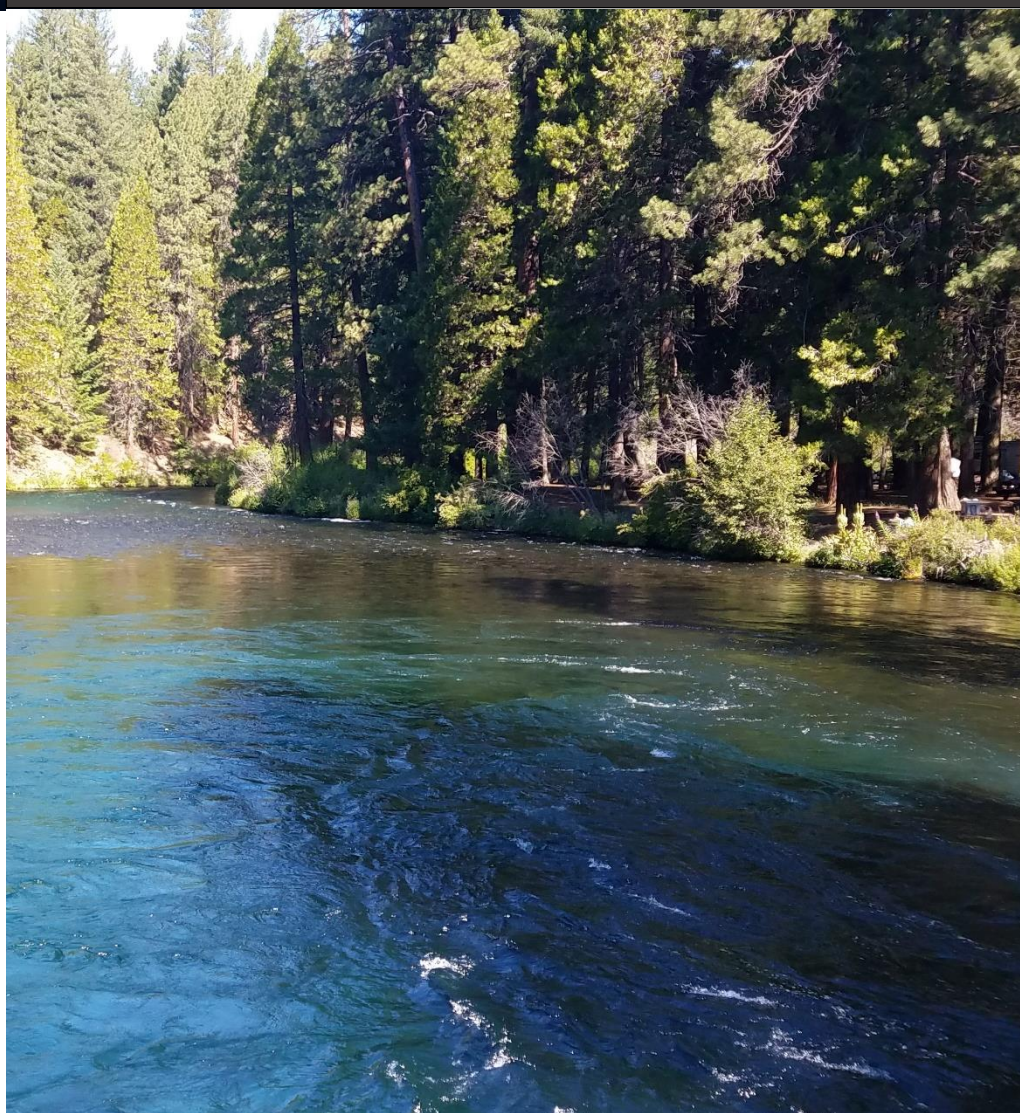
Oregon Water Quality Index Data Summary

Water Years 2013-2022

February 2023



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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 DEQ has calculated for more than three decades, analyzes a defined set of discrete water quality variables and produces scores describing general water quality at a network of locations on Oregon's rivers and streams. 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, 2012 through September 30, 2022. 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.

