

Oregon Water Quality Index Data Summary

Water Years 2010-2019

(Oct. 1, 2010 through Sept. 30, 2019)

By: Dan Brown

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.



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Introduction

This report provides a general statistical overview of water quality status and trends across Oregon through use of 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 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 Oct. 1, 2010 through Sept. 30, 2019. DEQ calculated seasonal averages for the summer season (June to September) and fall-winter-spring season (October to 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>.

2019 Water Quality Status and Trend

Status

Oregon Water Quality Index results for water years 2010-2019 show 51 percent of sites in excellent or good status, 16 percent in fair and 33 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 a part of a special study and were dropped from the ambient network at the completion of the study.

Trend

In 2019, three of the 19 sites added to the ambient network in 2012 or 2013 reached the required amount of data to be included in the trend analysis (30 or more scores) compared to four sites included in 2018. This increased the number of ambient sample sites with sufficient data to calculate trends to 152. Of the 152 trendable sites, 16 percent showed improving water quality, while 16 percent had declining water quality. Of the sites with improving trends, 38 percent are categorized as fair to very poor status. This is up slightly from 36 percent last year. On the other hand, eight of the 25 sites with declining water quality are categorized as excellent or good status and should be evaluated

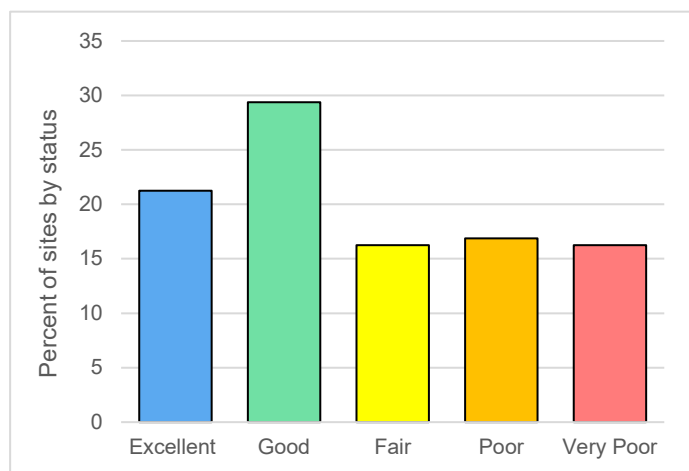


Figure 1. Percent of sites with scores in each Oregon Water Quality Index status.

further to avoid a decrease in water quality status. The remaining 68 percent of sites have no statistically significant trend.

New Trend Sites

As mentioned above, three sites reached the required amount of data to be included in trend analysis during the 2019 water year, however no significant trend was identified at any of these locations. Each of these sites were added to the ambient monitoring network in either 2012 or 2013 in conjunction with Oregon Department of Agriculture. These sites improved the spatial coverage of the OWQI and provided important information on state waters in agricultural areas for ODA. While these sites are in their first year of trend analysis, the status of these sites has been included in previous OWQI data summaries. Table 1 indicates the status of these sites since their inclusion in the ambient monitoring network.

Table 1. Status of new trend sites from the date established.

Station	Location Description	Basin	Land Use	Water Year Range	OWQI Status						
					2013	2014	2015	2016	2017	2018	2019
10730	Owyhee R at Rome (Hwy 95)	Owyhee	Range	2013-19	Fair	Fair	Fair	Fair	Fair	Fair	Fair
12265	Donner und Blitzen River at Page Springs Campground	Oregon Closed Lakes	Range	2013-19	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
33930	Chewaucan River 2.4 miles u/s of Paisley, OR	Oregon Closed Lakes	Range	2013-19	Fair	Fair	Fair	Fair	Good	Good	Fair

Where are we seeing improving and declining water quality?

Sites with significantly improving water quality index trends in 2019 were spread across the state (Table 2). The site that showed the greatest improvement, based on the magnitude of the trend, was Rhea Creek in the Umatilla Basin. This the third consecutive year in which this site has had an improving trend. Three sites, Deschutes River at Warm Springs, John Day River at Hwy 206 and Owyhee River at Hwy 201, are showing an improving trend for the first time in more than five years. Both the Deschutes River at Warm Springs and Owyhee River at Hwy 201 sites also reversed declining trends within the last five years. 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 = 15, \bar{x} = 2.1, Fair to Very Poor n = 9, \bar{x} = 3.6).

