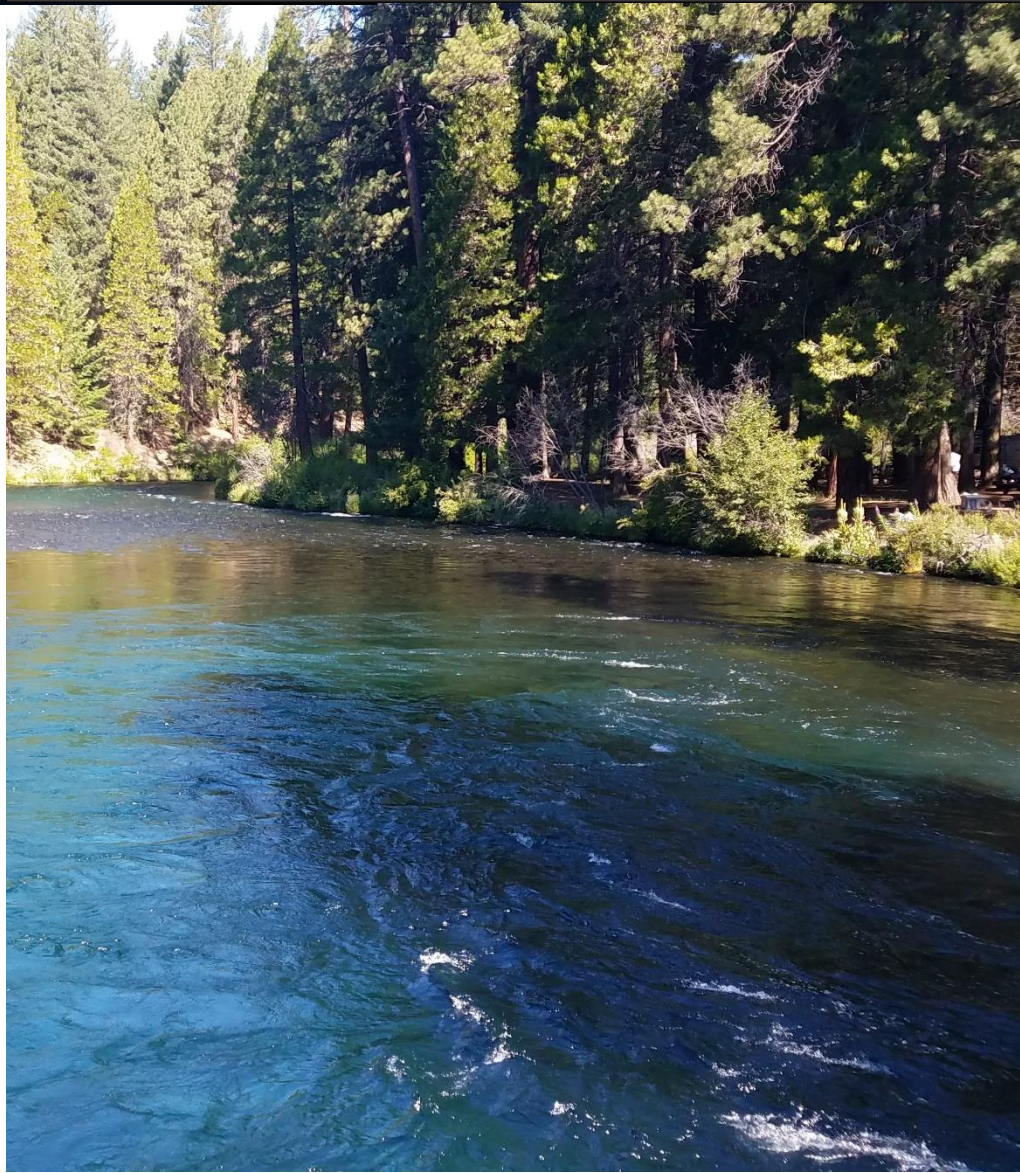




Oregon Water Quality Index Data Summary Water Years 2012-2021

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Introduction

This report provides a general statistical overview of water quality status and trends across Oregon using the Oregon Water Quality Index (OWQI). The index, which the state of Oregon has calculated for more than three decades, analyzes a defined set of water quality variables and produces scores describing general water quality throughout Oregon's rivers. This report only presents water quality from the rivers of Oregon. It does not include lakes, wetlands, estuaries, marine waters or groundwater resources. Variables included in the index are dissolved oxygen (percent saturation and concentration), biochemical oxygen demand (BOD), pH, total solids, ammonia and nitrate nitrogen, total phosphorus, temperature and bacteria (*E. coli*). Index scores range from 10 (worst case) to 100 (ideal water quality). DEQ uses the index to communicate information on the overall water quality of Oregon's rivers in an easy-to-understand, non-technical manner to the public, agency managers and the Oregon Legislature.

