Oregon Water Quality Index Data Summary

Water Years 2008-2017

(Oct. 1, 2008 through Sept. 30, 2017)

By: Dan Brown

February 2018

Laboratory and Environmental Assessment Program
7202 NE Evergreen Pkwy,
Suite 150
Hillsboro, OR 97124
Phone: 503-693-5700
800-52-4011
Fax: 503-693-4999
Contact: Dan Brown
www.oregon.gov/DEQ

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

State of Oregon
Department of Environmental Quality

Last Updated: 2/14/18

This report prepared by:

Oregon Department of Environmental Quality
Laboratory and Environmental Assessment Program
7202 NE Evergreen Parkway, Suite 150, Hillsboro, Oregon 97124 U.S.A.
1-800-452-4011
www.oregon.gov/deq

Contact:
Lesley Merrick
503-693-5724
merrick.lesley@deq.state.or.us

OR

Dan Brown
503-693-5743
brown.daniel@deq.state.or.us

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. Only river water quality is presented in this report. 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, 2008 through Sept. 30, 2017. 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.

2017 Water Quality Status and Trend

Status

Oregon Water Quality Index results for water years 2008-2017 show 49 percent of sites in excellent or good status, 18 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.

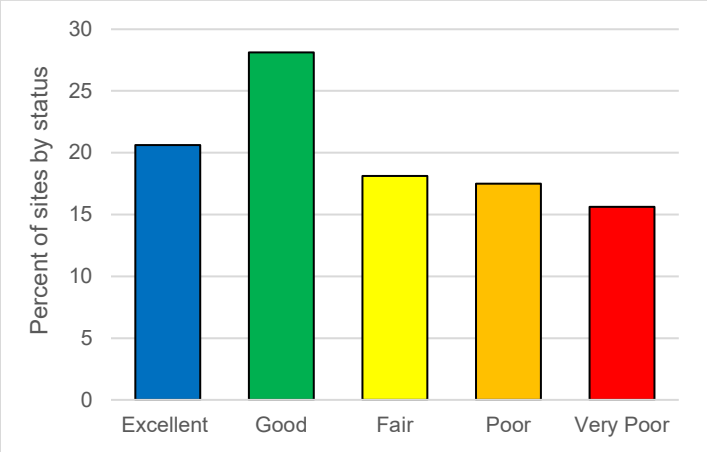

Figure 1. Percent of sites with scores in each Oregon Water Quality Index status.

Trend

In 2017, 14 of the 29 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). This increased the number of ambient sample sites with sufficient data to calculate trends to 145. Of the 145 sites, 32 percent showed improving water quality, while 8 percent have declining water quality. Of the sites with improving trends, 37 percent are categorized as fair to very poor status. This is down from 41 percent last year, which is encouraging as continued upward trends may result in improved water quality status for these sites. On the other hand, five of the twelve sites with declining water quality are in good status and

should be evaluated further to avoid a decrease in water quality status. The remaining 64 percent of sites have no statistically significant trend.

New Trend Sites

As mentioned above 14 sites reached the required amount of data to be included in trend analysis during the 2017 water year. All 14 of these sites were added to the ambient monitoring network in either 2012 or 2013 in conjunction with Oregon Department of Agriculture. These sites improve the spatial coverage of the OWQI and provide 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 provides information about how the inclusion of these new trend sites influenced statewide trends. Table 2 indicates the status of these sites since their inclusion in the ambient monitoring network.

Table 1. Statewide trend data from water year 2016 and water year 2017 with and without the new trend sites.

	Improving	Declining	No Trend	Total # Sites
2016	24%	6%	69%	131
2017	34%	8%	58%	131
2017*	32%	8%	60%	145

*Including new trend sites

Table 2. Status of new trend sites from the date established.