Table 2. Sites monitored by DEQ showing significant improving trends in water quality for water years 2010-2019. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the five-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	Water Year Range	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend							
								Temp	PH	DO	BOD	TS	N	P	Bact
DESCHUTES BASIN															
10506	Deschutes R at Warm Springs	Range	2010-19	85	Good	↑ 2.5		↑	↓	↑	↓	↑	↓	↑	↓
10688	Deschutes R at Pringle Falls	Forest	2010-19	92	Excellent	↑ 1.6		↑	↑	↑	↑	↑	↑	↑	↑
10690	Metolius R at Bridge 99 (Camp Sherman)	Forest	2010-19	91	Excellent	↑ 1.2		↑	↑	↑	↑	↑	↑	↑	↑
GRANDE RONDE BASIN															
10410	Wallowa R at Minam	Forest	2010-19	86	Good	↑ 3.7		↑	↑	↑	↑	↑	↑	↑	↑
10719	Grande Ronde R at HWY 82 (Elgin)	Mixed	2010-19	84	Fair	↑ 2.9		↑	↑	↑	↑	↑	↑	↑	↑
JOHN DAY BASIN															
11386	John Day R at HWY 206	Range	2010-19	81	Fair	↑ 2.9		↑	↑	↑	↑	↑	↑	↑	↑

Table 2, continued. Sites monitored by DEQ showing significant improving trends in water quality for water years 2010-2019. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the five-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	Water Year Range	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend									
								Temp	pH	DO	BOD	TS	N	P	Bact		
KLAMATH BASIN																	
10770	Williamson R at Williamson R Store	Mixed	2010-19	89	Good	↑ 1.7		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
21535	Sprague River at Sprague River Rd	Range	2012-19	87	Good	↑ 2.3		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
MALHEUR BASIN																	
11480	Malheur R at Little Valley	Range	2010-19	53	Very Poor	↑ 5.7		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
MID COAST BASIN																	
11241	Salmon R at Otis	Forest	2010-19	89	Good	↑ 2.2		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
33644	North Beaver at Ona Grange	Forest	2010-19	83	Fair	↑ 3.4		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
NORTH COAST BASIN																	
10812	Skipanon R at HWY 101	Mixed	2010-19	40	Very Poor	↑ 3.7		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
11856	Nehalem R at Foley Rd	Forest	2010-19	87	Good	↑ 1.9		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
13411	Miami R at Moss Creek Rd	Forest	2010-19	86	Good	↑ 2.0		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
13424	Wilson R at HWY 6	Forest	2010-19	89	Good	↑ 1.7		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
13433	Trask R at HWY 101	Mixed	2010-19	85	Good	↑ 1.9		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
OWYHEE BASIN																	
10729	Owyhee R at HWY 201	Agriculture	2010-19	49	Very Poor	↑ 1.7		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
ROGUE BASIN																	
10418	Rogue R at Robertson Bridge (Merlin)	Forest	2010-19	87	Good	↑ 2.8		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
10421	Rogue R at Rock Point Bridge (Gold Hill)	Forest	2010-19	88	Good	↑ 2.8		↑	↑	↓	↑	↑	↑	↑	↑	↑	↑
SOUTH COAST BASIN																	
13570	Millicoma R at Rooke Higgins Boat Ramp	Forest	2010-19	73	Fair	↑ 1.8		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
UMATILLA BASIN																	
36785	Rhea Creek at Bergevin Rd. or Morter Rd	Agriculture	2012-19	61	Poor	↑ 8.1		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
UMPQUA BASIN																	
10997	Cow Creek at Mouth (Riddle)	Forest	2010-19	86	Good	↑ 0.8		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
WILLAMETTE BASIN - LOWER																	
11201	Columbia Slough at Landfill Rd	Urban	2010-19	50	Very Poor	↑ 2.6		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
WILLAMETTE BASIN - UPPER																	
10662	McKenzie R at Hendricks Bridge	Forest	2010-19	94	Excellent	↑ 1.7		↑	↑	↑	↑	↓	↑	↑	↑	↑	↑

Fourteen of the 25 sites with declining trends in 2019 are located in the Willamette Basin. Statewide, thirteen sites had declining trends for the first time in more than a year, including six in the Willamette Basin (Table 3). Despite being categorized as good status, the Willamette River at Albany site has shown a declining trend for four consecutive years. One notable absence from this list is the Willamette River at Canby Ferry site, which had previously shown a declining for three consecutive years. The site remains categorized in good status, but showed no significant trend in water quality.

