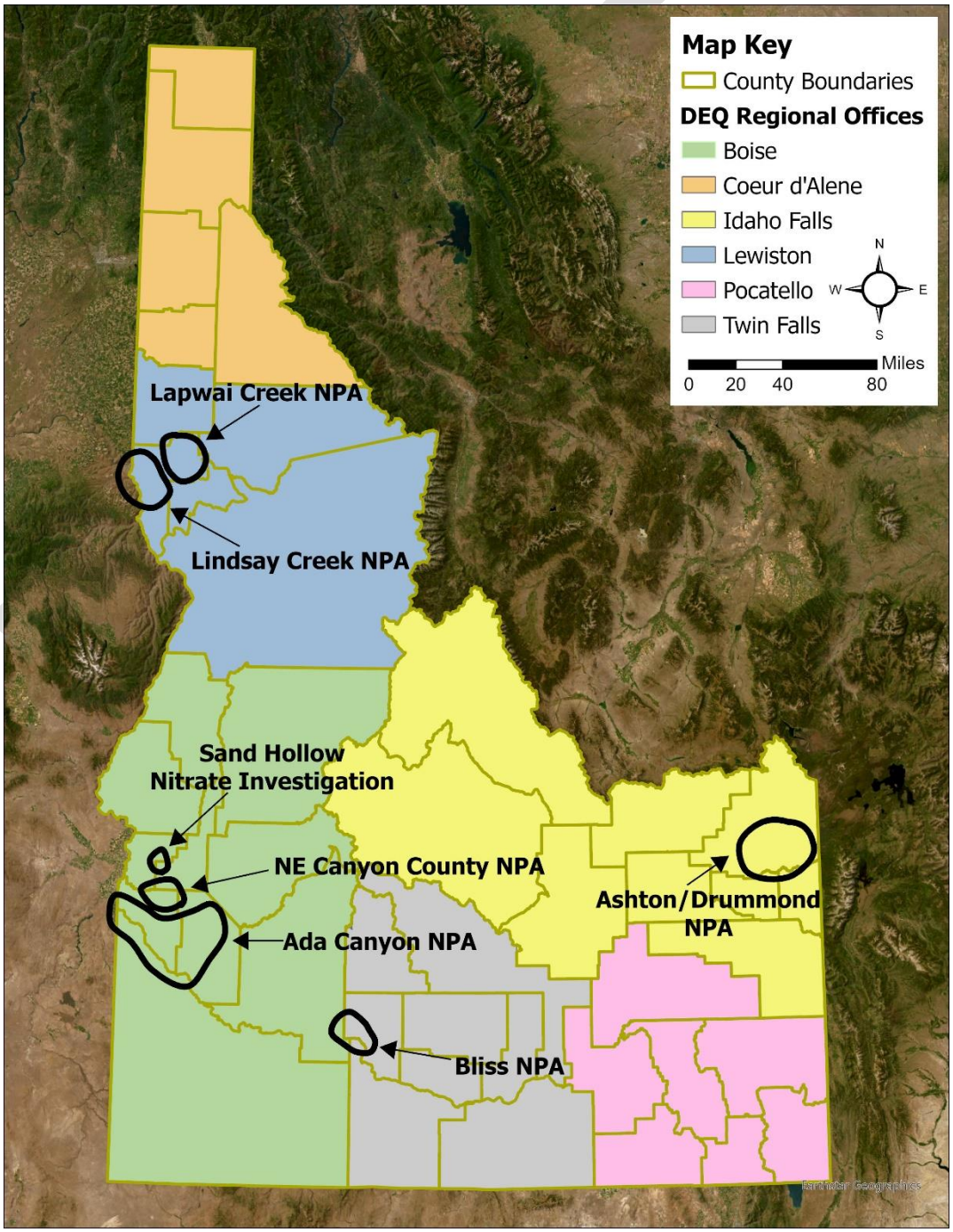
STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Groundwater Summary Report

Summary Report for the Idaho Department of Environmental Quality Groundwater Quality Monitoring Projects.



STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Summary Report: Northeast Canyon County Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Northeast Canyon County Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated the water quality and sampled for various contaminant concentrations in the Northeast Canyon County NPA in Canyon County, Idaho (Figure 1). This NPA was previously sampled in 2013 and 2018 as part of DEQ's NPA evaluation process. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate source—typically wastewater, sewage,

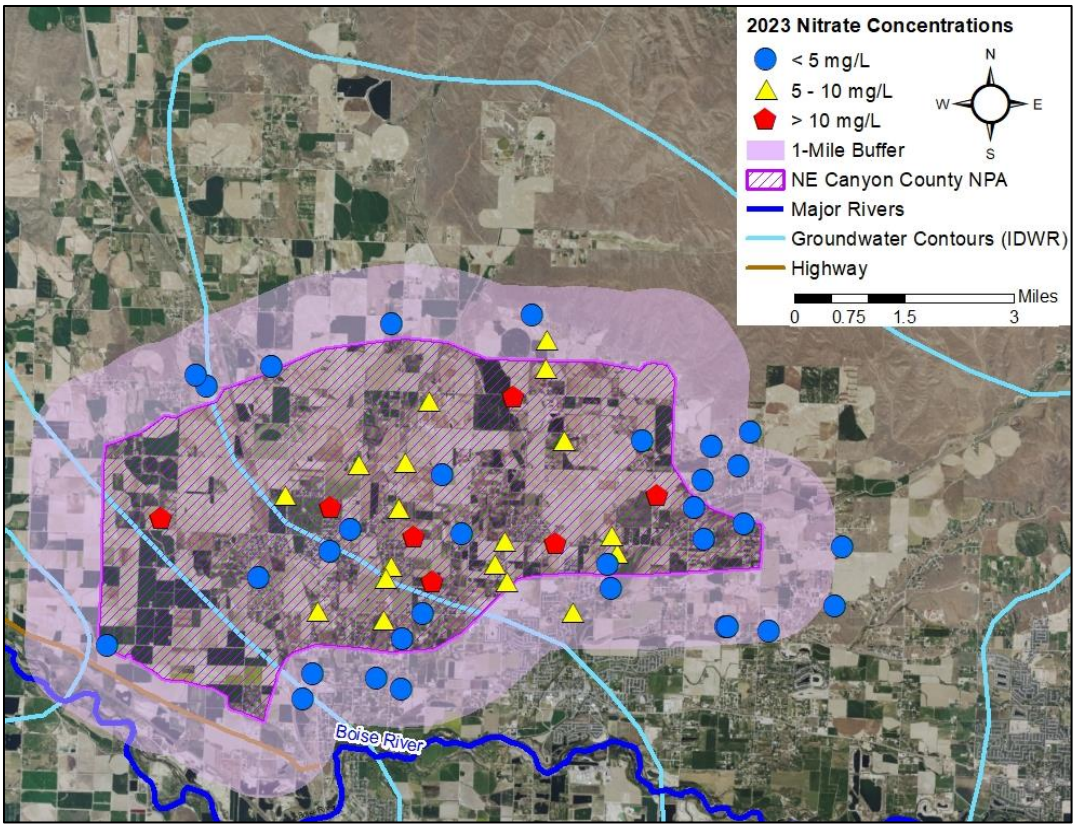


Figure 1. Locations of wells sampled in the Northeast Canyon County NPA and nitrate concentrations.

fertilizer, or animal waste—and that the groundwater aquifer is susceptible to other surface contaminants. Once an area with elevated nitrate concentrations is identified, DEQ conducts a more narrow investigation by sampling domestic and irrigation wells in the area and using the data generated by the sampling to identify boundaries to the area of nitrate impact. NPAs throughout the state are evaluated and ranked by existing nitrate concentrations, statistical trends in the nitrate concentrations over time (if available), and local populations potentially affected to prioritize management strategies for each area. In 2020, the Northeast Canyon County NPA was ranked 6th in the state (out of 35 NPAs) with an increasing trend (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern.

The Northeast Canyon County NPA is located north of the Boise River in Canyon County, Idaho. Groundwater flow across the NPA trends west-southwest toward the Boise River. Depth to groundwater ranges from 64 to 313 feet, and general lithology of the area (as reported in the Well Driller's Reports) is interbedded layers of sand, gravel, and clay (IDWR 2025). Land use in the Northeast Canyon County NPA is generally agricultural and residential. The area is undergoing increased residential building on historical agricultural land, creating a mix of rural-residential use. Residents rely on domestic wells and individual wastewater disposal (septic) systems.

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

In 2023, DEQ sampled groundwater from 57 domestic and irrigation wells in the Northeast Canyon County NPA. Samples were analyzed for nitrate, nitrite, nitrogen isotope ($\delta^{15}N$), uranium, arsenic, alkalinity, and bacteria to assess water quality in the project area. Several wells sampled in previous years were unavailable for this sampling event. DEQ sampled 53 of the 85 wells sampled in 2018 and 21 of the 89 wells sampled in 2013. Three new wells were added in the areas previously sampled. DEQ provided sample results to the homeowners.