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 that includes more parameters and is not calculated as an index. 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.

2022 Water Quality Index Status and Trend

Status

Oregon Water Quality Index results for water years 2013-2022 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.

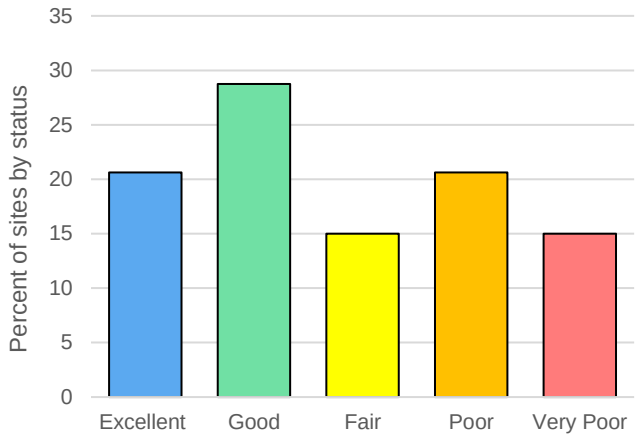


Figure 1. Percent of sites with scores in each Oregon Water Quality Index status.

Trend

The Skipanon River at Highway 101 and South Fork Blitzen River at Blitzen Crossing monitoring locations did not have the required data (30 or more scores) in this data window to calculate a trend. The Skipanon River 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. The Blitzen River site is one of the most remote locations in the ambient network and access can be difficult during large portions of the year. Of the 158 locations where trend analysis could be completed, 14 percent showed an improving trend in water quality, while 11 percent had a declining trend in water quality (Figure 2). Of the sites with improving trends, 54 percent are categorized as fair to very poor status. This is up from 41 percent last year. On the other hand, 39 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 75 percent of sites have no statistically significant trend.