Station	Location Description	Basin	Land Use	Water Year Range	OWQI Status					
					2012	2013	2014	2015	2016	2017
28333	Fifteen mile creek at Petersburg, OR	Columbia	Agriculture	2012-17	Poor	Poor	Poor	Poor	Poor	Poor
36776	Trout Creek ds of Mud Springs Creek	Deschutes	Agriculture	2012-17	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor
33603	Neal Creek at Fir Mountain Rd	Hood	Agriculture	2012-17	Good	Good	Good	Good	Fair	Fair
36787	Rock Creek near mouth	John Day	Agriculture	2012-17	Fair	Fair	Good	Good	Good	Fair
21535	Sprague River at Sprague River Rd	Klamath	Agriculture	2012-17	Good	Good	Good	Fair	Good	Good
33266	Willow Creek north of Jamieson, OR	Malheur	Agriculture	2012-17	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor
36805	Applegate River at Murphy, OR	Rogue	Agriculture	2012-17	Good	Excellent	Excellent	Excellent	Excellent	Excellent
36784	Willow Creek at Rhea Rd	Umatilla	Agriculture	2012-17	Poor	Poor	Poor	Poor	Poor	Poor
36785	Rhea Creek at Bergevin Rd. or Morter Rd	Umatilla	Agriculture	2012-17	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Poor
36786	Pine Creek at Hudson Bay Substation Rd	Umatilla	Agriculture	2012-17	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor
36875	Luckiamute River at Buena Vista Rd	Willamette - Middle	Agriculture	2012-17	Good	Good	Good	Good	Good	Good
11182	Calapooia Creek at HWY 99E	Willamette - Upper	Agriculture	2012-17	Excellent	Good	Good	Fair	Fair	Poor
36788	Amazon Creek at High Pass Rd	Willamette - Upper	Agriculture	2012-17	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor
36790	Muddy Creek south of Corvallis at Airport Ave	Willamette - Upper	Agriculture	2012-17	Poor	Poor	Poor	Fair	Poor	Poor

Where are we seeing improving and declining water quality?

Sites with significantly improving water quality index scores in 2017 were spread across the state. Three sites showed the greatest improvement, based on the magnitude of the trend, two in the Klamath Basin and one in the Umatilla Basin. The two sites in the Klamath Basin have shown double-digit improvement for the last three years. While some sites improve consistently over a number of years, 14 sites are showing an improving trend for the first time in five or more years. Many of the sites with improving water quality are in fair to very poor status (16 out of 46 sites; Table 3), indicating that the largest gains in water quality occurred at sites with the most room for improvement.

