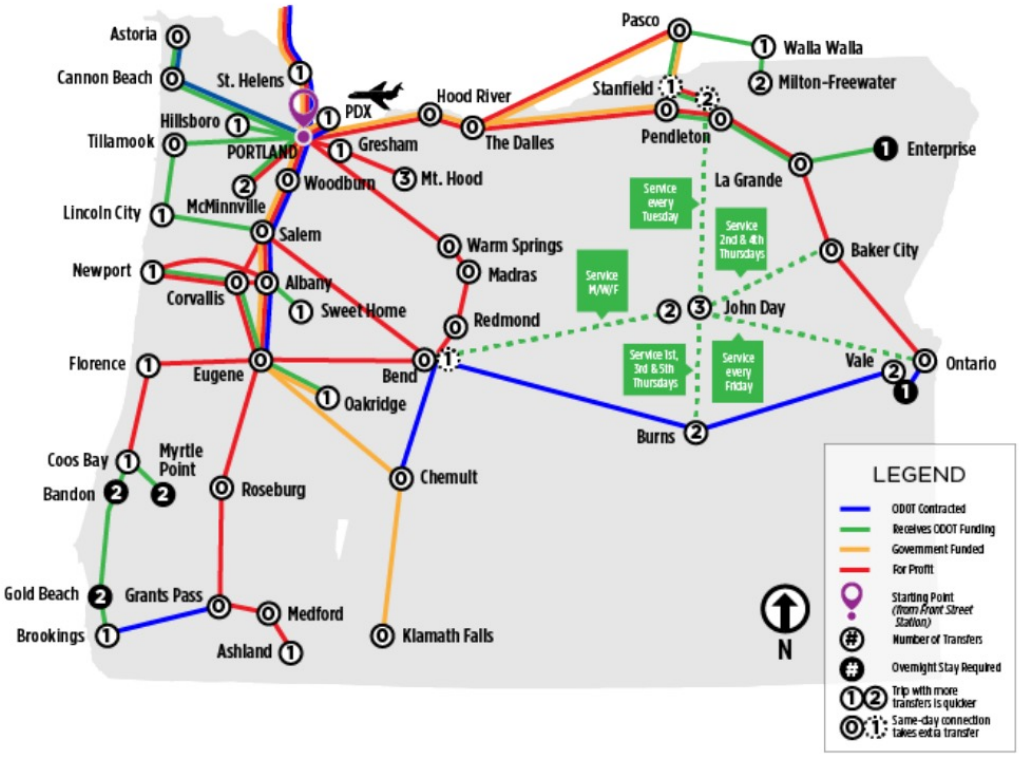
Oregon has many types of public transportation including:

- Bus routes (local service)
- Bus rapid transit (e.g., TriMet's Frequent Express bus routes)
- Regional bus routes (e.g., Rogue Valley Transportation District 1X: Medford-Ashland Express)
- Light rail (TriMet MAX)
- Commuter rail (TriMet WES)
- Intercity rail (Amtrak Cascades and Coast Starlight)
- Intercity bus (e.g., Flix Bus, Greyhound, Point)
- Paratransit
- Dial-a-ride/on-demand transit
- Micromobility (e.g., Biketown bikeshare and Lime scootershare)
- Ridematching and other Transportation Demand Management measures
- Aerial Tram (Portland Bureau of Transportation/ Oregon Health Sciences University)
- Ferries (Wheatland, Buena Vista, Canby)

The state of Oregon has transit connections among most major cities and towns, however the frequency and schedules vary significantly. For example, many places in northeast and southwest Oregon require an overnight stay to travel to Portland or Bend via public transportation. The sparsely populated southeast corner of the state has no transit connections. Within the state, there are urban systems (TriMet, Cherriots and Lane Transit District, Rogue Valley Transportation District, and South Clackamas Transportation District) as well as countywide and regional service, intercity and interstate service, and other fixed route and on-demand services. Tribal entities also run transit systems, such as Kayak Public Transit. Rural areas receive Oregon Department of Transportation (ODOT) funding to remain financially viable, and as a "last resort" some have operators that are contracted directly by ODOT.

ODOT partners with Washington Department of Transportation (WSDOT) to fund and operate Amtrak Cascades intercity rail, which as of November 2023 includes 12 daily round trips between Portland and Seattle and 2 daily round trips between Eugene and Portland. This route, which also includes the Coast Starlight Amtrak line through Oregon from Los Angeles to Seattle, serves as a critical travel option along the already congested I-5 corridor. During the COVID-19 pandemic, reduced service levels in turn reduced ticket revenues. There is no ongoing federal support for the Amtrak Cascades line.