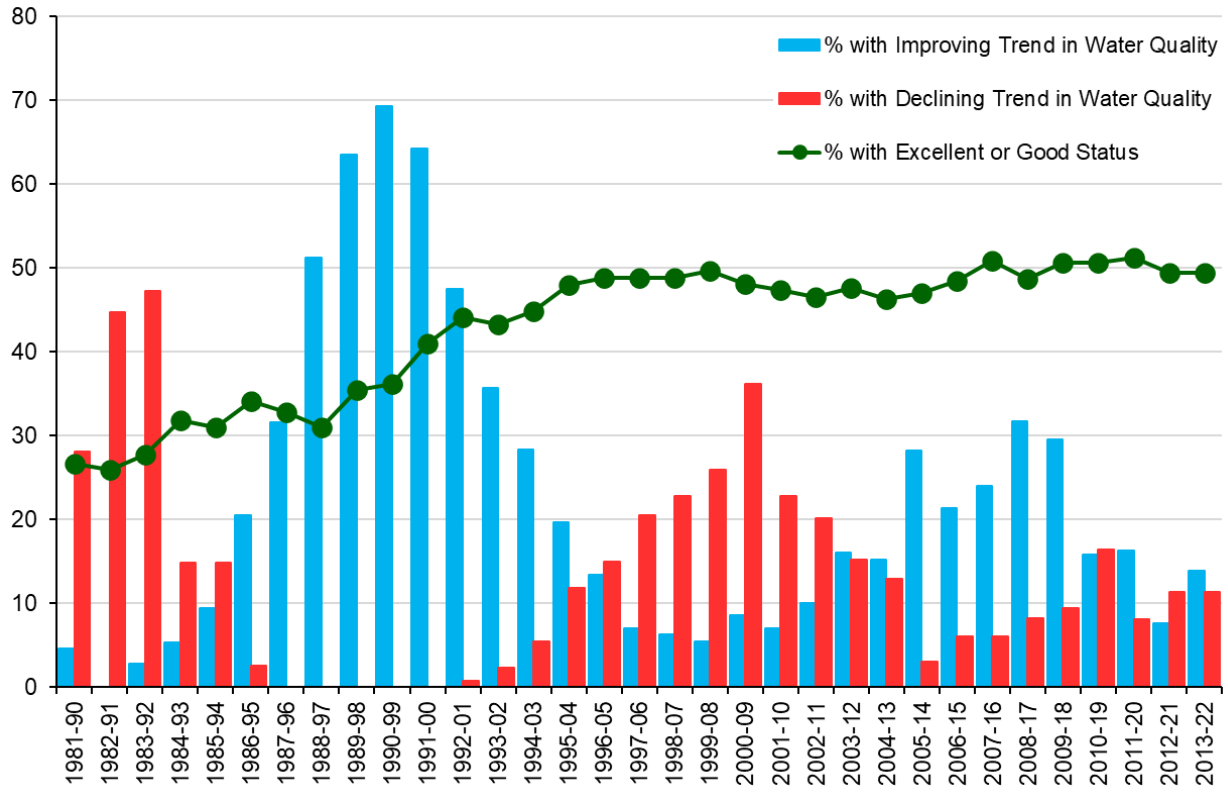


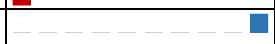
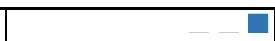
Figure 2. Percentages of sites with improving or declining trends and the percentage of sites with Excellent or Good status by OWQI reporting period. Sites determined to have no trend in a reporting period are not shown.

Where are we seeing improving and declining water quality?

Improving Trends

Sites with significantly improving water quality index trends in 2022 were spread across the state (Table 2). The site that showed the greatest improvement, based on the magnitude of the trend, was Owyhee River at Highway 201 in the Owyhee Basin. While this site is still in Very Poor status it has improved from an OWQI score of 38 in 2013 to an OWQI score of 48 in 2022. Nine sites are showing an improving trend for the first time. 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 = 10, $\bar{x}$ = 1.7, Fair to Very Poor n = 12, $\bar{x}$ = 4.2).

Table 2. Sites monitored by DEQ showing significant improving trends in water quality for water years 2013-2022. 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. For sub-index status, blue indicates excellent, green indicates good, yellow indicates fair, orange indicates poor, and red indicates very poor status. Sub-index codes: T = Temperature, D = Dissolved Oxygen, B = BOD, TS = Total Solids, N = Nitrogen, P = Phosphorous and E = *E. coli.*

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude		OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend							
								T	pH	D	B	TS	N	P	E
DESCHUTES BASIN															
10508	Deschutes R at Lower Bridge	Range	87	Good	↑	2.0					↑			↑	
36776	Trout Creek ds of Mud Springs Creek	Range	47	Very Poor	↑	3.7			↑			↑		↑	
MALHEUR BASIN															
11043	Bully Creek at HWY 20 (Vale)	Agriculture	33	Very Poor	↑	1.0			↑	↑	↓			↑	↑
11480	Malheur R at Little Valley	Range	58	Very Poor	↑	10.6		↑	↑			↑		↑	
MID COAST BASIN															
10391	Siletz R 5 miles ds Siletz	Forest	91	Excellent	↑	1.9					↑		↑		
11263	Alsea R at Thissell Rd	Forest	89	Good	↑	3.2		↑		↑					↑
11476	Yaquina R ds Chitwood	Forest	84	Fair	↑	1.3			↑				↑		↑
NORTH COAST BASIN															
10521	Necanicum R at Forest Lake RV Camp	Forest	91	Excellent	↑	1.4		↑	↑		↑	↑	↑		
10523	Nestucca R at Cloverdale	Forest	86	Good	↑	1.5			↑	↑	↑				↑
12187	Youngs R at Youngs R Loop Rd	Forest	89	Good	↑	1.5				↓					
13411	Miami R at Moss Creek Rd	Forest	88	Good	↑	1.9			↑					↑	
13433	Trask R at HWY 101	Mixed	88	Good	↑	1.2					↑				
OREGON CLOSED LAKES BASIN															
10741	Honey Creek at Plush, OR	Range	66	Poor	↑	1.5			↑						
OWYHEE BASIN															
10729	Owyhee R at HWY 201	Agriculture	48	Very Poor	↑	11.6		↑	↑	↑	↑	↑	↑	↑	
SOUTH COAST BASIN															
13574	S Fk Coos R at Anson Rogers Bridge	Forest	83	Fair	↑	0.8			↑		↑				
UMATILLA BASIN															
36785	Rhea Creek at Bergevin Rd. or Morter Rd	Agriculture	65	Poor	↑	5.4				↑					↑
WILLAMETTE BASIN - LOWER															
10458	Tualatin R at Elsner Rd	Agriculture	42	Very Poor	↑	2.8				↑	↑		↑		
10480	Beaverton Creek at 216th (Orenco)	Urban	41	Very Poor	↑	4.9				↑				↑	
11233	Clackamas R at High Rocks	Mixed	91	Excellent	↑	1.5					↑			↑	↑
11321	Johnson Creek at SE 17th Ave. (Portland)	Urban	39	Very Poor	↑	3.7		↑	↑		↑				
14008	Clackamas R at Memaloose Rd	Forest	94	Excellent	↑	0.9		↑		↑	↑	↑			
WILLAMETTE BASIN - MIDDLE															
10929	McKenzie R at Hendricks Bridge	Forest	79	Poor	↑	3.3		↑			↑	↑			

