



2022 Summary Report: Lake Cascade Groundwater Monitoring

The Idaho Department of Environmental Quality’s Groundwater Quality Rule is intended to maintain and protect the existing high quality of Idaho’s groundwater. By sampling and monitoring wells throughout the state, DEQ can assess water quality to aid in land use management decisions that impact groundwater.

This monitoring project is designed to assess water quality in wells adjacent to Lake Cascade for evidence of septic influence on groundwater.

Background

Lake Cascade is a man-made reservoir in western Idaho, popular for fishing, boating, and other recreation (Figures 1 and 2). In 2022, DEQ collected groundwater samples from domestic wells along the perimeter of Lake Cascade and analyzed the samples for selected water quality constituents and contaminants. This sampling effort is part of a broader assessment of potential septic system impacts to groundwater and resultant degradation of water quality in Lake Cascade.

Lake Cascade lies along the margin of the Idaho Batholith in west-central Idaho. The towns of Donnelly and Cascade border the lake to the north and south, respectively. Since the late

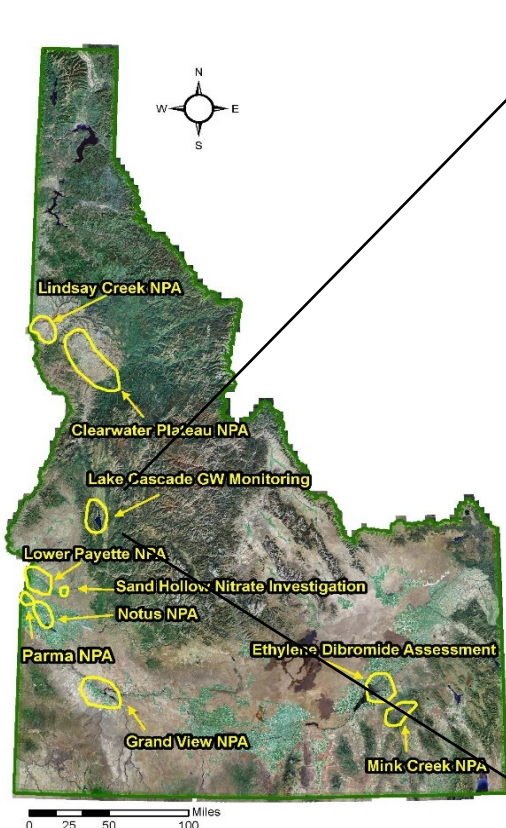


Figure 1. Location of Lake Cascade in Idaho and other projects sampled in 2022.

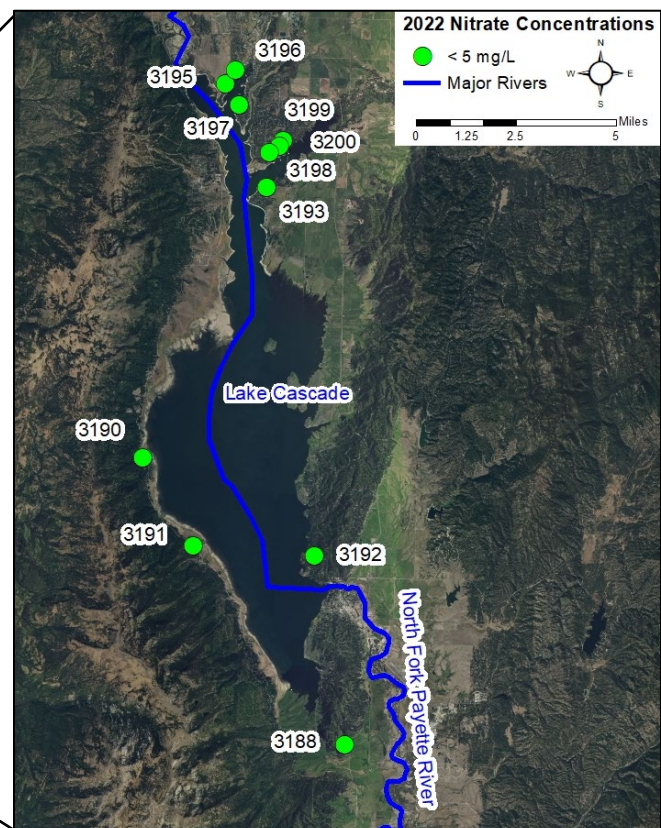


Figure 2. Location of wells sampled near Lake Cascade and nitrate concentrations.