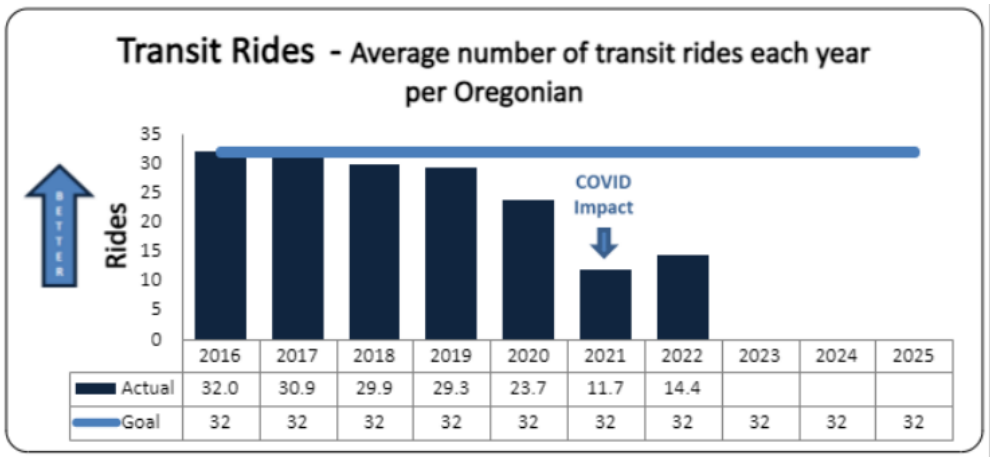




CAPACITY

Oregon has 36 counties across varying climates, geographies, and scattered population centers, and its residents and visitors take approximately 120 million public transportation rides annually. In 2022, the average number of transit rides each year per Oregonian was 14.4, just more than half of average rides in 2019. This time period also saw service reductions due to low ridership and shortage of transit operators. As pandemic restrictions were lifted in late 2022, some services were restored, such as TriMet's discontinued low-ridership lines and new frequent service lines as part of their Forward Together plan.

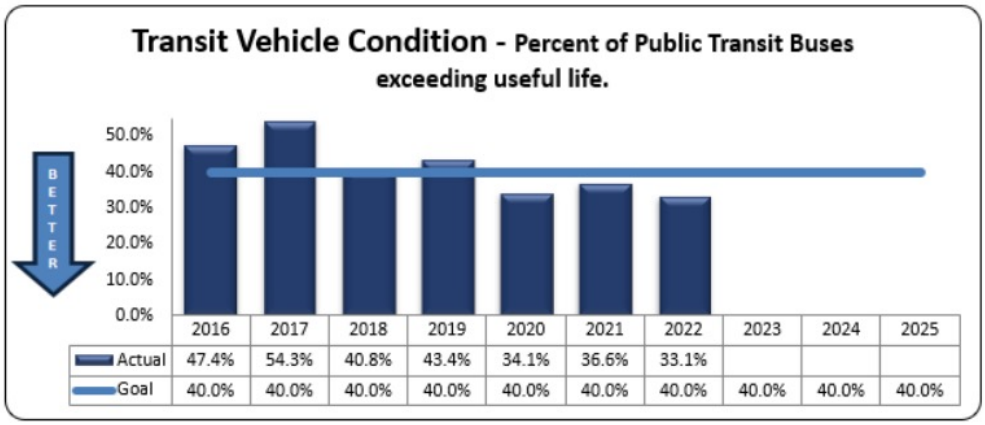
Transit needs to be tailored to the urban and rural communities it serves to help reduce Oregon's increasing vehicle miles traveled (VMT), which place a burden on its roadways. Post-pandemic travel trends have shifted with the advent of hybrid and remote work, however 60% of workers nationwide do not have the ability to work remotely. There's an increased need for transit and other non-car choices for both commutes and other daily trips. In recent years, costs of living and the cost of owning a private vehicle have risen, but transit access has been reduced.



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Actual	32.0	30.9	29.9	29.3	23.7	11.7	14.4			
Goal	32	32	32	32	32	32	32	32	32	32

CONDITION

Transit needs to be safe, reliable, and convenient. The Oregon Transportation Commission (OTC) allocated an additional $15M in flexible funds for transit vehicles for the 2019-2025 period, however, even with new funding sources, the desired fleet maintenance goals will likely not be met in future years. For example, the cost of replacing one diesel 40' Gillig bus is approximately $800K and a new battery electric bus is approximately $1.1M, roughly translating to about 15 vehicle replacements with the new flexible fund, while in the 2021-2023 biennium, 263 vehicles were purchased across the state (up from the 225 vehicles in the 2019-2021 biennium). In addition to many transit vehicles reaching the end of their useful life, many transit facilities in Oregon, such as bus stops, are also not in states of good repair, and this can make them feel uninviting or unsafe.



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Actual	47.4%	54.3%	40.8%	43.4%	34.1%	36.6%	33.1%			
Goal	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%

With encouragement from the ODOT Public Transportation Department, agencies are investing in zero emission or battery electric buses, as well as a renewed focus on hiring and retaining staff through initiatives such as TriMet's $7,500 hiring bonus. Rail expansion, which mainly occurs in the Portland Metro region, has been put on hold since the 2020 bond measure to fund the TriMet Southwest Corridor Light Rail Expansion plan did not pass.

FUNDING

Increases in federal funding from laws like the IIJA and House Bill 2017 (HB2017), Keep Oregon Moving, have helped the state keep up with its public transit needs. However, transit providers continue to struggle with reduced revenues, inflation, and maintenance costs that grew during and after the COVID-19 pandemic. TriMet, for example, had a 2023 annual operating budget of $425.2M while passenger revenue was $48.6M, which represents about 11% of the total operating budget.

The state's public transit is primarily funded with state and federal tax revenues. Most of the funding comes from grants from the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA). Other funding sources include the ODOT Transportation Operating Fund, cigarette tax, Oregon I.D. card revenue, and interest income.

Oregon has multiple funding sources including the following:

- About $150M in public transportation funding from the Federal Transit Administration each year.
- A 0.1 percent employee payroll tax ($1 for $1,000 in payroll) pays for public transportation service in both rural and urban communities.
- A 0.5 percent vehicle dealer privilege tax on new car sales funds rebates for electric vehicles and provides ongoing funding for the multimodal Connect Oregon program.
- A $15 tax on the sale of new bicycles with tires over 26 inches and that cost at least $200 goes to off-road bicycle and pedestrian paths that serve commuters.