Nitrate

Nitrate is a widespread groundwater contaminant in Idaho. Common sources of nitrate include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Seven wells (12%) sampled in the Northeast Canyon County NPA had nitrate detections over the MCL (10 milligrams per liter [mg/L]). Eighteen of the 57 wells (32%) had nitrate concentrations greater than 5 mg/L but below the MCL. No wells had detections for nitrite or ammonia.

DEQ also analyzed wells with nitrate detections of 5 mg/L or greater for $\delta^{15}N$ (24 wells). $\delta^{15}N$ is frequently used as an environmental tracer and can provide information on the origin and fate of nitrogen in a sample. Two wells (8%) had ratios from -4 per mil (‰) to +4‰, indicating the nitrate source was likely commercial fertilizer. The remaining 22 wells had ratios between 4.4‰ and 7.5‰, indicating a mix of organic sources. No nitrogen isotope results were above +9.0‰, which points to waste sources (Seiler 1996).

Table 1. Nutrient and isotope concentrations in Northeast Canyon County NPA.

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration			Isotopes
			Nitrite[A]	Nitrate[A]	Ammonia	$\delta^{15}N$
			mg/L	mg/L	mg/L	‰
Water Quality Standard:			1.0	10	No Stand.	No Stand.
2106	109	04/11/2023	<0.30	14.5	-	7.4
2109	153	04/05/2023	<0.30	2.86	-	-
2111	313	04/03/2023	<0.30	3.8	-	-
2112	293	04/05/2023	<0.30	1.5	<0.50	-
2113	138	04/05/2023	<0.30	10.8	-	6.4
2114	117	04/05/2023	<0.30	7.63	-	6.5
2117	118	04/05/2023	<0.30	10.1	-	3.4
2118	66	04/10/2023	<0.30	9.62	-	-
2123	98	04/04/2023	<0.30	4.15	<0.050	-
2125	115	04/11/2023	<0.30	16.3	-	6.3
2126	146	04/11/2023	<0.30	8.08	-	6.6
2130	80	04/10/2023	<0.30	5.42	-	7.5
2147	120	04/11/2023	<0.30	6.28	-	4.6
2151	103	04/11/2023	<0.30	4.58	-	-
2152	83	04/10/2023	<0.30	9.71	-	5.1
2155	170	04/03/2023	<0.30	1.38	-	-
2157	153	04/05/2023	<0.30	2.05	-	-
2165	173	04/04/2023	<0.30	0.0308	<0.050	-
2171	165	04/11/2023	<0.30	3.13	-	-
2177	262	04/03/2023	<0.30	1.66	-	-
2182	166	04/03/2023	<0.30	2.44	-	-
2185	136	04/10/2023	<0.30	3.39	-	-
2186	95	04/10/2023	<0.30	5.36	-	4.5
2528	80	04/04/2023	<0.30	1.81	-	-

2705	220	04/05/2023	<0.30	1.14	-	-
2706	161	04/11/2023	<0.30	6.85	-	6.2
2707	184	04/05/2023	<0.30	2.44	-	-
2709	132	04/12/2023	<0.30	4.15	-	-
2712	135	04/04/2023	<0.30	11.2	-	3.3
2713	225	04/03/2023	<0.30	4.79	-	-
2714	219	04/10/2023	<0.30	0.596	-	-
2715	78	04/04/2023	<0.30	13.9	-	5.9
2716	97	04/11/2023	<0.30	7.58	-	4.2
2717	106	04/10/2023	<0.30	1.33	-	-
2718	129	04/11/2023	<0.30	2.52	-	-
2719	265	04/05/2023	<0.30	6.26	-	6.3
2720	190	04/12/2023	<0.30	0.196	<0.050	-
2721	304	04/03/2023	<0.30	0.860	-	-
2730	180	04/03/2023	<0.30	1.57	-	-
2731	158	04/11/2023	<0.30	9.30	-	5.3
2733	258	04/04/2023	<0.30	0.665	<0.050	-
2734	81	04/10/2023	<0.30	5.33	-	4.6
2737	180	04/10/2023	<0.30	0.844	-	-
2740	131	04/12/2023	<0.30	3.77	-	-
2746	97	04/10/2023	<0.30	17.1	-	4.0
2747	121	04/04/2023	<0.30	6.78	-	5.7
2748	185	04/03/2023	<0.30	2.36	-	-
2750	135	04/03/2023	<0.30	2.94	-	-
2766	102	04/04/2023	<0.30	2.89	-	-
2767	96	04/05/2023	<0.30	6.33	-	5.5
2770	200	04/04/2023	<0.30	6.18	-	4.2
2771	152	04/05/2023	<0.30	9.06	-	7.1
2772	175	04/05/2023	<0.30	8.95	-	6.4
2773	100	04/03/2023	<0.30	0.845	-	-
3283	64	04/12/2023	<0.30	0.428	-	-
3284	76	04/12/2023	<0.30	4.04	-	-
3285	90	04/10/2023	<0.30	6.45	-	5.5

Notes: mg/L = milligrams per liter; ‰ = permil; (-)=Not Analyzed; No Stand = No Primary or Secondary Drinking Water Regulation or Idaho Ground Water Quality Rule standard currently established;
[A] Contaminant with a National Primary Drinking Water Regulation standard.

Bacteria

DEQ analyzed all 57 wells for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present, and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to confirm the result. Two wells (4%) had positive detections for TC, but *E. coli* was not detected in any sample.

Arsenic

As a naturally occurring element in the earth's crust, trace amounts of arsenic are found in all living matter, rocks, soil, water, and air. Water that encounters rock formations can dissolve arsenic and carry it into underground aquifers, streams, and rivers that may be used as drinking water sources. Eight wells (14%) exceeded the arsenic the MCL (0.01 mg/L). Data compiled by the Idaho Department of Water Resources also shows higher arsenic concentrations in southwestern Idaho.

Uranium

Uranium is a naturally occurring element in rock that can percolate into groundwater after erosion. All 57 wells in the Northeast Canyon County NPA had uranium detections; 13 wells (23%) exceeded the MCL of 30 micrograms per liter.

Conclusions

Twenty-five out of 57 wells sampled in the Northeast Canyon County NPA in 2023 had nitrate concentrations over half the MCL, and 7 of those 25 exceeded the MCL of 10 mg/L. Two wells had positive detections for TC, 8 wells exceeded the MCL for arsenic, and 13 wells exceeded the MCL for uranium. Together, these findings highlight the importance of continued monitoring and groundwater management in the Northeast Canyon County NPA. DEQ will use the results to evaluate NPAs and determine the extent and level of concern of groundwater degradation. Sampling will be conducted again in 2028.

All Northeast Canyon County NPA 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). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise, ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

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STATE OF IDAHO
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ENVIRONMENTAL QUALITY

2023 Summary Report: Ada Canyon Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Ada Canyon Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated the water quality and sampled for various contaminant concentrations in the Ada Canyon NPA in Ada and Canyon Counties, Idaho (Figure 1). This NPA was previously sampled in 2012 and 2017 as part of DEQ's NPA evaluation process. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate source—typically wastewater, sewage, fertilizer, or animal