1990s, Lake Cascade has experienced algal blooms, fish kills, and excessive growth of aquatic weeds, likely a result of elevated nutrients (nitrate and phosphorus) and sediment in the water (DEQ 1999 and DEQ 2018). In 2021, the Valley Soil and Water Conservation District (VSWCD) proposed that the effluent from poorly maintained septic systems could leach into groundwater and contribute to the nitrate and phosphorus levels in Lake Cascade.

This study assessed selected water quality parameters in groundwater at water wells located adjacent to Lake Cascade. DEQ reviewed the maps in the Idaho Department of Water Resources (IDWR) Well Driller's Reports for wells located adjacent to the lake. Eleven wells were identified for assessment with shallow groundwater and the potential for interaction with Lake Cascade. Seven of the wells are located in residential/vacation residential areas at the north end of the lake (southwest of Donnelly); one well is on the west side of the central lake area; one well is on the west side of the southern area of the lake; and two wells are on the east side of the southern area of the lake.

Depths of the 11 wells ranged from 24 to 84 feet (average of 47 feet) with groundwater reported at depths ranging from 1.5 to 44 feet below the surface (average of 20 feet). The wells were located in areas not served by public sewer systems, where residential septic systems (septic tanks and drainfields) are assumed to be used.

General subsurface lithology of nine wells, including the seven wells located at the north end of the lake, as reported in the IDWR Well Driller's Reports, was interbedded layers of sand, gravel, sandy clay, and clay. The Well Driller's Reports for the other two wells identified a subsurface of soil overlying granitic rock.

Drinking Water Standards

The United States Environmental Protection Agency (EPA) sets national drinking water standards for approximately 90 contaminants. The maximum contaminant level (MCL) is an enforceable standard set by EPA that defines the maximum level of a contaminant allowed in water delivered to a public water system. DEQ adopts drinking water standards in the Groundwater Quality Rule, IDAPA 58.01.11.200. DEQ uses these standards to evaluate private well water quality.

Groundwater Monitoring Results

The groundwater samples were analyzed for nitrate, nitrite, total phosphorus, calcium, magnesium, sodium, chloride, sulfate, alkalinity, ammonia, and bacteria. Elevated concentrations of nitrate, ammonia, phosphorous, and chloride, or the presence of bacteria, would indicate potential septic wastewater impact to groundwater.

Nitrate

Common sources of nitrate include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. The concentrations of nitrate detected in the 11 samples ranged from not detected (less than 0.18 milligrams per liter [mg/L])

to 3.19 mg/L. Only two samples (Wells 3192 and 3196) contained nitrate at a concentration greater than 1 mg/L (3.19 mg/L and 1.21 mg/L, respectively), indicating possible impact to groundwater resulting from septic wastewater, fertilizer, or surface animal waste. The EPA established the MCL for nitrate in public drinking water as 10 mg/L (Table 1).

Total Phosphorus

Concentrations of total phosphorus detected in the 11 samples ranged from 0.018 mg/L to 0.12 mg/L (Table 1). The phosphorus concentrations detected in the samples do not appear at a level indicating wastewater impact and are similar to background concentrations in the surface water tributaries to Lake Cascade. There is no MCL established for phosphorus in drinking water.