Local agencies then depend on local taxes and ridership fares to make up over 40% of their remaining budget. Oregon does not have a consistent source of state funding for transit. Looking for new funding streams, in the Portland Metro region, the Urban Mobility Strategy was developed to help make everyday travel safer, and included projects such as the I-205 Toll Project (now-paused) were developed to use variable-tolling funds for walking, rolling, and public transportation.

ODOT's Transit Program budget in 2021-2023 decreased 7 percent from the 2019-2021 Legislatively Approved Budget. Inflation and the grant program for transportation services for veterans increased the budget, but the Federal Cares Act funds available in 2019-21 that did not continue into 2021-23 results in an overall decrease.

Beginning in 2019, the Statewide Transportation Improvement Fund (STIF) was created as part of the 2017 transportation funding package. According to ODOT, STIF funds may be used for public transportation purposes that support the effective planning, deployment, operation, and administration of public transportation programs. They cannot be used for light rail capital expenses and are not intended to supplant local funding sources to maintain existing services.

Funding through the STIF is helping grow Oregon's transit system. However, the state predicts by around 2026, the additional funding will no longer keep pace with population growth and service levels are projected to decline below 2013 levels.

The IIJA includes a five-year (federal FY 2022-2026) reauthorization of existing federal highway, transit, safety, and rail programs as well as new programs and increased funding for existing programs. ODOT outlines that $200 million will be invested into transit from the IIJA over 5-years. ODOT's 2023-2025 Legislatively Adopted Budget forecasts approximately $1.5 billion in additional federal highway revenues through the 2025-2027 biennium. Approved increases in the act in 2022 included 72 permanent positions and four limited duration positions to provide necessary staffing to administer the IIJA funded projects.

The state has made progress in funding sources and completing projects, though funding for operations and maintenance and project rollout remain limited and inflexible for how and where funds are spent.

FUTURE NEED

Creating a connected multimodal network that improves access to active and public transportation and improves the safety and well-being of all Oregonians is the state's aim. The 2021-2023 Strategic Action Plan set by the state outlines that over the past 30 years, ODOT spent an average of 1.1% of state highway funds on pedestrian and bicycle improvement. Without increased funding, it will take 150 years to complete the state's pedestrian and bicycle network, which provides essential access to public transit systems.

Agencies across the state are updating their transit plans to unlock federal or state transit grant funding. Recent examples of updates to plans include TriMet's Forward Together plan and Lane Transit District's Community Investment Plan (FY 2023-2032) as well as small agencies plans, such as Canby Area Transit (Canby Area Transit Master Plan update).

In addition, planning early for vehicle replacement is critical because of the timeline it takes to receive funding for, design, order, build, and deliver larger buses – and potentially longer timeline for low or zero-emission buses. Sustainable funding sources at local and state levels for both the expansion and maintenance of transit facilities remains imperative in reaching a healthier, more equitable, connected, and carbon neutral future.

OPERATIONS AND MAINTENANCE

Across the state, many vehicle fleets are aging. As of June 2020, 49% of large, heavy-duty buses outside Portland and Salem were not in a state of good repair. Recent examples of improvements being made with funds accessed through state and federal grants include buying new biodiesel or electric and hybrid bus fleets, capital improvements to the roadway or rails, and active transportation safety improvements. Supply chain issues in procuring buses and parts have added to challenges, as has training a workforce to maintain new types of transit vehicles.

Often there are shared capital infrastructure responsibilities and goals between transit and transportation agencies in the same jurisdiction. For example, TriMet improves some bus stops, while PBOT improves others through spot improvement and corridor projects, and in some cases, both agencies financially share the responsibility. In Oregon, for the most part, transportation agencies (or public works departments in smaller jurisdictions) maintain the roadway surfaces, roadway signing, striping, utility work, pedestrian and bike infrastructure and signals. The transit agencies are typically responsible for upkeep of their shelter, bus stop signs, benches, trash receptacles, and other related infrastructure. It's important to have MOUs in place to determine who is responsible for each maintenance task, especially considering there is often no budget contingency built in for climate adaptation in infrastructure already in the ground.

For capital infrastructure improvements, ODOT receives $700M from Federal Highway Administration (FHWA) annually for construction projects on state roads and interstates, 30% of which it can pass onto local jurisdictions. Many of Oregon's rural transit agencies use state roads and interstates for their bus routes, and often the transit, bike, and pedestrian infrastructure is lacking on these facilities.