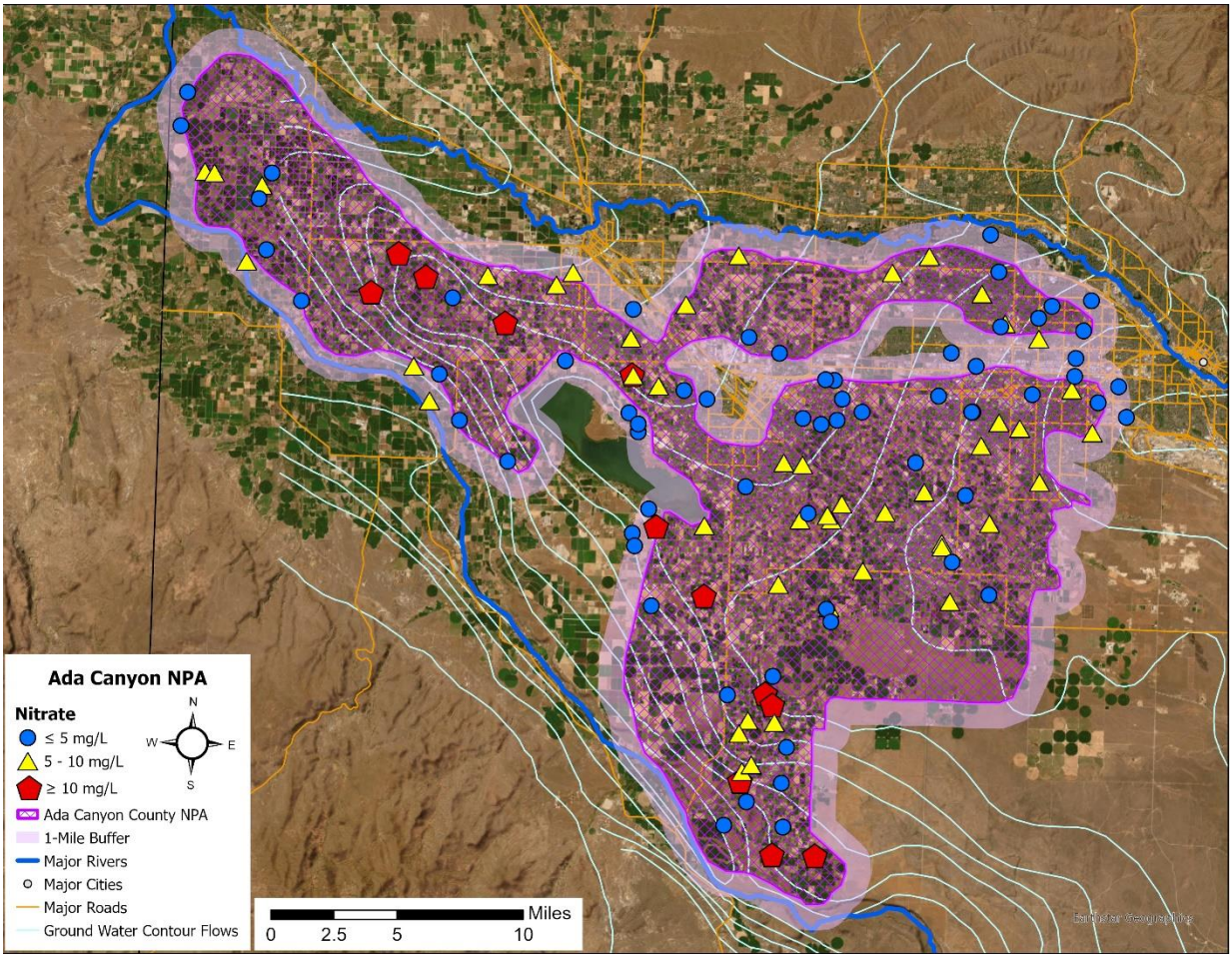


Figure 1. Locations of wells sampled in the Ada Canyon NPA and nitrate concentrations.

waste—and that the groundwater aquifer is susceptible to other surface contaminants. Once an area with elevated nitrate concentrations is identified, DEQ conducts a more narrow investigation by sampling domestic and irrigation wells in the area and using the data generated by the sampling to identify boundaries to the area of nitrate impact. NPAs throughout the state are evaluated and ranked by existing nitrate concentrations, statistical trends in the nitrate concentrations over time (if available), and local populations potentially affected. In 2020, the Ada Canyon NPA was ranked 8th in the state (out of 35 NPAs), but a statistical trend of nitrate concentrations in groundwater (increasing, decreasing, or stable) was not able to be determined (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern.

The Ada Canyon NPA encompasses portions of the cities of Boise, Eagle, Nampa, Caldwell, Wilder, Parma, Greenleaf, Kuna, and Melba. Well Drillers' Reports filed with the Idaho Department of Water Resources reported that the depth to groundwater of wells sampled in the project area range from 34 to 270 feet (IDWR 2025). Land use in the NPA is a mix of agricultural and residential. The area is undergoing increased residential building on historical agricultural land and relies on domestic wells and on-site wastewater disposal (septic) systems.

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

In 2023, DEQ sampled groundwater from 121 domestic and irrigation wells in the Ada Canyon NPA. DEQ analyzed samples for nitrate, nitrite, nitrogen isotope ($\delta^{15}N$), uranium, arsenic, alkalinity, and bacteria to assess water quality in the project area. Seventy-nine of the 121 wells sampled in 2023 had been previously sampled in 2017. Forty-six wells were also sampled in 2012. DEQ sampled 42 new wells in the NPA in 2023. DEQ provided sample results to homeowners.

Nitrate, $\delta^{15}N$, and Ammonia

Nitrate is a widespread groundwater contaminant in Idaho. Its sources include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Thirteen wells (11%) sampled in the Ada Canyon NPA had nitrate detections over the MCL (10 milligrams per liter [mg/L]). Forty-five of the 121 wells (37%) had nitrate concentrations greater than 5 mg/L but below the MCL. Seven wells were under the nitrate MCL, but ammonia was present. No MCL exists for ammonia.

DEQ also analyzed 58 wells with nitrate detections of 5 mg/L or greater for the stable nitrogen isotope $\delta^{15}N$. $\delta^{15}N$ is frequently used as an environmental tracer and can provide information on the origin and fate of nitrogen in a sample. Fourteen wells had isotope ratios in the -4 per mil (‰) to +4‰ range, indicating that the nitrate source was likely commercial fertilizer. Forty-two wells had isotope ratios in the 4‰ to 9‰ range, indicating a mix of organic sources. Two wells had isotope ratios above +9.0‰, which suggests waste sources (Seiler 1996).

Bacteria

DEQ analyzed all 121 wells for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present, and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to confirm the result. Twenty-eight wells (23%) had positive detections for TC. *E. coli* was not detected in any sample.

Arsenic

As a naturally occurring element in the earth's crust, trace amounts of arsenic are found in all living matter, rocks, soil, water, and air. Water that encounters rock formations can dissolve arsenic and carry it into underground aquifers, streams, and rivers that may be used as drinking water sources. Forty-one wells (34%) exceeded the arsenic MCL of 0.01 mg/L. Data compiled by the Idaho Department of Water Resources also shows higher arsenic concentrations in southwestern Idaho.

Uranium

Uranium is a naturally occurring element in rock that can percolate into groundwater after erosion. One hundred eighteen wells in the Ada Canyon NPA had uranium detections. Eleven wells (9%) had detections above the MCL (30 micrograms per liter [µg/L]).

Conclusions

Fifty-eight out of the 121 wells sampled in the Ada Canyon NPA in 2023 had nitrate concentrations over half the MCL, and 13 of those 58 exceeded the nitrate MCL of 10 mg/L. Twenty-eight wells had positive detections for TC, 41 exceeded the MCL for arsenic, and 11 exceeded the MCL for uranium. Together, these findings highlight the importance of continued monitoring in the Ada Canyon NPA. DEQ will use the results to evaluate NPAs and determine the extent and level of concern of groundwater degradation. Sampling will be conducted again in 2027.

All Ada Canyon NPA 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). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise, ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

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Seiler, R.L. 1996. *Methods for Identifying Sources of Nitrogen Contamination of Ground Water in Valleys in Washoe County, Nevada*. US Geological Survey Open-File Report 96-461.

STATE OF IDAHO
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2023 Summary Report: Lindsay Creek Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Lindsay Creek Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated the water quality and sampled nitrate and bacteria in the Lindsay Creek NPA in Nez Perce County, Idaho (Figure 1). The Lindsay Creek NPA, formerly named the Project of Tammany and Lindsay Creeks, was designated and renamed during the 2008 NPA ranking and delineation update. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate source—typically wastewater, sewage, fertilizer, or animal waste—and that the groundwater aquifer is susceptible to other surface contaminants. Once an area of elevated nitrate concentrations is identified, DEQ conducts a more narrow investigation by sampling domestic and irrigation wells in the area and using the data generated by the sampling to identify boundaries to the area of nitrate impact. In 2020, the Lindsay Creek NPA was ranked 20th in the state (out of 35 NPAs) with no change in statistical trend for nitrate concentration (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern. DEQ previously sampled the Lindsay Creek NPA quarterly from 2008–

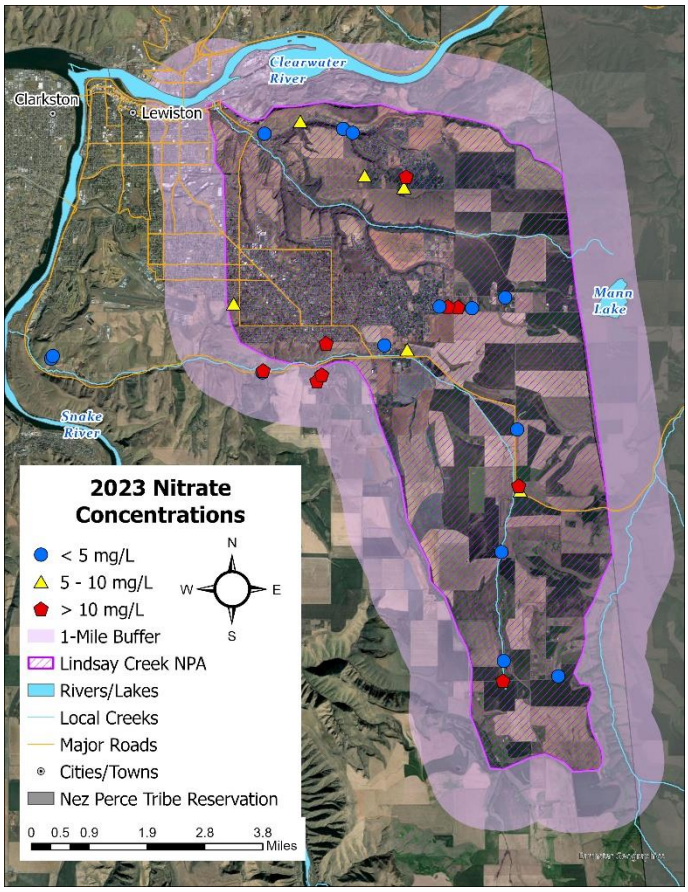


Figure 1. Location of wells sampled in the Lindsay Creek NPA and nitrate concentrations.