For this report, DEQ calculated water quality index results on all samples meeting data quality and quantity requirements collected from October 1, 2011 through September 30, 2021. DEQ calculated seasonal averages for the summer season (June through September) and fall-winter-spring season (October through May) and used the minimum of these seasonal 10-year averages for scoring purposes. Once scored, sites were given a status designation varying from excellent to very poor. Sites with sufficient data (30 or more scores) were analyzed for significantly improving or declining 10-year trends using the nonparametric Seasonal-Kendall test, which factors in normal seasonal variation. DEQ reports the magnitude and direction of significant trends at the 80 percent or greater confidence level. For more information on the reporting methods and uses of the index as well as an interactive map showing site locations, status and trends visit <http://www.oregon.gov/deq/wq/Pages/WQI.aspx>.

In addition, the Water Quality Index is not compared to water quality standards, does not evaluate if beneficial uses are supported, does not have regulatory standing, nor does it attempt to identify pollutant sources contributing to water quality impairments. These points differentiate the Water Quality Index from the Integrated Report, a biennial assessment of Oregon's surface water required by the Clean Water Act, Total Maximum Daily Load reports, which are science-based plans to clean up polluted water so that the waterbody meets state water quality standards, and the Oregon Statewide Water Quality Status and Trends Report, an annual assessment of Oregon's surface water. While the Integrated Report, TMDL reports, and the Status and Trends Report may incorporate the raw data used in the Water Quality Index, the analyses are different and, under certain circumstances, may identify results that appear to be inconsistent with the Water Quality Index.

Impacts on 2021 Data Collection

Only one sampling trip was cancelled in water year 2021 due to the ongoing pandemic. The development of sampling protocols and lifting of travel restrictions meant that DEQ monitoring staff were able to conduct their work with minimal interruption. The effect of the samples not

collected are expected to be minimal; however, DEQ will continue to consider the effect of COVID sampling interruptions on future OWQI analyses. Wildfires did not impact the ability of DEQ staff to collect samples in water year 2021. Due to the timing of the 2020 wildfires, this data summary is the first to include monitoring results following the 2020 fire season.

2021 Water Quality Index Status and Trend

Status

Oregon Water Quality Index results for water years 2012-2021 show 49 percent of sites in excellent or good status, 15 percent in fair and 36 percent in poor or very poor status for the statewide ambient monitoring network of 160 sites (Figure 1). Three sites reported on in 2015 and 2016 were part of a special study and were dropped from the ambient network at the completion of the study.

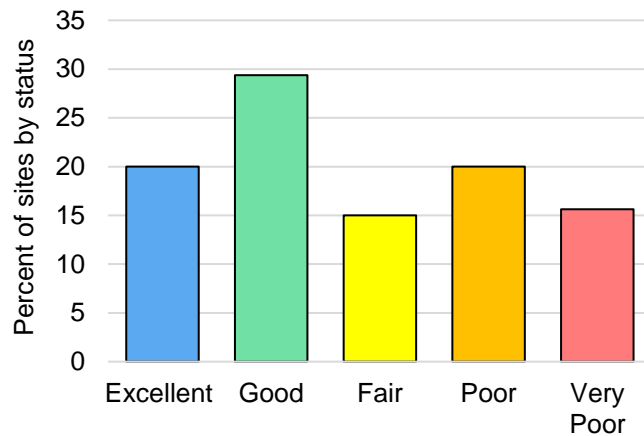


Figure 1. Percent of sites with scores in each Oregon Water Quality Index status.

Trend

One location, Skipanon River at Highway 101, did not have the required data (30 or more scores) in this data window to calculate a trend. This site is tidally influenced. High conductivity samples are not included in the analysis because they do not accurately reflect ambient water quality as this study is intended. Of the 159 locations where trend analysis could be completed, 8 percent showed an improving trend in water quality, while 11 percent had a declining trend in water quality. Of the sites with improving trends, 41 percent are categorized as fair to very poor status. This is up from 27 percent last year. On the other hand, 33 percent of the sites with declining water quality are categorized as excellent or good status and should be evaluated further to avoid a decrease in water quality status. The remaining 82 percent of sites have no statistically significant trend.

Where are we seeing improving and declining water quality?