Bacteria

Samples were analyzed for total coliform (TC) bacteria and *Escherichia coli* (*E. coli*). TC bacteria are commonly found in soil and generally not harmful but can indicate potential surface contamination of groundwater or can result from poorly constructed wells that allow surface water to flow down the well casing or boring. *E. coli* is a subgroup of coliform found in animal fecal matter. If *E. coli* is detected with TC, this is a strong indication of septic wastewater and human or animal waste contamination of groundwater and disinfection is required ([Coliform Bacteria Fact Sheet](#)). Well 3200, located in the residential/vacation home area at the north end of the lake, had positive detections for TC and *E. coli.*; however, the sample from this well had a low nitrate concentration estimated at 0.084 mg/L (Table 1). Sample results were provided to the homeowners.

Table 1. Nutrient and Bacteria Concentrations

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration				Bacteria Concentration ^B	
			Phosphorus	Nitrite ^A	Nitrate ^A	Ammonia	E. coli	Total Coliform
			mg/L	mg/L	mg/L	mg/L	MPN/100 mL	MPN/100 mL
Water Quality Standard:			No Stand.	1.0	10	No Stand.	<1	1.0
3188	76	06/06/2022	0.12	<0.30	0.0883	<0.050	<1.0	<1.0
3190	24	06/06/2022	0.022	<0.30	<0.18	<0.050	<1.0	<1.0
3191	60	06/06/2022	0.027	<0.30	0.0818	<0.050	<1.0	<1.0
3192	84	06/06/2022	0.12	<0.30	3.19	<0.050	<1.0	<1.0
3193	48	06/06/2022	0.017	<0.30	0.131	<0.050	<1.0	<1.0
3195	48	06/06/2022	0.028	<0.30	0.990	<0.050	<1.0	<1.0
3196	30	06/06/2022	0.018	<0.30	1.21	<0.050	<1.0	<1.0
3197	49	06/06/2022	0.096	<0.30	0.247	<0.050	<1.0	<1.0
3198	30	06/06/2022	0.11	<0.30	<0.18	0.099	<1.0	<1.0
3199	27	06/06/2022	0.12	<0.30	<0.18	0.22	<1.0	<1.0
3200	38	06/06/2022	0.054	<0.30	0.0839	0.054	5.0	5.0

Notes: mg/L = milligrams per liter; No Stand = No Primary or Secondary Drinking Water Regulation or Idaho Ground Water Quality Rule standard currently established; MPN/100 mL = most probable

number per 100 milliliters

^A Contaminant with a National Primary Drinking Water Regulation standard.

^B Total coliform and E. coli standards are from the Idaho Ground Water Quality Rule (IDAPA 58.01.11.200). An exceedance of the primary ground water quality standard for total coliform (indicated by gray shaded numbers) is not a violation of these rules. Total coliform is not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present. Although the standards are given in cfu/100 mL, analytical results provided in MPN/100 mL are acceptable for comparison to the standard.

Conclusions

In 2022, DEQ sampled 11 wells along the perimeter of Lake Cascade to assess whether septic wastewater impact to groundwater could contribute to elevated nutrient levels in the lake. The 2022 assessment identified one well with bacteria contamination potentially impacted by wastewater but did not identify significantly elevated nutrient or other water quality analytes that directly indicated wastewater impacts to groundwater at the well locations.

DEQ may consider sampling additional Lake Cascade wells in the future, especially wells located in subdivisions on the southernmost end of the lake. The VCSWD obtained the names of well owners in the area who agreed to well sampling.

All Lake Cascade groundwater monitoring sampling results are available at [Ground Water Quality Monitoring and Protection](#).

Contact: DEQ Boise Regional Office, (208) 373-0550

References

- DEQ (Idaho Department of Environmental Quality). 1999. *1996 and 1999 Cascade Reservoir Watershed Assessment and TMDL*. <https://www.deq.idaho.gov/water-quality/surface-water/total-maximum-daily-loads/payette-river-north-fork-subbasin/>
- DEQ (Idaho Department of Environmental Quality). 2018. *Cascade Reservoir Watershed: TMDL Five Year Review*. <https://www2.deq.idaho.gov/admin/LEIA/api/document/download/11978>
- IDAPA. 1997. "Ground Water Quality Rule." Idaho Administrative Code. IDAPA 58.01.11.200.