2015, but with the limited seasonal variability of nitrate concentrations observed in most wells, monitoring was reduced to once per year. Due to the pandemic and staffing limitations, DEQ conducted no monitoring in 2021 but resumed it in 2022.

The project area is located east and southeast of Lewiston, Idaho. The land use is primarily agricultural, specifically dryland farming. Rangeland and grazing are also common in the area. The area is underlain by the Columbia River Basalt Group and consists of units that formed when lava flows filled in the preexisting topography during the Miocene era (Stevens et al. 2003). A thin layer of loess forms the present-day land surface for most of the area. Groundwater in the area is mostly found in the basalt and occasionally in the alluvial valley sediments and basement rocks. Groundwater generally flows to the north and eventually discharges into the Clearwater River (Hagan 2003). Well depths from groundwater sampling locations ranged from 16 feet to 950 feet.

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

In 2023, DEQ sampled groundwater from 29 domestic and irrigation wells in the Lindsay Creek NPA. Samples were analyzed for nitrate and nitrite as nitrogen and bacteria to assess water quality in the project area. DEQ also analyzed 20 wells for major ions: alkalinity, chloride, sulfate, calcium, potassium, magnesium, and sodium. Twenty-one of the wells had been previously sampled, and eight new sites were added. DEQ provided sample results to the homeowners.

Nitrate, Nitrite, and Ammonia

Nitrate is a widespread groundwater contaminant in Idaho. Common sources of nitrate include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Nine of the 29 sources sampled (31%) had nitrate concentrations over the MCL (10 milligrams per liter [mg/L]). Six of the 29 sources (20%) had nitrate concentrations greater than 5 mg/L but below the MCL. Due to a lab error for site 3258, nitrate + nitrite was reported as non-detect. Another bottle from the same sample site proved the non-detect incorrect when it was analyzed for nitrate and nitrite separately under a different EPA method. DEQ rejected the initial nitrate + nitrite result for 3258 and listed the accepted nitrate and nitrite results in Table 1. A total of four wells were sampled for ammonia in addition to nitrate. Ammonia concentrations for this project were all non-detect—less than 0.2 mg/L.

Table 1. Nutrient results—Lindsay Creek Nitrate Priority Area Groundwater Monitoring Project.

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration			
			Nitrite[A]	Nitrate + Nitrite[A]	Nitrate[A]	Ammonia
			mg/L	mg/L	mg/L	mg/L
Water Quality Standard:			1.0	10	10	No Stand.
533	225	10/16/2023	-	12.6	-	-
1038	150	10/16/2023	-	8.92	-	-
1312	1025	10/11/2023	-	<1	-	-
1315	589	10/11/2023	-	13.5	-	-
2655	203	10/16/2023	-	16.3	-	-
3239	290	10/11/2023	-	5.46	-	-
3240	303	10/11/2023	-	11.6	-	-
3243	425	10/11/2023	-	4.72	-	-
3244	490	10/11/2023	-	<1	-	-
3245	173	10/10/2023	-	11.5	-	-
3246	229	10/10/2023	-	13.5	-	-
3248	475	10/10/2023	-	<1	-	-
3249	404	10/10/2023	-	<1	-	<0.2
3258	230	10/17/2023	<1	R	5.60	-
3259	275	10/17/2023	-	6.73	-	-
3262	Unk	10/17/2023	-	<1	-	<0.2
3263	150	10/17/2023	-	19.7	-	-
3269	540	10/10/2023	-	<1	-	<0.2
3271	Unk	10/10/2023	-	9.45	-	-
3279	370	10/17/2023	-	<1	-	-
3282	175	10/12/2023	-	<1	-	<0.2
3444	1175	10/11/2023	-	<1	-	-
3445	Unk	10/11/2023	-	3.4	-	-
3446	Unk	10/11/2023	-	11.8	-	-
3447	Unk	10/16/2023	-	2.12	-	-
3448	850	10/16/2023	-	<1	-	-
3449	360	10/16/2023	-	12.4	-	-
3450	Unk	10/17/2023	-	6.88	-	-
3451	795	10/17/2023	-	<1	-	-

Notes: mg/L = milligrams per liter; Unk=Unknown. Well log not found; (-) =Not Analyzed; No Stand = No Primary or Secondary Drinking Water Regulation or Idaho Ground Water Quality Rule standard currently established; R = Results rejected

[A] Contaminant with a National Primary Drinking Water Regulation standard.

Bacteria

DEQ analyzed all 29 sites for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present, and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to

confirm the result. Eleven sites (37.9%) had positive detections for TC, and one of those 11 was also positive for *E. coli*.

Major Ions

Twenty wells were analyzed for major ions, primarily sampling those previously unsampled for ions. Groundwater chemistry results at all wells were acceptable, with no analyte exceeding set drinking water standards (Figure 3).

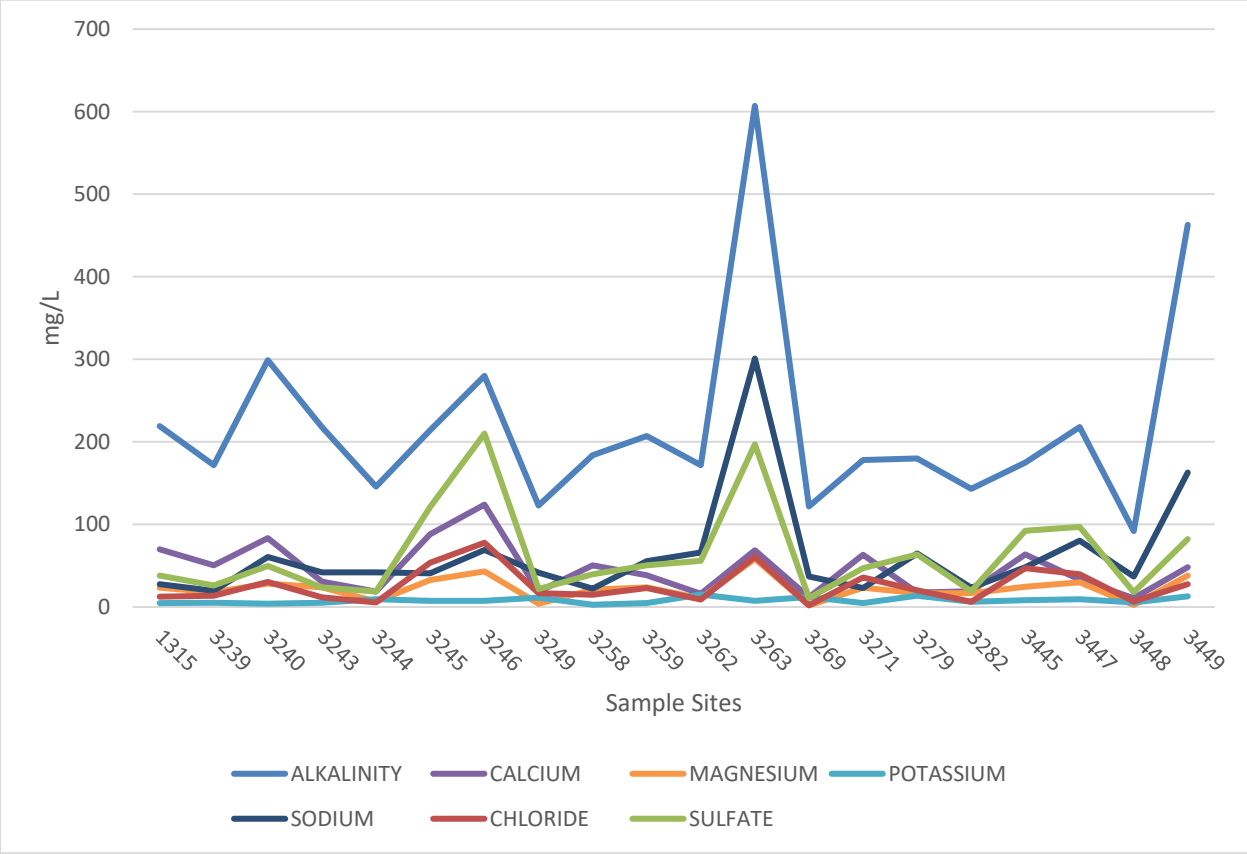


Figure 3. Major ion results for Lindsay Creek NPA sampled in 2023.

Conclusions

Fifteen out of the 29 wells sampled in the Lindsay Creek NPA in 2023 had nitrate concentrations over half the MCL, and 9 of those 15 exceeded the MCL of 10 mg/L. Of the 21 sites that had been previously sampled, 4 had increased nitrate results compared to previous results, 9 had lower nitrate results, and 8 had no change. Eleven wells had a positive detection for TC and one for *E. coli*. Together, these findings highlight the importance of continued monitoring and management in the Lindsay Creek NPA. DEQ will use the results to evaluate NPAs and determine the extent and level of concern of groundwater degradation. Results from 2024 sampling will be presented in our next summary report.