Declining Trends

Statewide, ten sites showed a declining trend for the first time (Table 3). Twelve sites are now showing declining trends despite showing improving trends in the last five to ten years. After five years of declining trends, Neal Creek at Fir Mountain Road in the Hood River Basin showed no trend in 2022. The site that showed the greatest drop in water quality, based on the magnitude of the trend, was Willow Creek at Rhea Rd 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 = 7, $\bar{x}$ = -2.1, Fair to Very Poor n = 11, $\bar{x}$ = -4.3).

Table 3. Sites monitored by DEQ showing significant declining trends in water quality for water years 2013-2022. 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. For sub-index status, blue indicates excellent, green indicates good, yellow indicates fair, orange indicates poor, and red indicates very poor status. Sub-index codes: T = Temperature, D = Dissolved Oxygen, B = BOD, TS = Total Solids, N = Nitrogen, P = Phosphorous and E = E. coli.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude		OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend							
								T	pH	D	B	TS	N	P	E
DESCHUTES BASIN															
10517	Crooked R at Lone Pine Rd	Range	76	Poor	↓	-5.0			↓	↓		↓	↑		↑
JOHN DAY BASIN															
11020	S Fk John Day R at Dayville	Range	88	Good	↓	-1.5		↑			↓				
36787	Rock Creek near mouth	Range	82	Fair	↓	-3.1			↑			↓			
KLAMATH BASIN															
10763	Klamath Strait at USBR Pump Station F	Agriculture	23	Very Poor	↓	-1.4		↑							
10768	Link R at Mouth (Lake Ewauna)	Mixed	33	Very Poor	↓	-1.9					↓		↓		
OWYHEE BASIN															
11050	Jordan Creek at Arock Rd	Range	74	Poor	↓	-1.7									↓
ROGUE BASIN															
10421	Rogue R at Rock Point Bridge (Gold Hill)	Forest	86	Good	↓	-2.1		↑		↓	↓				
10423	Rogue R at Dodge Park	Mixed	91	Excellent	↓	-3.8			↑	↓				↑	↑
10602	Little Butte Creek at Agate Rd (White City)	Agriculture	73	Poor	↓	-4.3					↓	↓	↓	↓	
11051	Bear Creek at Kirtland Rd	Mixed	63	Poor	↓	-6.4						↓		↓	
36805	Applegate River at Murphy, OR	Forest	90	Excellent	↓	-1.8						↓	↓	↑	↑
UMATILLA BASIN															
10404	Umatilla R at Yoakum	Range	81	Fair	↓	-5.1						↓	↓		
11489	Umatilla R at Westland Rd (Hermiston)	Agriculture	53	Very Poor	↓	-5.5				↓			↓		
36784	Willow Creek at Rhea Rd	Agriculture	67	Poor	↓	-7.4			↑	↓		↓	↓		

Table 3, continued. Sites monitored by DEQ showing significant declining trends in water quality for water years 2013-2022. 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. For sub-index status, blue indicates excellent, green indicates good, yellow indicates fair, orange indicates poor, and red indicates very poor status. Sub-index codes: T = Temperature, D = Dissolved Oxygen, B = BOD, TS = Total Solids, N = Nitrogen, P = Phosphorous and E = E. coli.