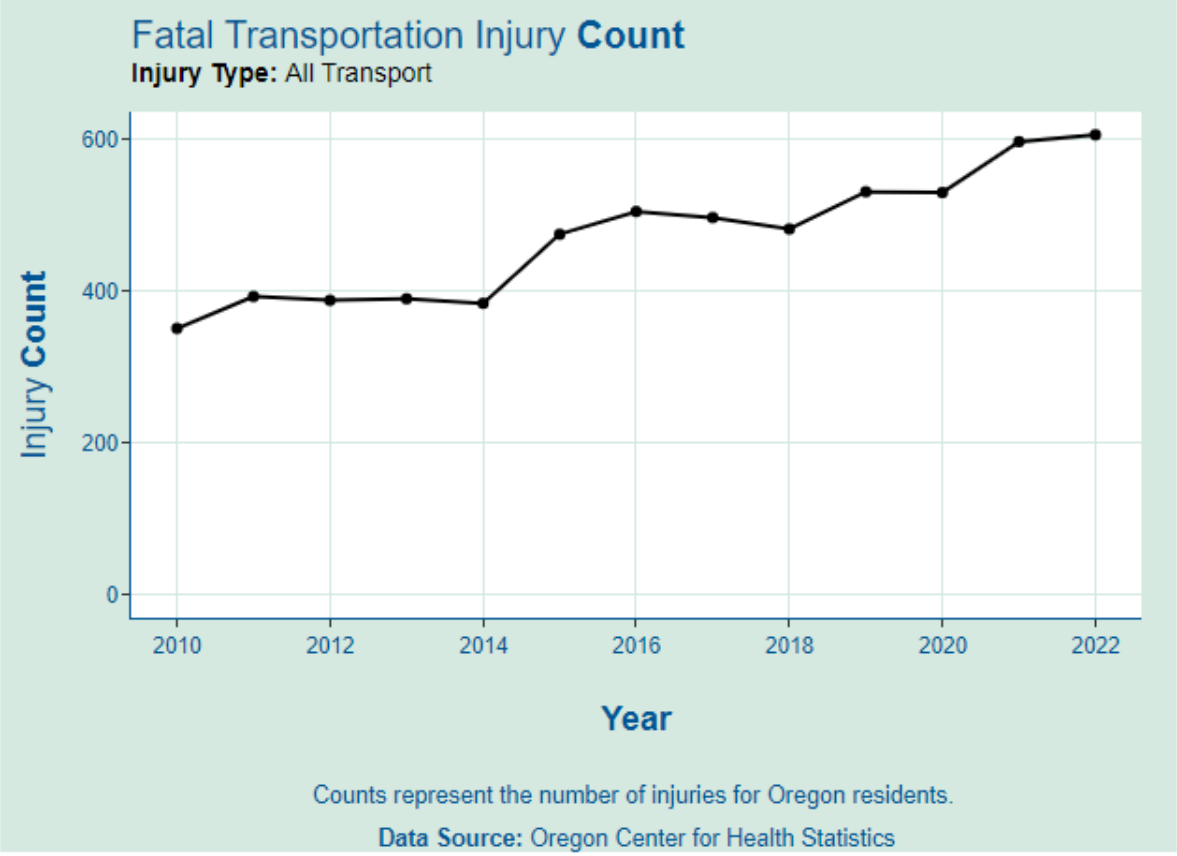
Many of Oregon's public transportation projects are supplemented with funding from adjacent infrastructure projects. A key urban example, Portland non-profit Albina Vision Trust recently won a historic $450M grant from FHWA for the construction of covers (to include restored street connections) over I-5 in Northeast Portland while Portland Bureau of Transportation (PBOT) simultaneously won $38M from the same grant program for improvements to the Broadway-Weidler corridor in the same quadrant of the city. These two projects have the potential to drastically improve transit, bike, and pedestrian infrastructure connections in a central section of the city that was fractured by I-5 in the 1950s and 1960s.

PUBLIC SAFETY

Like many states, Oregon is facing a growing homelessness, mental health, and drug crisis in both urban and rural areas. With increased populations of people experiencing these crises in and around transit centers, greater numbers of public safety incidents have occurred. Public drug use, including on public transit, has increased dramatically; in early 2024, a fentanyl state of emergency was declared in Downtown Portland. In February 2024, the state legislature passed Senate Bill 1553 to make "interfering with public transit" including ingesting, inhaling, igniting, injecting, or consuming illegal controlled substances on public transit a misdemeanor.

Because of deficiencies in social services, transit agencies are having to provide such services as well as security to maintain public safety for all riders. For many agencies, including TriMet and Cherriots, explicit training has been provided to bus operators to aid in crises. These types of public safety issues can greatly impact someone's choice to take transit. In the Portland region, TriMet has added more transit police since 2023, doubling the budget. Nighttime transit can be a mobility lifeline for night-shift workers as well as a benefit for anyone looking to travel after hours, however transit stop location and illumination becomes even more important in the dark. During illumination audits, many stops in the Portland region have lighting levels that should be improved. Traffic safety is also a significant issue in Oregon. Vehicle crashes resulting in injury and deaths have increased over the past 15 years. All transit users are also pedestrians or people riding bikes at some point in their journey, and face more extreme risk of traffic violence than previous years.

Count for Oregon Residents



RESILIENCE

Extreme weather events can make transit operations challenging while also providing a lifeline for riders to access jobs, healthcare, and other essential services. During winter storms, full plowing doesn't always occur in more temperate areas of Oregon. Local agencies work to ensure at least one lane on critical emergency and transit routes are plowed and deiced. Ice and snow storms can significantly slow buses due to the need to use chains. Rail, such TriMet's MAX, faces different challenges, as it relies on power from the grid, and during extreme weather, both during winter storms and summer fires, is often accompanied by power outages.

Oregon currently has 4,142 identified unstable slopes along Oregon highways. These landslides affect about 7% of Oregon's entire highway system or 495 miles or road, which impacts bus transit. In addition, between December 2023 and January 2024, the Amtrak Cascades and Coast Starlight trains were impacted by three landslides, which stopped service between Portland and Seattle. These examples also show that retaining networks for multiple types of transit - bus, rail - can make public transportation more resilient when one option is out of service. Oregon transit agencies also supply buses for transporting firefighters and supplies to fight increasingly intense wildfires.