All Lindsay Creek NPA sampling results are available at *Ground Water Quality Monitoring and Protection*.

Contact: DEQ Lewiston Regional Office, (208) 799-4370

References

DEQ (Idaho Department of Environmental Quality). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise, ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

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STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Summary Report: Lapwai Creek Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Lapwai Creek Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated the water quality and sampled for nitrate and bacteria in the Lapwai Creek NPA in Nez Perce County, Idaho (Figure 1). The Lapwai Creek NPA was designated during the 2002 NPA ranking and delineation. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate source—typically wastewater, sewage, fertilizer, or animal waste—and that the groundwater aquifer is susceptible to other surface contaminants. Once an area of elevated nitrate concentrations is identified, DEQ conducts a more narrow investigation by sampling domestic and irrigation wells in the area and using the data generated by the sampling to identify boundaries to the area of nitrate impact. In 2020, Lapwai Creek NPA was ranked 17th in the state (out of 35 NPAs) with no change in statistical trend for nitrate concentration (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern. DEQ conducted

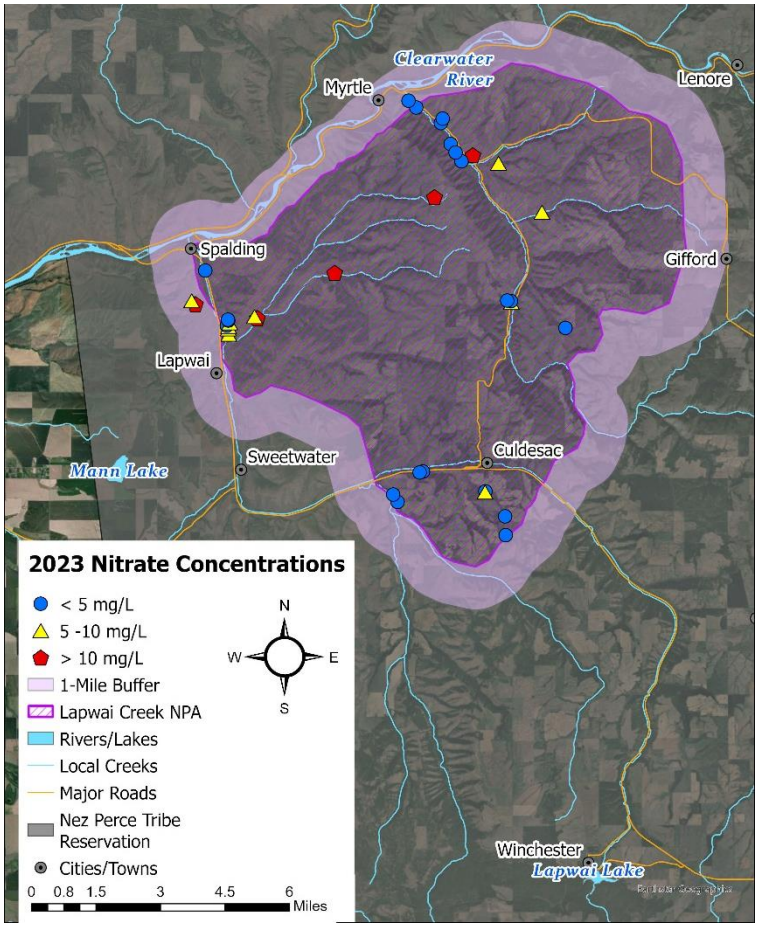


Figure 1. Location of wells sampled in the Lapwai Creek NPA and nitrate concentrations.

monitoring within the NPA during the 2014 Cottonwood Creek nitrate investigation. Thanks to a partnership with the Nez Perce Tribe Water Resources Division, 2023 was the first time the NPA was sampled in its entirety.

The project area is located within the Nez Perce Tribe Reservation and includes the cities of Lapwai and Culdesac. The land use is primarily agricultural, specifically dryland farming. Rangeland and grazing are also common in the area. The NPA is on the eastern edge of the Lewiston Basin, which consists of a deep, regional basalt aquifer in the Grande Ronde Basalt; a series of shallow perched aquifers in the basalt flows; and sedimentary interbeds of the Wanapum and Saddle Mountains Basalts (Neely 2012). Well depths from groundwater sampling locations ranged from 30 feet to 1090 feet.

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

In 2023, DEQ sampled groundwater from 33 domestic and irrigation wells and three springs in the Lapwai Creek NPA. Samples were analyzed for nitrate and nitrite as nitrogen and bacteria to assess water quality in the project area. DEQ also analyzed 20 wells for major ions: alkalinity, chloride, sulfate, calcium, potassium, magnesium, and sodium. Prior to this sampling event, none of the 36 sites had previously been sampled by DEQ. DEQ provided sample results to the homeowners.

Nitrate

Nitrate is a widespread groundwater contaminant in Idaho. Common sources of nitrate include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Five of the 36 sites sampled (14%) had nitrate detections over the MCL (10 milligrams per liter [mg/L]). Ten of the 36 sites (27%) had nitrate concentrations greater than 5 mg/L but below the MCL.

Bacteria

All 36 sites were analyzed for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present, and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to confirm the result. Fourteen sites (38%) had positive detections for TC. Of those positive for TC, *E. coli* was detected in three samples.

Table 1. Nutrient results—Lapwai Creek Nitrate Priority Area Groundwater Monitoring Project.

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration (mg/L)
			Nitrate + Nitrite[A]
Water Quality Standard:			10
3407	152	09/18/2023	9.12
3408	145	09/18/2023	6.64
3409	180	09/18/2023	6.07
3410	200	09/18/2023	1.02
3411	85	09/18/2023	5.31
3412	97	09/18/2023	3.97
3413	75	09/18/2023	4.62
3414	1090	09/19/2023	3.65
3415	Unk	09/19/2023	4.47
3416	Unk	09/19/2023	8.71
3417	180	09/19/2023	2.34
3418	84	09/19/2023	1.23
3419	Unk	09/19/2023	3.64
3420	135	09/19/2023	<1
3421	Unk	09/19/2023	<1
3422	450	09/20/2023	14.6
3423	368	09/20/2023	12.8
3424	240	09/20/2023	14.2
3425	375	09/20/2023	5.48
3426	500	09/21/2023	<1
3427	30	09/21/2023	9.36
3428	240	09/21/2023	2.66
3429	110	09/21/2023	1.42
3430	220	09/21/2023	5.26
3431	165	09/21/2023	1.39
3432	110	09/21/2023	4.91
3433	922	09/26/2023	<1
3434	158	09/26/2023	6.42
3435	128	09/26/2023	13.2
3436	132	09/26/2023	<1
3437	Unk	09/26/2023	<1
3438	Unk	09/26/2023	<1
3439	Unk	09/26/2023	5.00
3440	285	09/26/2023	4.85
3441	215	09/20/2023	12.6
3442	220	09/20/2023	8.64

Notes: mg/L = milligrams per liter; Unk=Unknown. Well log not found.

[A] Contaminant with a National Primary Drinking Water Regulation standard.

Major Ions

DEQ analyzed 20 wells for major ions, primarily from those that have not been sampled for ions in the past. Groundwater chemistry results at all wells were acceptable, with no analyte exceeding set drinking water standards (Figure 3).