Improving Trends

Sites with significantly improving water quality index trends in 2021 were spread across the state (Table 2). The site that showed the greatest improvement, based on the magnitude of the trend, was Malheur River at Little Valley in the Malheur Basin. While this site is still in Very Poor condition it has improved from an OWQI score of 43 in 2013 to an OWQI score of 56 in 2021. Two sites, Little Deschutes River at Highway 42 and Johnson Creek at SE 17th Ave in Portland, are showing an improving trend for the first time since 2018. The average improving trend magnitude was higher at sites in fair to very poor status than at sites in good or excellent status indicating that the largest gains in water quality occurred at sites most in need of improvement (Excellent or Good, n = 7, \bar{x} = 1.6, Fair to Very Poor n = 5, \bar{x} = 8.1).

Table 2. Sites monitored by DEQ showing significant improving trends in water quality for water years 2012-2021. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the ten-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years
DESCHUTES BASIN						
10506	Deschutes R at Warm Springs	Range	85	Good	↑ 1.8	
10696	Little Deschutes R at HWY 42	Forest	92	Excellent	↑ 1.1	
GRANDE RONDE BASIN						
10410	Wallowa R at Minam	Forest	87	Good	↑ 1.9	
MALHEUR BASIN						
11480	Malheur R at Little Valley	Range	56	Very Poor	↑ 10.4	
NORTH COAST BASIN						
11856	Nehalem R at Foley Rd	Forest	89	Good	↑ 1.9	
13424	Wilson R at HWY 6	Forest	91	Excellent	↑ 2.2	
13433	Trask R at HWY 101	Mixed	87	Good	↑ 1.3	

Table 2. Sites monitored by DEQ showing significant improving trends in water quality for water years 2012-2021. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the ten-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years
OWYHEE BASIN						
10729	Owyhee R at HWY 201	Agriculture	50	Very Poor	↑ 13.5	
UMATILLA BASIN						
36785	Rhea Creek at Bergevin Rd. or Morter Rd	Agriculture	62	Poor	↑ 5.5	
WILLAMETTE BASIN - LOWER						
11201	Columbia Slough at Landfill Rd	Urban	52	Very Poor	↑ 9.3	
11321	Johnson Creek at SE 17th Ave. (Portland)	Urban	39	Very Poor	↑ 1.9	
WILLAMETTE BASIN - UPPER						
10662	McKenzie R at Hendricks Bridge	Forest	94	Excellent	↑ 1.3	

Declining Trends

Seven of the 18 sites with declining trends in 2021 are located in the Willamette Basin. Statewide, eight sites showed a declining trend for the first time including three sites downstream of 2020 wildfire affected watersheds (Table 3). The sites in wildfire affected watersheds are Bear Creek at Kirtland Road, McKenzie River at Coburg Road and Rogue River at Dodge Park. Eleven sites are now showing declining trends despite showing improving trends in the last five to ten years. One site, Neal Creek at Fir Mountain Road in the Hood River Basin, has shown a declining trend for five consecutive years. The site that showed the greatest drop in water quality, based on the magnitude of the trend, was Umatilla River at Yoakum in the Umatilla Basin (Table 3). The average declining trend magnitude was higher at sites in fair to very poor status than at sites in good or excellent status indicating that the largest drops in water quality occurred at sites most in need of improvement (Excellent or Good, $n = 6$, $\bar{x} = -1.8$, Fair to Very Poor $n = 12$, $\bar{x} = -3.0$).

Table 3. Sites monitored by DEQ showing significant declining trends in water quality for water years 2012-2021. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the ten-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years
DESCHUTES BASIN						
10411	Deschutes R at Deschutes R Park (Mouth)	Range	82	Fair	↓ -2.9	
HOOD BASIN						
33603	Neal Creek at Fir Mountain Rd	Mixed	84	Fair	↓ -2.5	
JOHN DAY BASIN						
11020	S Fk John Day R at Dayville	Range	88	Good	↓ -1.6	
KLAMATH BASIN						
10763	Klamath Strait at USBR Pump Station F	Agriculture	24	Very Poor	↓ -1.4	
10765	Klamath R at Keno	Forest	38	Very Poor	↓ -4.5	
NORTH COAST BASIN						
13440	Tillamook R at Bewley Creek Rd	Mixed	78	Poor	↓ -2.4	
ROGUE BASIN						
10423	Rogue R at Dodge Park	Mixed	92	Excellent	↓ -3.1	
11051	Bear Creek at Kirtland Rd	Mixed	66	Poor	↓ -3.8	
UMATILLA BASIN						
10404	Umatilla R at Yoakum	Agriculture	81	Fair	↓ -5.1	
10406	Umatilla R at HWY 11 (Pendleton)	Agriculture	73	Poor	↓ -3.3	
UMPQUA BASIN						
10442	S Umpqua R at Melrose Rd	Mixed	69	Poor	↓ -0.9	
WILLAMETTE BASIN - LOWER						
10456	Tualatin R at Boones Ferry Rd	Urban	35	Very Poor	↓ -0.9	
WILLAMETTE BASIN - MIDDLE						
10640	Pudding R at HWY 211 (Woodburn)	Agriculture	60	Poor	↓ -4.9	