Table 3. Sites monitored by DEQ showing significant improving trends in water quality for water years 2008-2017. Sites are listed by basin in alphabetical order. Highlighted stations are new to trend analysis in 2017. 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		Trend for Past 5 Reporting Years	Sub-Index Status and Trend							
									Temp	pH	DO	BOD	TS	N	P	Bact
DESCHUTES BASIN																
10508	Deschutes R at Lower Bridge	Range	2008-17	85	Good	↑	3.7				↓	↑		↑	↑	
10511	Deschutes R at Mirror Pond (Bend)	Mixed	2008-17	92	Excellent	↑	2.1						↑		↑	
10517	Crooked R at Lone Pine Rd	Range	2008-17	73	Poor	↑	2.8					↑		↑		
10688	Deschutes R at Pringle Falls	Forest	2008-17	92	Excellent	↑	2.4			↑		↑				
10690	Metolius R at Bridge 99 (Camp Sherman)	Forest	2008-17	91	Excellent	↑	2.4			↑		↑				
10696	Little Deschutes R at HWY 42	Forest	2008-17	91	Excellent	↑	2.9						↑	↑	↑	
GRANDE RONDE BASIN																
10410	Wallowa R at Minam	Forest	2008-17	85	Good	↑	5.3			↑		↑	↑		↑	
10719	Grande Ronde R at HWY 82 (Elgin)	Mixed	2008-17	84	Fair	↑	3.5		↑	↑		↑			↑	
11457	Minam R at Minam	Forest	2008-17	95	Excellent	↑	3.9					↑		↑	↑	
KLAMATH BASIN																
10759	Lost R at HWY 39 (us Merrill)	Agriculture	2008-17	32	Very Poor	↑	0.7		↑		↑		↑			
10764	Klamath R ds Big Bend Powerhouse	Forest	2008-17	73	Poor	↑	11.9				↑	↑		↑	↑	
10765	Klamath R at Keno	Forest	2008-17	39	Very Poor	↑	10.6			↑				↑	↑	
10768	Link R at Mouth (Lake Ewauna)	Mixed	2008-17	41	Very Poor	↑	8.3					↑	↓	↑	↑	
MALHEUR BASIN																
11480	Malheur R at Little Valley	Range	2008-17	49	Very Poor	↑	1.7		↑			↑	↑	↑		↑
MID COAST BASIN																
11241	Salmon R at Otis	Forest	2008-17	89	Good	↑	2.7			↑	↑	↑		↓	↑	
33644	North Beaver at Ona Grange	Forest	2008-17	83	Fair	↑	0.5		↑	↑		↑		↑	↑	
NORTH COAST BASIN																
10521	Necanicum R at Forest Lake RV Camp	Forest	2008-17	90	Excellent	↑	0.2		↑			↑	↑		↑	
10812	Skipanon R at HWY 101	Mixed	2008-17	39	Very Poor	↑	3.33		↑		↑					
13411	Miami R at Moss Creek Rd	Forest	2008-17	84	Fair	↑	2.2		↑			↑			↑	↑
ROGUE BASIN																
10414	Rogue R at Lobster Point Bridge	Forest	2008-17	88	Good	↑	1.97					↑			↑	
10418	Rogue R at Robertson Bridge (Merlin)	Forest	2008-17	87	Good	↑	3.53				↑	↑		↓	↑	
10421	Rogue R at Rock Point Bridge (Gold Hill)	Forest	2008-17	88	Good	↑	5.81		↑			↑			↑	↑
10423	Rogue R at Dodge Park	Mixed	2008-17	92	Excellent	↑	3.35		↑	↑		↑			↑	↑
10428	Applegate R at HWY 199	Forest	2008-17	88	Good	↑	2.8				↑	↑	↓			
10602	Little Butte Creek at Agate Rd (White City)	Agriculture	2008-17	73	Poor	↑	6.4		↑	↑		↑			↑	↑
11482	Illinois R ds Kerby	Forest	2008-17	88	Good	↑	1.8			↑		↑			↑	
36805	Applegate River at Murphy, OR	Forest	2008-17	91	Excellent	↑	4.2		↑	↑	↑	↑				
SOUTH COAST BASIN																
10533	Sixes R at HWY 101	Forest	2008-17	90	Excellent	↑	2.4					↑		↑	↑	
11493	Pistol R at Pistol R Loop Rd	Forest	2008-17	85	Good	↑	4.94				↑	↑	↑		↑	
11905	Elk R at HWY 101	Forest	2008-17	93	Excellent	↑	2.1					↑	↑	↓	↑	
13570	Millicoma R at Rooke Higgins Boat Ramp	Forest	2008-17	73	Poor	↑	1.92						↑	↑	↑	
13574	S Fk Coos R at Anson Rogers Bridge	Forest	2008-17	80	Fair	↑	2.21						↑		↑	
UMATILLA BASIN																
10404	Umatilla R at Yoakum	Agriculture	2008-17	80	Fair	↑	8.5			↑		↑				
36785	Rhea Creek at Bergevin Rd. or Morter Rd	Agriculture	2013-17	60	Poor	↑	10.8			↑					↑	
UMPQUA BASIN																
10437	Umpqua R at Elkton	Forest	2008-17	87	Good	↑	2.2								↑	
10997	Cow Creek at Mouth (Riddle)	Forest	2008-17	86	Good	↑	2.6				↑	↑			↑	