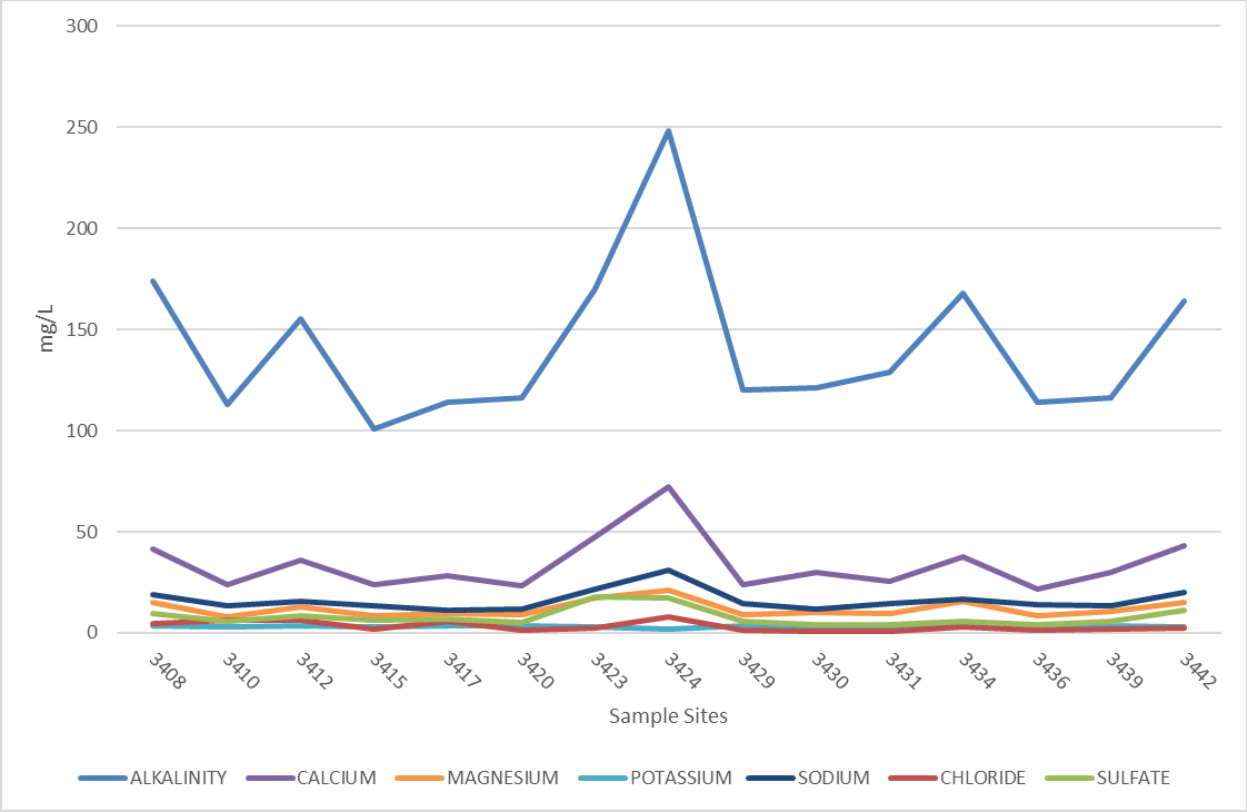


Figure 3. Major ion results for Lapwai Creek NPA sampled in 2023.

Conclusions

Fifteen out of the 36 sites sampled in the Lapwai Creek NPA in 2023 had nitrate concentrations over half the MCL, and 5 of those 15 exceeded the MCL of 10 mg/L. Fourteen sites had positive detections for TC, and three of those 14 had positive detections for *E. coli*. This project was the most complete sampling of the Lapwai Creek NPA thanks to the partnership with the Nez Perce Tribe. Together, these findings highlight the importance of continued monitoring and management in the Lapwai Creek NPA. Results from 2024 sampling will be presented in our next summary report.

All Lapwai Creek NPA sampling results are available at *Ground Water Quality Monitoring and Protection*.

Contact: DEQ Lewiston Regional Office, (208) 799-4370

References

DEQ (Idaho Department of Environmental Quality). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise, ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

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Neely, K.W. 2012. *Summary of Groundwater Level Data and Trends in the Lindsay Creek Groundwater Management Area and the Tammany Creek Area, 2012*. Boise, ID: Idaho Department of Water Resources.

STATE OF IDAHO
DEPARTMENT OF
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2023 Summary Report: Bliss Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Bliss Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated water quality and sampled for various contaminants within the Bliss Nitrate Priority Area (NPA) located northwest of Bliss, Idaho (Figure 1). The Bliss NPA was previously sampled in 2016 as part of DEQ's statewide NPA monitoring program. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate source—typically wastewater, sewage, fertilizer, or animal waste—and that the groundwater aquifer is susceptible to other surface contaminants. NPAs throughout the state are evaluated and ranked by existing nitrate concentrations, statistical trends in the nitrate concentrations over time (if available), and local populations potentially affected. In 2020, the Bliss NPA was ranked 32nd in the state (out of 35 NPAs), but a statistical trend of nitrate concentrations in groundwater (increasing, decreasing, stable) was not able to be determined (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern.

The Bliss NPA consists of approximately 6,800 acres of irrigated agricultural land situated above a shallow basalt water aquifer. The Gooding Soil Conservation District completed a study that concluded that a connection exists in the NPA between the concentration of nutrients and the transport of these nutrients from high water inputs (District 2010). Tracking data suggested that organic and inorganic nutrients enter the perched aquifer through shallow soils and shallow fractured basalt formations in areas where water inputs are sufficient for transport of contaminants through the soil column. Water sources into the NPA include irrigation structures, crop irrigation practices, and animal feeding operations.

The shallow perched aquifer lies within a sequence of basalt flows interbedded with sedimentary units of ash, cinders, clay, and other sedimentary type deposits. Shallow soils and shallow groundwater depth in fractured basalt and other volcanic materials promote vertical and horizontal transport to groundwater.

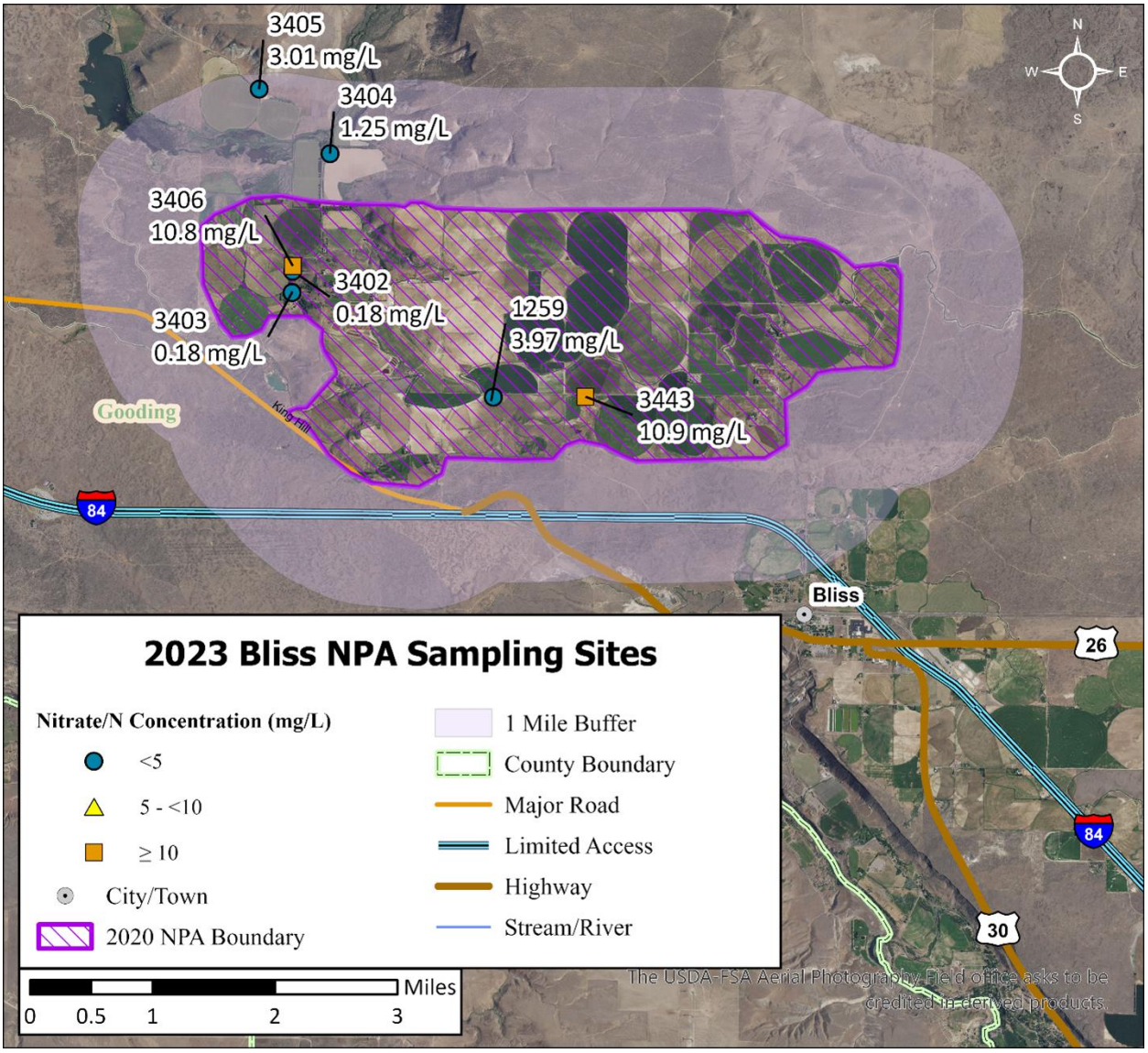


Figure 1. Locations of sources sampled in the Bliss NPA in 2023 and nitrate concentrations.

Drinking Water Standards

The US 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

In 2023, DEQ sampled from six domestic wells and one spring in the Bliss NPA. Samples were analyzed for nitrate, chloride, sulfate, and bacteria to assess water quality in the project area.

DEQ previously sampled the 6 wells in 2016. The spring was sampled for the first time during this sampling event. The sample size for this year was not in and of itself sufficient to evaluate statistical degradation. However, the Bliss NPA was not based on this limited dataset as historical trends and long-term monitoring data was used. The six samples were part of the annual monitoring requirement for an existing NPA but not the basis for the NPA designation. DEQ provided sample results to the homeowners.