In addition to climate related natural disasters, western Oregon faces a potential 9.0 magnitude Cascadia Subduction Zone Earthquake. During such an event, where many bridges and roadways may fail, waterway travel may still be a viable option. While many coastal and Willamette Valley cities are based on rivers, almost none have ferries, an efficient alternative mobility option outside of roadways and rail.

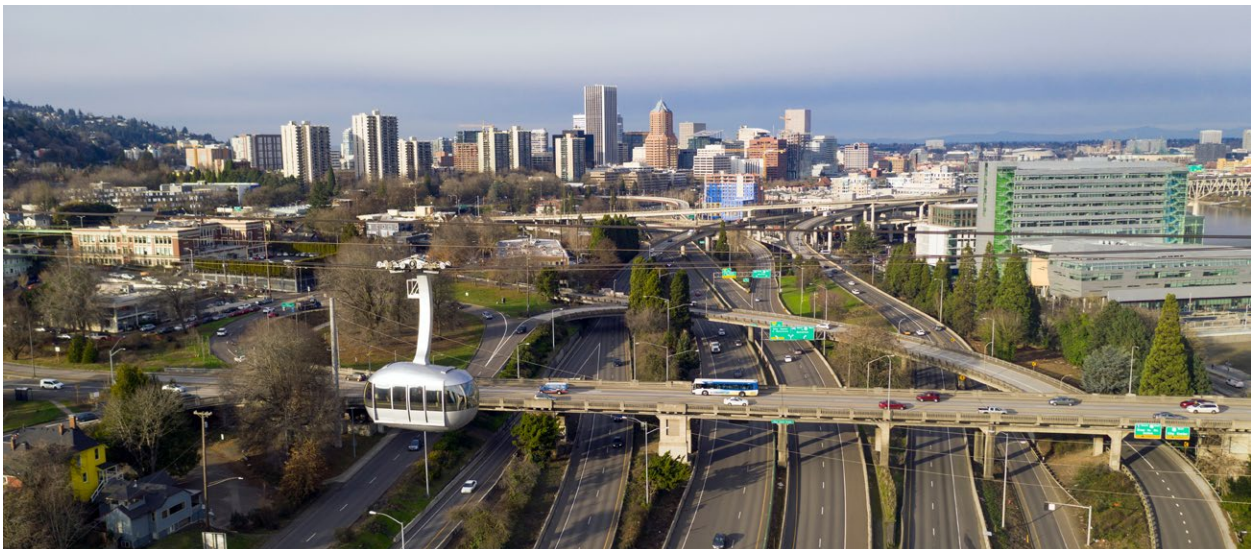
On rail in Oregon, freight trains take priority and passenger rail must cede to freight when tracks are shared. This makes passenger train travel less reliable. Unfortunately, the state has no power to regulate freight trains blocking at-grade crossings for significant amounts of time either. This creates reliability and resiliency issues for both bus routes and emergency vehicle access.

Public transit is an important tool to help Oregon decarbonize as well as provide redundancy in transportation options. Transit-oriented design along with careful land-use planning could help reduce the state's GHG emissions by 25%; Oregon's transportation sector is responsible for 40% of the state's carbon emissions. In 2018, TriMet calculated that switching from diesel buses to electric buses would reduce overall emissions from buses by 57% in the Portland General Electric (PGE) service area. TriMet has committed to a goal of a 100% zero-emission fleet by 2040, which includes both battery electric and hydrogen fuel cell electric buses. As of 2024, TriMet has ordered 24 new battery electric buses to add to their fleet of 10 electric buses.

With fleet management plans, agencies can better use metrics to improve their fleets. New vehicle technologies in Oregon that aim to meet climate goals require an adapting workforce and processes to keep systems running. Maintenance on new bio-diesel or electric vehicles requires additional and routine training. Technology should be adopted through a planning process, noting that one size may not fit all even within agencies' service areas.

More federal funding has become available to switch to battery electric and hydrogen fuel cell battery electric vehicles as well as installing charging infrastructure and planning for new electric vehicle maintenance processes. For example, Canby Area Transit is readying for a future electric vehicle conversion by utilizing grant funds to design a new transit building with a transformer ready to accommodate the increased electricity load of electric bus charging.

Extreme weather events can make transit operations challenging while also providing a lifeline for riders to access jobs, healthcare, and other essential services. During winter storms, full plowing doesn't always occur in more temperate areas of Oregon.



INNOVATION

Maintaining and expanding transit services is the baseline standard that Oregonians expect. Innovation at community, local, and state government levels are needed to continue to have efficient and enjoyable travel. Innovative practices in expanding transit access throughout the state currently looks like:

- The integration of real time information such as vehicle tracking from transit agencies into universal apps such as Google Maps
- Most Oregon transit agencies offering online trip planning
- Larger agencies having a dedicated website or app that can be opened on a smartphone and displays bus and train locations and arrivals to stops as well as full mapped trip planning and connections
    - While smartphones have become commonplace, and trip planner apps and digital reader boards aid in the convenience of navigating transit systems for all users, physical maps remain important for users without smartphones.
- Contactless smartphone app, digital wallet, or card tap technology (e.g., Hop Fastpass for the TriMet system) while still retaining multiple fare collection systems including cash for redundancy and for unbanked transit riders
- Integrated intercity bus ticket platforms and transit pass exchanging (e.g., Point bus connections can be purchased on the Amtrak website through the same account to purchase Amtrak train tickets)
- Bus, streetcar, light rail, bike, and pedestrian active and passive/pre-timed signal priority
- Intelligent Transportation Systems (ITS) that can incorporate traffic information in real time
- Transportation Demand Management (TDM) initiatives such as employer-sponsored transit passes or benefits for using active transportation to commute to reduce carbon footprints and increase transit revenue (i.e., Get There Oregon online carpool board)
- Access to micromobility in some urban areas as a first/last-mile option (i.e., PeaceHealth Rides Eugene bikeshare)
- Bike/walking buses/trains for job and school commuting (i.e., PBOT Employee Bike Bus, Hood River's May Street Elementary School Bike Trains)

Oregon's public agencies' and private corporations' implementation and encouragement of these innovative practices work toward state-wide goals of sustainability, safety, and connectivity.