Table 3, continued. Sites monitored by DEQ showing significant improving trends in water quality for water years 2008-2017. Sites are listed by basin in alphabetical order. Highlighted stations are new to trend analysis in 2017. 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		Trend for Past 5 Reporting Years	Sub-Index Status and Trend							
									Temp	pH	DO	BOD	TS	N	P	Bact
WILLAMETTE BASIN - LOWER																
11201	Columbia Slough at Landfill Rd	Urban	2008-17	49	Very Poor	↑	2.4					↑	↑		↑	
11321	Johnson Creek at SE 17th Ave. (Portland)	Urban	2008-17	37	Very Poor	↑	1.1					↓		↑	↑	
13070	Clackamas R at McIver Park (Upper Boat Ramp)	Mixed	2008-17	93	Excellent	↑	1.6		↑		↑	↑			↑	
14008	Clackamas R at Memaloose Rd	Forest	2008-17	94	Excellent	↑	1.4			↑	↓	↑	↓	↑	↑	
WILLAMETTE BASIN - MIDDLE																
10344	Willamette R at Wheatland Ferry	Agriculture	2008-17	88	Good	↑	3.2							↑	↑	
12553	N Santiam R at Gates School Rd	Forest	2008-17	94	Excellent	↑	2.5				↓	↑		↑	↑	
12559	N Santiam R at Coopers Ridge Rd	Forest	2008-17	94	Excellent	↑	2.1				↓	↑		↑	↑	
WILLAMETTE BASIN - UPPER																
10376	McKenzie R at Coburg Rd	Mixed	2008-17	93	Excellent	↑	3.0		↑	↑	↑	↑			↑	
10662	McKenzie R at Hendricks Bridge	Forest	2008-17	94	Excellent	↑	2.2					↑		↑		
12552	McKenzie R at McKenzie Bridge	Forest	2008-17	94	Excellent	↑	3.2				↑	↑		↑	↑	

While sites with significantly declining water quality index scores in 2017 were also spread across the state, they were less prevalent. The site in the Deschutes Basin that had been declining for over three years in 2016 showed no trend in 2017. Three sites in the Willamette Basin that showed declining trends for the first time in 2016 (10339, 10350, and 10373), continued to show declining trends, but are all still in good status (Table 4). These are the only sites that have consistently shown declining trends. The declining trend at these locations appears to be ongoing and further investigation should be conducted to prevent any further decline in status.

Table 4. Sites monitored by DEQ showing significant declining trends in water quality for water years 2008-2017. Sites are listed by basin in alphabetical order. Highlighted stations are new to trend analysis in 2017. 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		Trend for Past 5 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	2008-17	83	Fair	↓	-11.8						↓	↓	↑	↓
NORTH COAST BASIN																
34019	Nehalem R at Birenkfeld	Forest	2008-17	85	Good	↓	-2.1		↑							↑
SOUTH COAST BASIN																
11486	S Fk Coquille R at Broadbent	Forest	2008-17	85	Good	↓	-2.3		↑			↑		↑	↑	
UMPQUA BASIN																
11522	S Umpqua R at Stewart Park Rd (Roseburg)	Mixed	2008-17	78	Poor	↓	-1.9					↑	↓			↑
WILLAMETTE BASIN - LOWER																
10332	Willamette R at SP&S RR Bridge (Portland)	Urban	2008-17	81	Fair	↓	-1.2				↓			↓		
10458	Tualatin R at Elsner Rd	Agriculture	2008-17	44	Very Poor	↓	-0.8		↑			↓	↓		↑	
WILLAMETTE BASIN - MIDDLE																
10339	Willamette R at Canby Ferry	Mixed	2008-17	88	Good	↓	-2.1							↓		↑
10929	N Yamhill R at Poverty Bend Rd	Agriculture	2008-17	79	Poor	↓	-3.9		↑				↓			
10948	S Yamhill R at HWY 99W	Mixed	2008-17	84	Fair	↓	-3.4		↑				↓		↑	
WILLAMETTE BASIN - UPPER																
10350	Willamette R at Albany	Agriculture	2008-17	89	Good	↓	-2.2						↓	↓		↑
10373	Mary's R at HWY 99W (Corvallis)	Agriculture	2008-17	85	Good	↓	-2.3							↓		
11180	Calapooia R at Queens Rd (Albany)	Agriculture	2008-17	78	Poor	↓	-5.0						↓			↓

Why is water quality improving or declining?