Station	Location Description	Land Use	OWQI Score	OWQI Status	OWQI Trend and Magnitude		OWQI Trend for Past 10 Reporting Years	Sub-Index Status and Trend							
								T	pH	D	B	TS	N	P	E
WILLAMETTE BASIN - UPPER															
10350	Willamette R at Albany	Agriculture	89	Good	↓	-2.3		↑					↓		
10355	Willamette R at HWY 99E (Harrisburg)	Agriculture	92	Excellent	↓	-1.2		↑					↓	↑	
10376	McKenzie R at Coburg Rd	Forest	93	Excellent	↓	-1.9		↑		↓			↓		
36788	Amazon Creek at High Pass Rd	Agriculture	49	Very Poor	↓	-5.6		↑	↑		↑		↓		↓

Which water quality sub-indices are improving or declining?

Trend analysis of water year 2022 data indicates that pH had the highest percentage of improving sub-index scores at 31 percent (Figure 3). Until this year, the percentages of improving subindex scores across all parameters had largely been declining since 2017. The percentage of sites with improving trends had also steadily been declining until this year. The analysis also showed 3 percent more improving trends during the 2022 OWQI reporting period than during the 2021 OWQI reporting period. Most of this improvement occurred in the Agriculture land use type, which had 20 more improving sub-index trends than last reporting period. There were 14 fewer improving sub-index trends for phosphorous during this reporting period compared to the 2021 OWQI reporting period. Nine of which were lost in the Forest land use type.

Nitrogen had the highest percentage of declining sub-index scores followed by total solids and dissolved oxygen. This is the eighth consecutive year in which these sub-indices have had the highest percentage of declining scores. The 2022 OWQI reporting period had 20 percent fewer declining sub-index trends than the 2020 OWQI reporting period. This reduction was most notable in the Forest land use type, where there were 10 fewer declining sub-index trends, and in dissolved oxygen, where there were 14 fewer declining sub-index trends, during this reporting period compared to the 2021 OWQI reporting period.

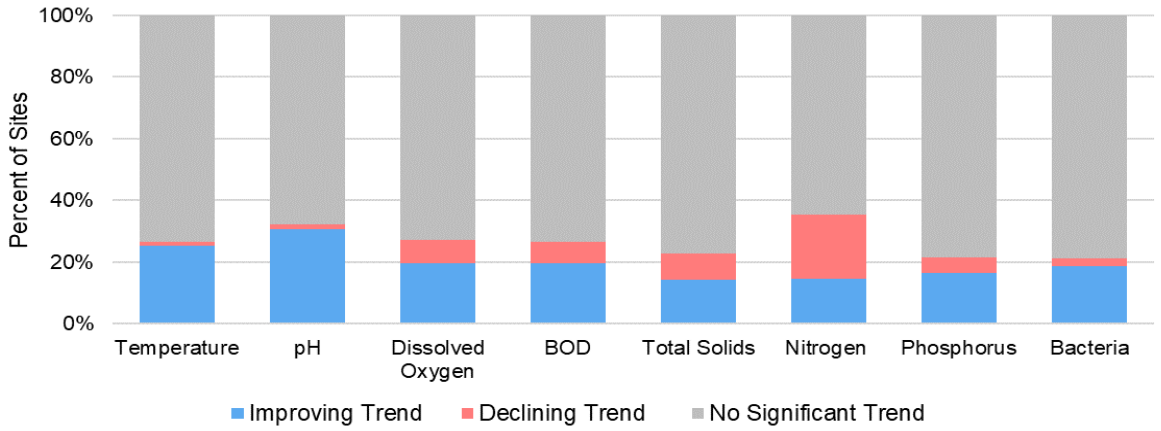


Figure 3. Sub-index trends for the 2022 water year (October 1, 2021 to September 30, 2022).