Transit

RECOMMENDATIONS TO RAISE THE GRADE

The following are recommendations to raise Oregon's transit grade:

- Develop transportation and land use plans hand-in-hand to support transit-oriented development, densification, and economic viability.
- Create sustainable funding sources for transit that don't rely on fare collection or ticket revenue as a significant source of funding, akin to funding for roads and bridges.
- Improve walking and biking infrastructure so riders can access transit stops safely.
- Establish transit resiliency plans at state and local levels to quickly restore transit infrastructure itself in addition to increasing transit's role in supporting natural or man-made disaster relief.
- Increase frequency and coverage across the state, balancing each with different systems' needs in rural vs. urban areas.
- Develop a diverse transit workforce, including providing multiple career pathways for transit operators, maintenance, and administrative workers. Provide readily available technical and vocational programs as well as career progression opportunities.

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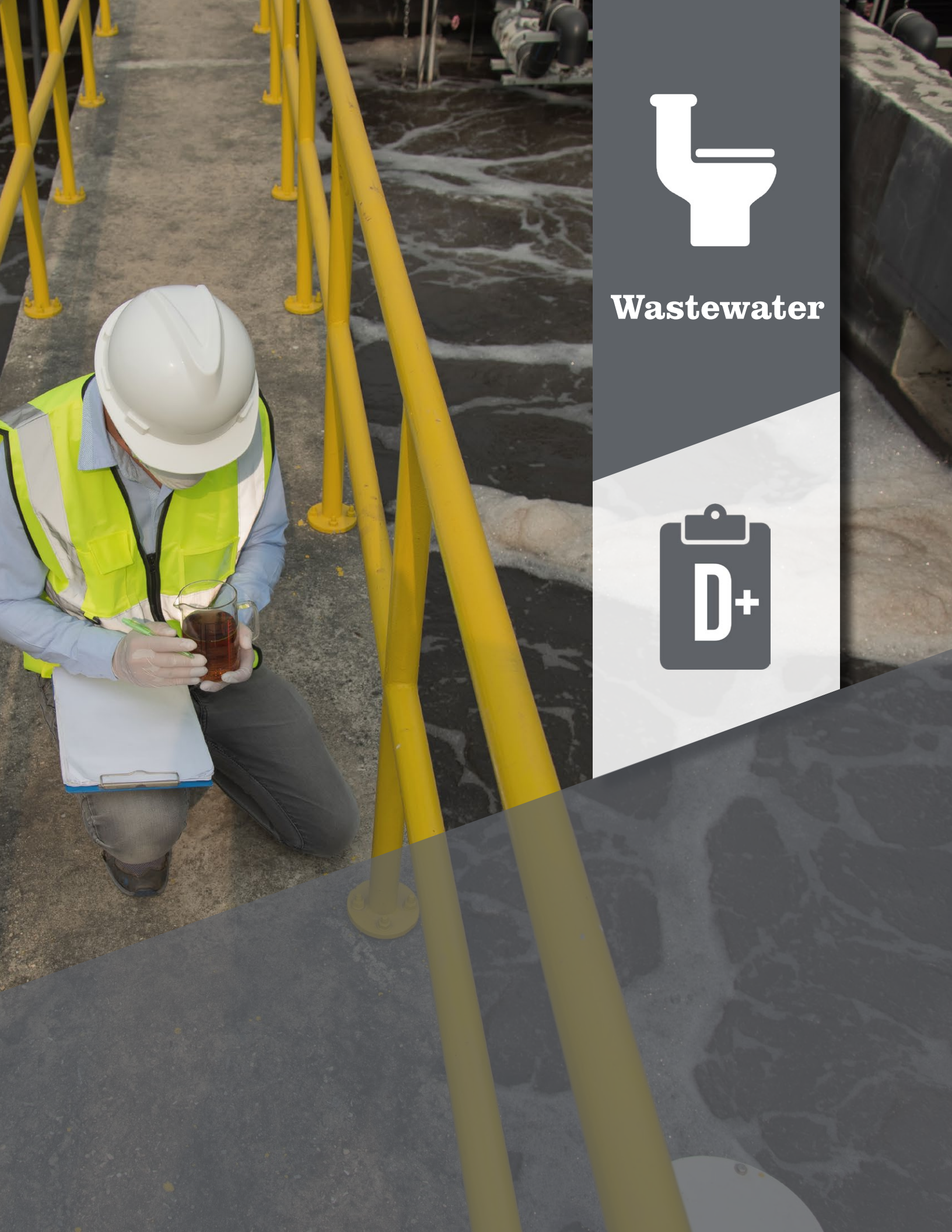

Wastewater

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EXECUTIVE SUMMARY

Oregon's wastewater systems are burdened by aging infrastructure and growing capacity needs due to population growth, which, despite recent slowing, still demands continuous investment. Significant capital programs in the large metro areas of the state are underway to address these issues, yet the financial needs far exceed available funding. The DEQ regulates numerous treatment facilities, but over 30% of Oregonians use septic systems that pose health risks without proper maintenance. Smaller communities often face emergency repairs due to inadequate planning and funding, exacerbating costs. Federal funding through the Infrastructure Investment and Jobs Act has provided some relief, but workforce shortages hinder effective utilization. Seismic resilience remains a critical concern, especially in the Willamette Valley, where infrastructure is vulnerable to earthquakes. Innovations in project delivery methods offer some improvement, but long-term solutions require increased federal funding, better workforce development, and proactive maintenance planning to ensure public safety and system reliability.