Trending analysis of the water years 2008-2017 data show a greater proportion of sites with improving trends for phosphorus than any other sub-index variable with 64 percent of the sites with improving trends, followed by temperature with 45 percent of the sites with improving trends (Figure 2). Nitrogen and total solids had the greatest percentage of sites with declining trends (19 percent), followed by dissolved oxygen (15 percent). With the exception of temperature and phosphorus, most sites showed no significant improving or declining 10-year trends for all other sub-indexes.

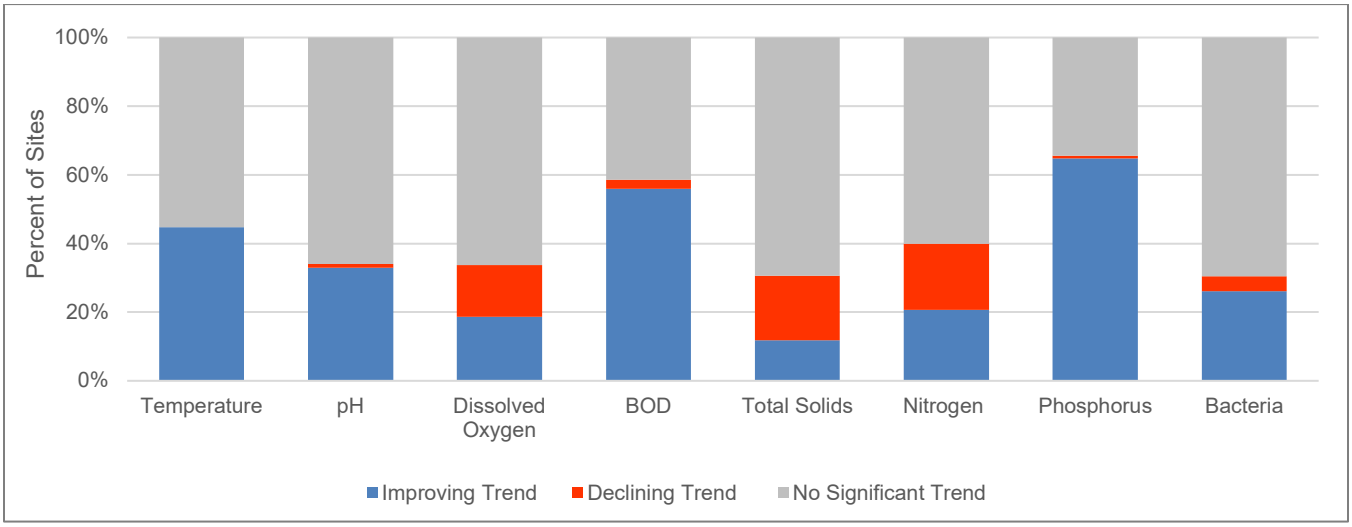

Figure 2. Sub-Index trends for the 2017 water year (October 1, 2016 to September 30, 2017).

How does land use influence status?

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. Comparatively, sites in the mixed and range land use types are evenly distributed among the five water quality status categories.

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.

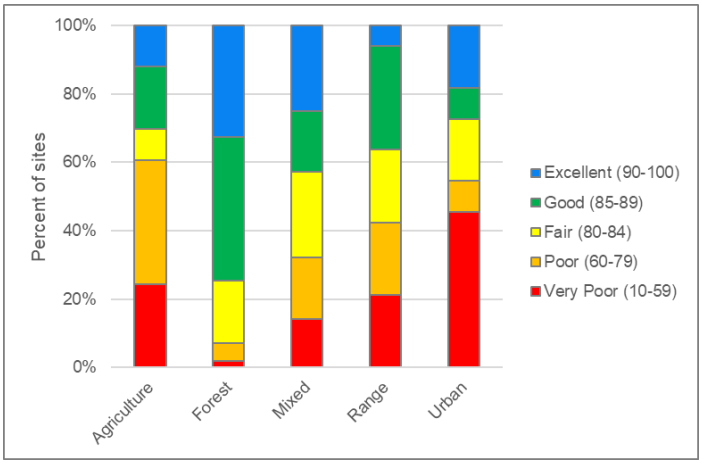

Figure 3. Influence of land use on water quality.

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 2008-2017 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 2017 Raw data and historical status and trends
- Documentation of the development and calculations methods of the index