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 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.

The forest land use type continued to have the highest percentage of excellent and good status sites (Figure 3). This is the first year that none of the sites in the forest land use type have had a status of very poor. It is also the first year that the percentage of excellent and good status site in the mixed land use type has reached 60 percent. This reporting period is the first time in at least five years that 40 percent of sites in the range land use type had a status of excellent or good. Compared to the urban land use type where nearly 90 percent of sites had a status of fair to very poor, and none of the sites had a status of excellent. The status shown in Figure 4, 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.

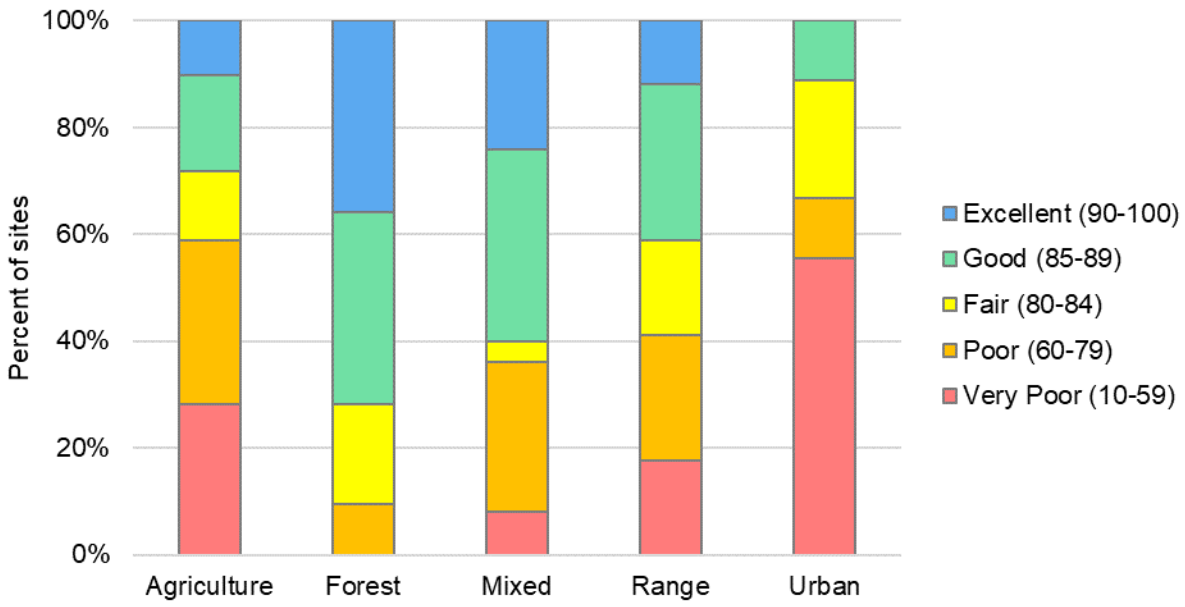


Figure 4. Influence of land use on water quality on OWQI scores.

Land use types were updated after the 2021 OWQI reporting period. DEQ used the 2019 USGS national land cover dataset (released in July 2021) to update the land use types. Any instance where land use type changed was visually confirmed before updating. This process resulted in the changing of land use type for 29 sites in the network. Table 4 shows the net change by land use type.

Table 4. Net change in number of sites by land use type between the 2021 and 2022 OWQI reporting periods.

Land Use Type	# of sites in 2021	# of sites in 2022	Change
Agriculture	33	39	6
Forest	55	53	-2
Mixed	28	25	-3
Range	33	34	1
Urban	11	9	-2

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 2013-2022 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 2022 raw data and historical status and trends
- Documentation of the development and calculation methods of the index