CONDITION AND CAPACITY

Oregon wastewater service providers often face competing demands of managing systems designed for much less capacity while fixing aging infrastructure on the cusp of failure.

Oregon's population grew from 3.85 million in 2010 to 4.29 million in 2019, growing as much as 1.9% annually. Population growth has slowed such that projected year-to-year increases for 2020 through 2030 slowing to 0.78%. This growth will continue to require continuous investment to expand system capacity. Oregon governor Tina Kotek introduced a bill to the 2024 Oregon legislature requesting $500 million to spur housing construction, with $200 million dedicated to roads, water infrastructure, and sewer infrastructure. However, the need is much larger. As the Oregonian reported on February 5, 2024, "Eighty-five cities submitted requests, totaling $827.9 million for 225 projects." The Governor has already stated her intent to submit a similar bill to the 2025 legislature.

Three of the largest wastewater service providers in Oregon have the largest ongoing capital programs addressing insufficient capacity. The largest wastewater capital program in Oregon is the City of Portland's Secondary Treatment Expansion Program (STEP) at the city's Columbia Boulevard Wastewater Treatment Plant. The program is not tied as much to population growth but to previous investments in constructing the Combined Sewage Overflow tunnels on the westside and eastside of the Willamette River. These tunnels intercept combined stormwater and wastewater that regularly overflowed into the Willamette River during peak storm events before the construction of the tunnels.

Water Environment Services (WES) is the primary wastewater service provider in Clackamas County, and maintains and operates two treatment plants and a collection system serving a 46-square-mile area. WES's large capital program addresses capacity deficiencies related to a surge in population in the last decade,

including an expansion of its service area. WES, like many wastewater service providers in Oregon, mainly uses System Development Charges (SDCs) to fund expanding system capacity due to increasing development.

The City of Bend in Deschutes County has seen explosive growth in the last decade, triggering large capital projects to provide increased capacity in its wastewater collection, conveyance, and treatment infrastructure. In addition to upsizing existing system capacity and constructing new services for new development, the city is expanding its system to serve residents who currently use onsite septic systems, thereby eliminating ongoing maintenance headaches associated with these systems.

Wastewater service providers across the state are also faced with repairing or replacing aging infrastructure that is beyond its useful life, leading to increased frequency of failures and costly system inefficiencies.

According to the Oregon Department of Environmental Quality (DEQ), there are 140 Publicly Owned Treatment Works (POTWs) regulated through the National Pollutant Discharge Elimination System (NPDES) permit program to treat domestic sewage, meaning that they discharge from a point source to state waters. There are nearly 83 additional public facilities that operate under Water Pollution Control Facility (WPCF) permits to discharge wastewater effluent to land. According to the Oregon Department of Environmental Quality (DEQ), more than 30% of Oregonians dispose of their wastewater through onsite septic systems, primarily residential systems. Without careful maintenance, any onsite septic systems can fail prematurely and result in a public health hazard caused by pollution that can impact streams and groundwater. DEQ regulates these systems by guiding their siting, design, installation, and ongoing operation and maintenance. Staff within the Water Quality program manage these regulations. The EPA estimates that 10 to 20% of the septic systems in Oregon fail each year, mainly from a lack of maintenance, which primarily includes pumping out solids regularly.

Wastewater service providers across the state are also faced with repairing or replacing aging infrastructure that is beyond its useful life, leading to increased frequency of failures and costly system inefficiencies.

OPERATIONS & MAINTENANCE

Especially for smaller communities, a lack of system knowledge makes it challenging to plan for operation and maintenance needs, leading to a reactive approach that increases spending on emergency maintenance and repairs. The accelerating deterioration of the collection and conveyance system introduces more stormwater infiltration and inflow (I&I), causing operation and maintenance issues due to roots, soil, and debris entering through pipe gaps. This I&I dramatically increases the volume of wastewater that conveyance systems and treatment plants must handle during wet weather. Consequently, treatment plants must be oversized to accommodate seasonal flow volumes, necessitating separate operating strategies for wet and dry weather seasons. System work during the wet season becomes more expensive due to high system flows and increased failure consequences. While emergency repairs are sometimes unavoidable, a proactive approach to identifying and addressing defects would minimize risks and reduce repair costs by scheduling them during lower system load periods. Improved asset management and replacement planning for conveyance and treatment systems is critical to reducing the need for reactive and more expensive maintenance.