Table 3. Sites monitored by DEQ showing significant declining trends in water quality for water years 2012-2021. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the ten-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years
WILLAMETTE BASIN - UPPER						
10355	Willamette R at HWY 99E (Harrisburg)	Agriculture	92	Excellent	↓ -1.2	
10376	McKenzie R at Coburg Rd	Mixed	93	Excellent	↓ -1.7	
10663	Mohawk R. at Hill Rd.	Mixed	88	Good	↓ -1.8	
11180	Calapooia R at Queens Rd (Albany)	Agriculture	76	Poor	↓ -3.1	
11275	Coast Fk Willamette R at Mt. Pisgah Park	Mixed	89	Good	↓ -1.3	

Which water quality sub-indices are improving or declining?

Trend analysis of water year 2021 data indicates that temperature had the highest percentage of improving sub-index scores at 27 percent (Figure 2). The percentages of improving subindex scores have steadily been declining since 2017. This coincided with the most recent peak in the percentage of sites with improving trends, which has also steadily been declining. The analysis also showed 25% fewer improving sub-index trends during the 2021 OWQI reporting period than during the 2020 OWQI reporting period. There were 49 fewer improving sub-index trends in the forest land use type during this reporting period, than during the 2020 OWQI reporting period. There were also 42 fewer improving sub-index trends for phosphorous during this reporting period compared to the 2020 OWQI reporting period. Total solids, dissolved oxygen, and nitrogen had the highest percentage of declining sub-index scores. This is the seventh consecutive year in which these sub-indices have had the highest percentage of declining scores. The 2021 OWQI reporting period had 1% fewer declining sub-index trends than the 2020 OWQI reporting period. There were 12 additional declining sub-index trends for nitrogen during this reporting period compared to the 2020 OWQI reporting period. No clear patterns in sub-indices occurred at sites downstream of wildfire impacted watersheds.

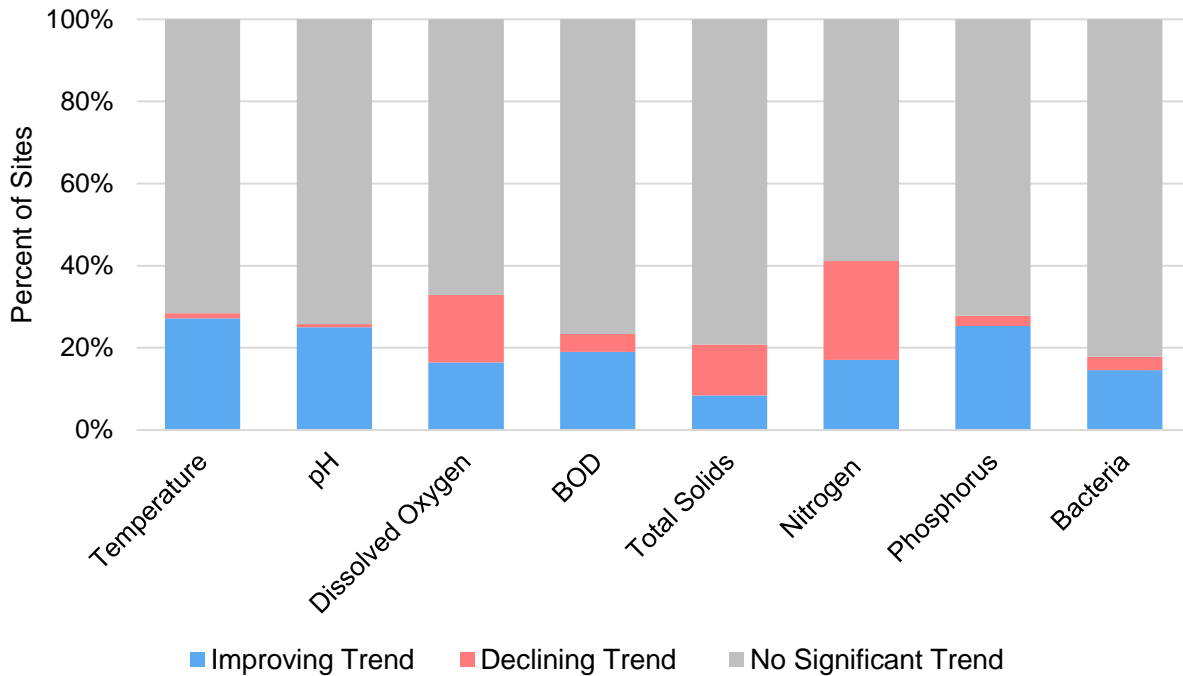


Figure 2. Sub-index trends for the 2021 water year (October 1, 2020 to September 30, 2021).