Table 3. Sites monitored by DEQ showing significant declining trends in water quality for water years 2010-2019. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the five-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	Water Year Range	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend									
								Temp	pH	DO	BOD	TS	N	P	Bact		
HOOD BASIN																	
33603	Neal Creek at Fir Mountain Rd	Mixed	2012-19	83	Fair	↓ -5.6		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
MALHEUR BASIN																	
11043	Bully Creek at HWY 20 (Vale)	Agriculture	2010-19	31	Very Poor	↓ -0.6		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

Table 3, continued. Sites monitored by DEQ showing significant declining trends in water quality for water years 2010-2019. Sites are listed by basin. Magnitude indicates the rate of change (i.e. higher numbers equal more rapid change). For the five-year trend, blue or red squares indicate improving or declining trends.

Station	Location Description	Land Use	Water Year Range	OWQI Score	OWQI Status	OWQI Trend and Magnitude	OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend							
								Temp	pH	DO	BOD	TS	N	P	Bact
NORTH COAST BASIN															
11434	Clatskanie R at HWY 30 (Clatskanie)	Forest	2010-19	84	Fair	↓ -1.3	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
34019	Nehalem R at Birenkfeld	Forest	2010-19	85	Good	↓ -2.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
ROGUE BASIN															
10423	Rogue R at Dodge Park	Mixed	2010-19	92	Excellent	↓ -1.5	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↑	↓	↑	↑	
SOUTH COAST BASIN															
10596	Coquille R at Sturdivant Park Dock	Forest	2010-19	82	Fair	↓ -3.6	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
11483	Chetco R at USGS Gage	Forest	2010-19	91	Excellent	↓ -1.3	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
11486	S Fk Coquille R at Broadbent	Forest	2010-19	85	Good	↓ -5.9	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
UMPQUA BASIN															
10443	S Umpqua R at HWY 42 (Winston)	Mixed	2010-19	74	Poor	↓ -3.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10996	Calapooya Creek at Umpqua	Forest	2010-19	80	Fair	↓ -3.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↓	↑	↑	
11522	S Umpqua R at Stewart Park Rd (Roseburg)	Mixed	2010-19	76	Poor	↓ -2.5	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
WILLAMETTE BASIN - LOWER															
10332	Willamette R at SP&S RR Bridge (Portland)	Urban	2010-19	81	Fair	↓ -0.7	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10456	Tualatin R at Boones Ferry Rd	Urban	2010-19	37	Very Poor	↓ -1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10458	Tualatin R at Elsner Rd	Mixed	2010-19	45	Very Poor	↓ -2.7	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10459	Tualatin R at HWY 210 (Scholls)	Agriculture	2010-19	37	Very Poor	↓ -0.6	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10469	Fanno Creek at Bonita Rd (Tigard)	Urban	2010-19	57	Very Poor	↓ -4.2	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↑	↓	↑	↑	↑	
10480	Beaverton Creek at 216th (Orengo)	Urban	2010-19	44	Very Poor	↓ -5.1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10611	Willamette R at Hawthorne Bridge	Urban	2010-19	84	Fair	↓ -3.1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
WILLAMETTE BASIN - MIDDLE															
10792	N Santiam R at Greens Bridge	Agriculture	2010-19	94	Excellent	↓ -1.1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10929	N Yamhill R at Poverty Bend Rd	Agriculture	2010-19	79	Poor	↓ -2.7	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10948	S Yamhill R at HWY 99W	Agriculture	2010-19	83	Fair	↓ -3.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
WILLAMETTE BASIN - UPPER															
10350	Willamette R at Albany	Agriculture	2010-19	89	Good	↓ -2.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
10373	Mary's R at HWY 99W (Corvallis)	Agriculture	2010-19	85	Good	↓ -2.1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
11180	Calapooia R at Queens Rd (Albany)	Agriculture	2010-19	76	Poor	↓ -4.0	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	
11275	Coast Fk Willamette R st Mt. Pisgah Park	Mixed	2010-19	88	Good	↓ -1.9	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	↑	↑	↓	↓	↑	↑	↑	

Why is water quality improving or declining?