Nitrate

Nitrate is a widespread groundwater contaminant in Idaho. Common nitrate sources include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Groundwater collected from five out of seven sources in the Bliss NPA had nitrate concentrations at less than half the MCL of 10 milligrams per liter (mg/L). Well 3443 and Spring 3406 exceeded the MCL at 10.9 mg/L and 10.8 mg/L, respectively. The average nitrate value in the sampling area was 4.36 mg/L.

Table 1. Bliss NPA Water Quality

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration
			Nitrate[A]
			mg/L
Water Quality Standard:			10
1259	98	10/18/2023	3.97
3402	Unk	10/30/2023	<0.18
3403	305	10/30/2023	<0.18
3404	174	10/18/2023	1.25
3405	Unk	10/18/2023	3.01
3406	Unk	10/30/2023	10.8
3443	Unk	10/18/2023	10.9

Notes: mg/L = milligrams per liter; Unk=Unknown. Well log not found;
[A] Contaminant with a National Primary Drinking Water Regulation standard.

Bacteria

All seven sources were analyzed for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present, and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to confirm the result. Two wells (29%) had positive detections for TC (Well 3405 and Well 3443), but no *E. coli* was detected in any sample.

Sulfate and Chloride

Water chemistry at all sources was acceptable, with neither sulfate nor chloride exceeding set drinking water standards in any samples.

Conclusions

In 2023, DEQ sampled more wells than in previous projects in the Bliss NPA. Samples were analyzed for nitrate and bacteria to assess water quality in the project area. Two out of seven sources exceeded the MCL for nitrate, and two wells had positive detections for TC but no *E.coli*. Together, these findings highlight the importance of continued monitoring and management in the Bliss NPA. DEQ will use the results to continue to evaluate NPAs and determine the extent and level of concern of groundwater degradation. DEQ plans to sample the Bliss NPA again in 2028.

All Bliss NPA sampling results are available at *Ground Water Quality Monitoring and Protection*.

Contact: Twin Falls Regional Office, (208) 736-2190

References

DEQ (Idaho Department of Environmental Quality). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise, ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

Gooding Soil Conservation District (District). 2010. *Bliss Nitrate Priority Area, Nutrient Management & Geologic Summary*. Gooding, ID: District.

IDAPA. 1997. “Ground Water Quality Rule.” Idaho Administrative Code. IDAPA 58.01.11.200.

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Summary Report: Ashton/Drummond Nitrate Priority Area

The Idaho Department of Environmental Quality's (DEQ'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 provide the data necessary for evaluating trends in groundwater nitrate concentrations in and around the Ashton/Drummond Nitrate Priority Area (NPA).

Background

In 2023, DEQ evaluated water quality and sampled for various contaminants within the Ashton/Drummond NPA in Fremont and Teton Counties, Idaho (**Error! Reference source not found.**). The Ashton/Drummond NPA was previously sampled in 2009 and 2010 following a public sampling event in 2008. NPAs in Idaho are initially identified by the presence of elevated nitrate concentrations in groundwater samples collected by the DEQ or other agencies. Elevated nitrate concentrations indicate that the groundwater has been impacted by a nitrate

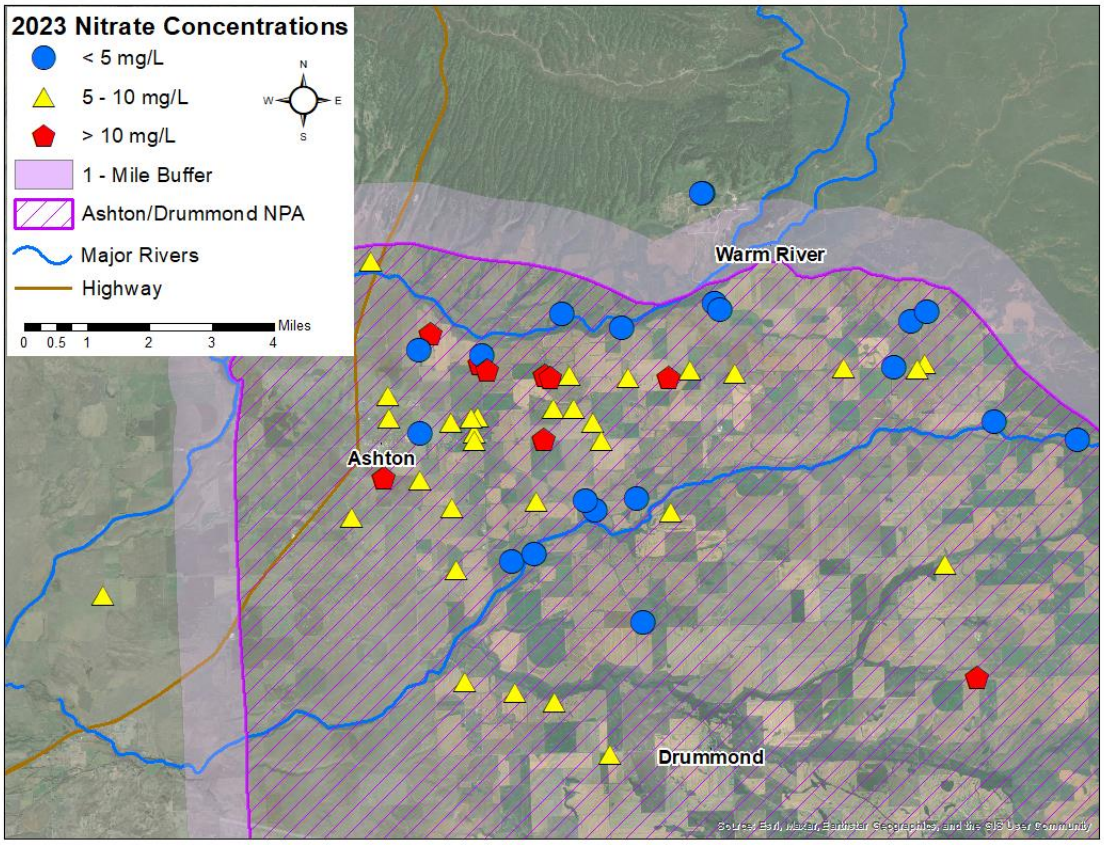


Figure 1. Location of wells sampled in the Ashton/Drummond NPA and nitrate concentrations.

source—typically wastewater, sewage, fertilizer, or animal waste—and that the groundwater aquifer is susceptible to other surface contaminants. Once an area of elevated nitrate concentrations is identified, DEQ conducts a more narrow investigation by sampling domestic and irrigation wells in the area and using the data generated by the sampling to identify boundaries to the area of nitrate impact. NPAs throughout the state are evaluated and ranked by existing nitrate concentrations, statistical trends in the nitrate concentrations over time (if available), and local populations potentially affected. In 2020, the Ashton/Drummond NPA was ranked 14th in the state (out of 35 NPAs), but a statistical trend of nitrate concentrations in groundwater was not able to be determined (DEQ 2021). The statewide rank reflects relative concern compared to other NPAs, with higher ranks indicating greater groundwater quality concerns and lower ranks indicating comparatively less concern.

The Ashton/Drummond NPA covers approximately 227 square miles and includes the communities of Ashton, Marysville, Drummond, Felt, and other small unincorporated areas. It is located along the northeastern margin of the Eastern Snake River Plain (ESRP) where tributary aquifers associated with the Henrys Fork of the Snake River, Fall River, and Teton River transition to the ESRP aquifer. Land use in the Ashton/Drummond NPA is generally agricultural with rural communities. The main agriculture crops are seed potatoes, wheat, and alfalfa. Rural residents rely on domestic wells and individual wastewater disposal (septic) systems.

Well Driller's Reports filed with the Idaho Department of Water Resources reported that the depths of 29 wells sampled in the Ashton/Drummond NPA ranged from 60 to 710 feet, with depths to groundwater of 2 to 260 feet (IDWR 2025). General lithology of the area as reported in the Well Driller's Reports was rhyolite and basalt with some fracturing.

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

In June 2023, DEQ sampled groundwater from 64 domestic and irrigation wells in and near the Ashton/Drummond NPA. Samples were analyzed for nitrate, sulfate, chloride, and bacteria to assess water quality in the project area. Eight of the 64 wells were sampled in a previous project in 2009 and 2010. Sixteen of the 64 wells were sampled again in July 2023 to further analyze bacteria, major ions, nutrients, and stable isotopes. DEQ provided sample results to the homeowners.

Nitrate (1st Round)

Nitrate is a widespread groundwater contaminant in Idaho. Common sources of nitrate include decaying plants and other organic matter, septic systems, byproducts from animal facilities, and nitrogen-based fertilizers. Additionally, nitrate concentrations may be impacted by local environments, indicating conditions allowing denitrification. Nine wells sampled in the Ashton/Drummond NPA had nitrate detections at or above the MCL of 10 milligrams per liter (mg/L). Thirty-three wells (approximately 52%) had nitrate detections of less than 10 mg/L but at or above 5 mg/L.