How does land use influence status?

Land use type is determined based on the dominant land use in a five-mile buffer upstream of the monitoring site. The mixed land use type was assigned when none of the other four land use designations made up more than 50 percent of the five-mile buffer. The “forest land use type” for water quality monitoring purposes encompasses all lands designated under a general umbrella, which could possibly be downstream of private industrial forest lands (some harvested recently, others not), state forests (harvestable and/or non-harvestable), state parks, protected areas and federal forest lands. The Water Quality Index is not intended to assess water quality in actively managed private timber lands.

As in recent years, the forest land use type continues to have the highest percentage of excellent and good status sites (Figure 3). More than 60 percent of sites in the agriculture, range, and urban land use types had a status of fair to very poor for the fourth consecutive year. For the sites in this group, 12% are declining in water quality while 8% are improving in water quality. This is the second straight year that the mixed land use type has had less than 50 percent of sites in fair to very poor status since water year 2015. The status shown in this figure, and throughout the report, is a result of a combination of the sub-index scores, so while the overall status may be excellent or good, some sub-index scores may reflect fair or poor water quality status.

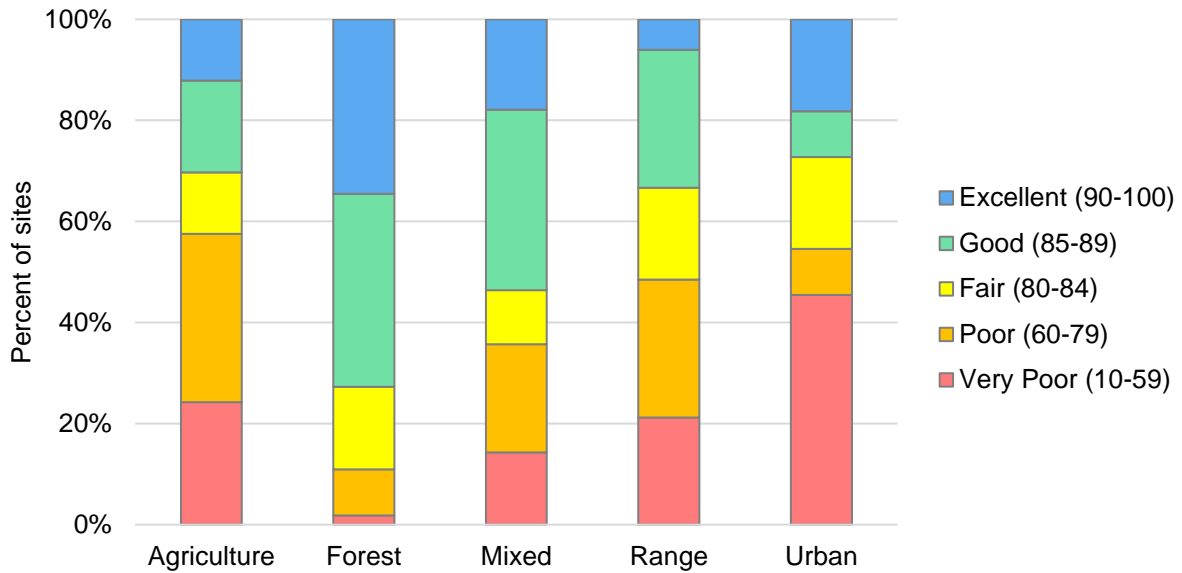


Figure 3. Influence of land use on water quality.

Want more information on the Oregon Water Quality Index?

Visit <http://www.oregon.gov/deq/wq/Pages/WQI.aspx> for links to these resources:

- Interactive map showing 2012-2021 status and trends for all monitoring sites
- Storymap that explains what parameters make up the OWQI
- Downloadable data summaries for all sites organized by basin
- Document on Reporting Methods and Uses of the Oregon Water Quality Index
- Downloadable Excel file of 2021 raw data and historical status and trends
- Documentation of the development and calculation methods of the index