FUNDING AND FUTURE NEEDS

A Portland State University estimate in 2021 identified $5.879 billion in statewide water quality/wastewater needs. Costs for necessary wastewater infrastructure exceed the affordable targets set by the EPA in many Oregon communities, with smaller and lower-income populations affected the most. Larger wastewater service providers like the City of Portland's Bureau of Environmental Services have funded multi-year programs to design and construct repairs to high-risk infrastructure assets. Funding for capital projects in the programs almost entirely come from bonds paid with utility rates. However, solely relying on raising sewer rates to fund capacity and asset condition needs may not be sustainable in the long term. For example, the City of Portland's sewer rates now exceed the Environmental Protection Agency's (EPA) affordability target by 5% considering the median household of their service area, and more rate hikes on the order of 3-5% are anticipated.

Smaller cities in Oregon address failing infrastructure project-by-project, sometimes borrowing capital funds through municipal bonds or using the Oregon Clean Water State Revolving Fund (OCWSRF), which provides low-interest loans for the planning, design, and construction of projects related to wastewater. Even with low interest rate loans funding large and expensive projects to expand capacity or fix aging assets is out of reach for many smaller cities in Oregon. The City of Banks (population 1,829 in 2021) issued a temporary building moratorium recently because of a lack of system capacity.

In the 2021 Oregon legislative session, lawmakers passed a package worth more than $530 million to fund water and sewer improvement projects but the biggest funding came from the federal government that same year. The Infrastructure Investment and Jobs Act (IIJA), passed by the U.S. Congress in 2021, delivers more than $50 billion to EPA to improve the nation's drinking water, wastewater, and stormwater infrastructure. Oregon's allocation for wastewater infrastructure was approximately $20 million to the CWSRF in Fiscal Year 2022 with increasing amounts for the next four years.

Workforce constraints will likely diminish the effective use of additional funds to address wastewater capacity and asset condition needs. Labor shortages in Oregon, especially skilled workers, have been increasing since the recovery from pandemic-related losses began. A League of Oregon Cities (LOC) survey in 2021 identified "workforce challenges (e.g. availability of skilled staff)" as an "issue/concern", second only to "replacement of aging infrastructure". This concern was echoed by a recent survey by the American Society of Civil Engineers: "Civil engineering firms find it difficult to hire and retain the skilled workers they need for all the infrastructure work that is suddenly available. Some firms must make difficult decisions about what work they can and cannot do". According to the Bureau of Labor Statistics, employment of civil engineers is projected to grow five percent from 2022 to 2032, faster than the average for all occupations. However, enrollment in many university civil and environmental engineering programs has been declining. Many factors for the decline have been hypothesized, including average pay that has historically lagged other engineering disciplines.

PUBLIC SAFETY

Much of Oregon's wastewater infrastructure remains in a state of rapid deterioration as costly repairs or replacements have been consistently deferred. This deferment in aging systems and systems with capacity constraints poses a risk to public safety. When aging buried pipes fail, they often fracture creating a sinkhole at the surface above as the soil and the material above flow into the pipe. A risk of insufficient capacity in conveyance pipes happens when the flow in the pipes backup, often resulting in untreated wastewater in the basement of homes or businesses or flooding the street. When septic systems fail, often from a lack of maintenance, untreated wastewater can enter the groundwater or spill over into surface waters, creating an environmental and public health hazard.

RESILIENCE & INNOVATION

System vulnerability can be broadly measured in system resilience during a seismic event and restoration of service after an event. Though some efforts have been made by wastewater service providers west of the Cascade mountains to make their systems more resilient, many remain vulnerable to a Cascadia subduction zone earthquake.

Much of the critical wastewater infrastructure in the Willamette Valley, including treatment plants, were built near rivers, where seismic-induced soil liquefaction would cause significant structural damage or system failure, especially to buildings that were built before the 1990s. Because of the absence of design guidance for seismic resilience, pipelines of any age remain vulnerable to hazards from landslides or ground deformation in an earthquake. The *2013 Oregon Resilience Plan* estimated the Cascadia subduction zone earthquake would cause 360 sewer pipe collapses and about 90 manhole replacements.

Restoration of wastewater service as quickly as possible is necessary to protect the community from sewage contamination and disease. Restoring wastewater service in the Willamette Valley could take up to a year and restoration of service on the Oregon coast could take up to three years, according to the Plan. Some wastewater service providers are including seismic vulnerability criteria into ongoing capital improvement planning but there is no statewide guidance. Wastewater service providers are also developing business continuity plans, including membership in the Oregon Water/Wastewater Agency Response Network (ORWARN) which provides mutual aid between cities.

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An area of innovation that is evolving is how projects are delivered. The default capital project delivery method set by Oregon law (ORS 279C.335) is to award construction contracts to the lowest responsible bidder. However, there are exceptions, and some infrastructure owners are using delivery methods like Construction Manager/General Contractor (CM/GC), Design-Build, and Progressive Design-Build to deliver some challenging wastewater projects. This is the case with the largest wastewater capital program in the state, STEP, which is using the CM/GC delivery model. WES and the City of Bend are also using alternative project delivery models with their large wastewater projects. Some of the benefits of using alternative delivery models identified by system owners include construction contractor input on constructability and costs while design concepts are being developed.

Wastewater

RECOMMENDATIONS TO RAISE THE GRADE

- Increase long-term and sustainable federal funding for wastewater infrastructure to address the gap between current resources and needs, especially for seismic resilience, capacity expansion, and compliance with evolving water quality standards.
- Advocate for career opportunities in wastewater infrastructure through public outreach and education programs to address the shortage of skilled workers. Enhance compensation and workplace flexibility to retain talent and attract new professionals.
- Oregon wastewater service providers should begin implementing recommendations from the 2013 Resiliency Plan, including establishing system recovery goals.

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