Trend analysis of 2019 water year data indicate that phosphorus had the highest percentage of improving subindex scores at 55 percent (Figure 2). This is the second consecutive year for phosphorous and third consecutive year for temperature in which no scores were declining for either subindex. This may be indicative of the restoration work done across the state, but, in the case of phosphorous, could also indicate an increase in aquatic plant growth, including algae, across the state. Total solids, nitrogen, and dissolved oxygen had the highest percentage of declining subindex scores. This is the fifth consecutive year in which these subindices have had the highest percentage of declining scores.

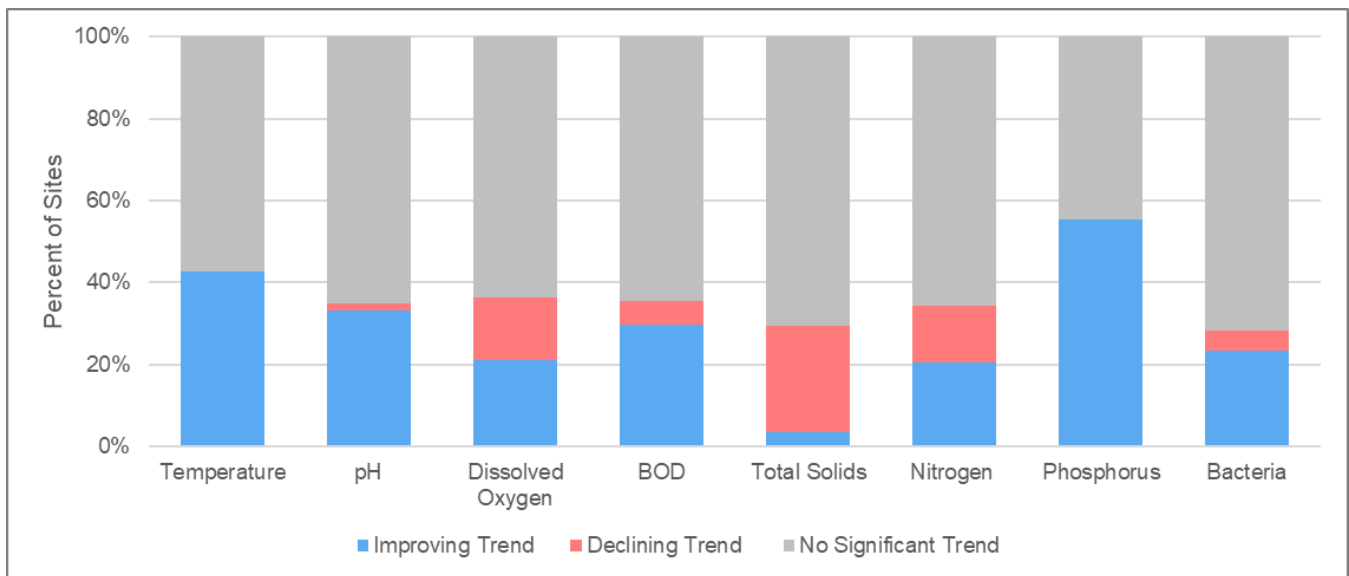


Figure 2. Sub-index trends for the 2019 water year (October 1, 2018 to September 30, 2019).

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 continues to have the highest percentage of excellent and good status sites, while the urban and agriculture land use types have the highest percentage of sites in fair to very poor status. Both the range and mixed land use types again had more than 50% of the sites in fair to very poor status, but both also have a considerable proportion of sites in excellent or good status.

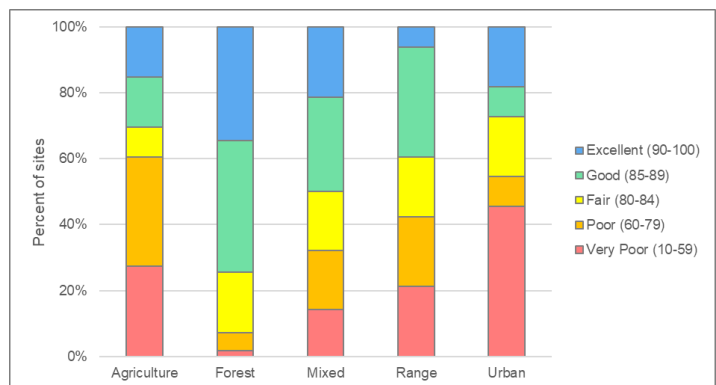


Figure 3. Influence of land use on water quality.

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 2010-2019 status and trends for all monitoring sites
- 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 2019 raw data and historical status and trends
- Documentation of the development and calculations methods of the index