Results for nitrate ranged from below the reporting level (0.18 mg/L) to 19.7 mg/L. Results indicate ambient nitrate levels are expected to be <1-2 mg/L overall and likely <1 for sites with minimal anthropogenic impact.

Bacteria (1st Round)

DEQ analyzed all 64 wells for *Escherichia coli* (*E. coli*) and total coliform (TC) bacteria. TC bacteria are common in the environment and are generally not harmful. *E. coli* is a subgroup of coliform found in greater quantities than TC in animal fecal matter. If *E. coli* is detected with TC, this indicates sewage or animal waste is present and disinfection is necessary to ensure the water is safe for drinking (*Coliform Bacteria Fact Sheet*). Follow up sampling is recommended to confirm the result. Seventeen wells (26.5%) had positive detections for TC. Two of the 17 also had positive detections for *E. coli*, but one of the two wells is solely used for irrigation and not for drinking purposes.

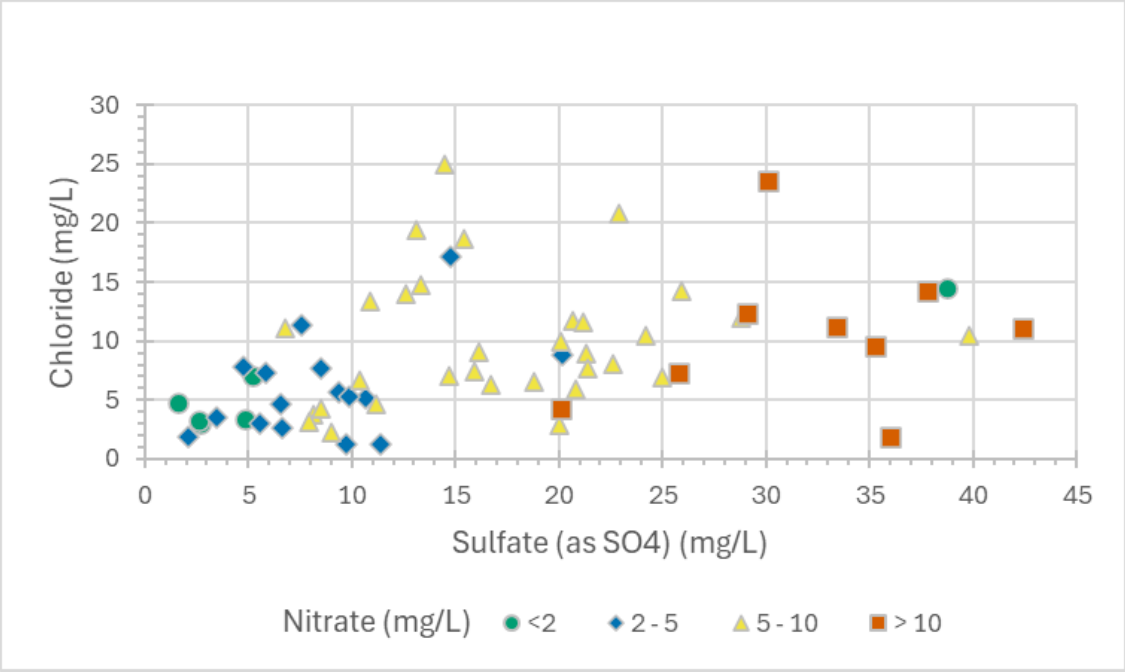


Figure 2. 1st round sampling correlation of chloride and sulfate concentrations with nitrates.

Sulfate and Chloride (1st Round)

Regional water quality monitoring in the area has suggested a correlation between relatively high sulfate and elevated nitrate concentrations for areas where ammonium sulfate fertilizer is commonly used (Welhan 2009). Monitoring data has also suggested a correlation between relatively high chloride and elevated nitrates at sites that may be influenced by septic or animal waste. The sulfate-to-chloride ratio is helpful in distinguishing the nitrate sources impacting different sites. This sampling event showed a stronger correlation between sulfate and nitrate than between chloride and nitrate (Figure 2).

Nitrogen (2nd Round)

All wells sampled in the second round had similar nitrate concentrations as in the first round. Six of the 16 wells that were selected for the second-round sampling had nitrate concentrations above 10 mg/L. Eight of the 16 wells had nitrate concentrations between 5–10 mg/L. The last two wells tested below 1 mg/L. DEQ selected these two wells as controls to test and observe the values of the suite of analytes in areas with potentially minimal anthropogenic impact. All samples resulted in nitrite values <0.30 mg/L and ammonia values <0.050 mg/L.

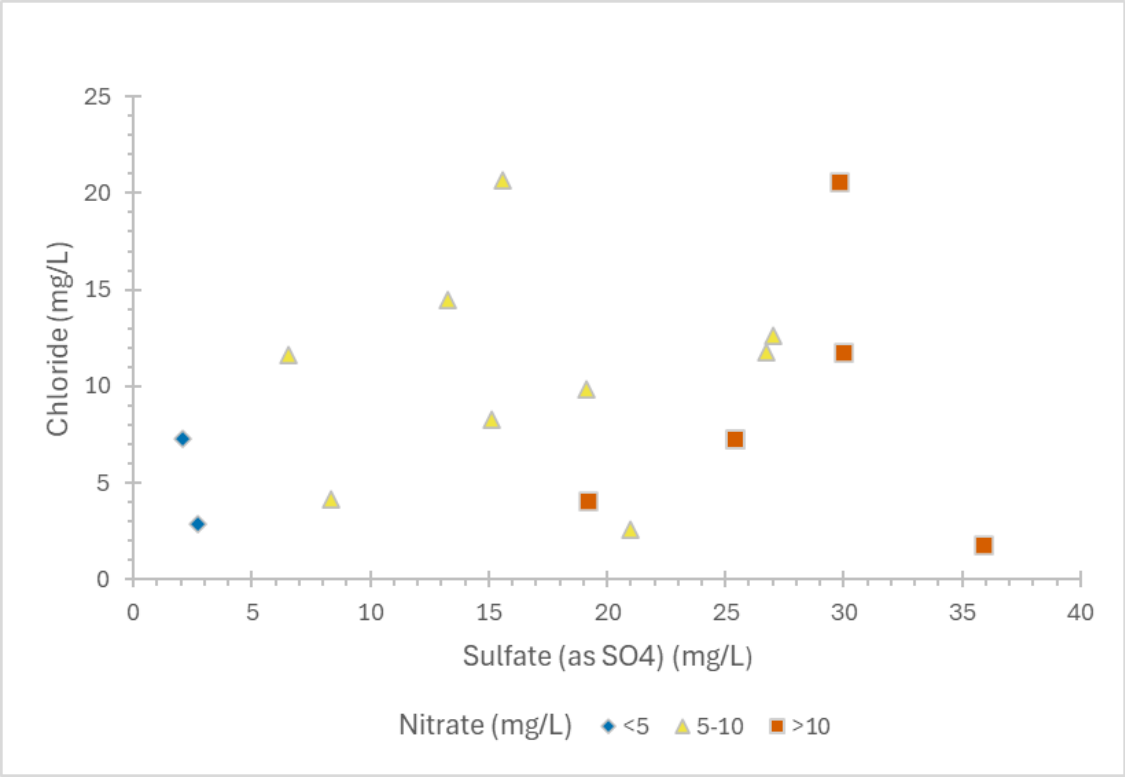


Figure 3. Second round sampling correlation of chloride and sulfate concentrations with nitrates.

Bacteria (2nd Round)

All wells sampled in the second round had similar bacteria concentrations as in the first round. Six of the 16 wells came back positive for total coliform. DEQ resampled the two *E. coli* positive results from the first round in the second round and both came back positive again.

Major Ions (2nd Round)

Sulfate and chloride concentrations seem to be diagnostic in interpreting possible nitrate sources (Figure 3). Areas with relatively high sulfate and elevated nitrate concentrations suggest an influence of ammonium sulfate fertilizer. Areas with relatively high chloride and elevated nitrates suggest the influence of septic or animal waste.

Trace Constituents (2nd Round)

DEQ also sampled for boron and bromine in the second round. Boron is naturally present in geologic materials and can be an important micronutrient used in east Idaho for potatoes and alfalfa. Boron can also be a significant tracer related to household cleaning products in domestic sewage. DEQ analyzed samples from all 16 sites for boron and bromine at trace levels as indicators for potential nitrate sources. Boron concentrations ranged from 2.8 to 137.4 micrograms per liter (µg/L), with a median value of 55.5 µg/L. Bromine concentrations ranged from 14.7 to 35.5 µg/L, with a median value of 26.03 µg/L.

Stable Isotopes (2nd Round)

Nitrogen isotope ($\delta^{15}N$) results ranged from 3.11 per mil (‰) to 6.72‰, with a median of 5.25‰. Six wells (38%) had ratios from -4‰ to +5‰, indicating the nitrate source potentially is influenced by commercial fertilizer. The other ten wells (62%) were between 5‰ and 9‰, indicating an influence of mixed organic sources. No nitrogen isotope results were above +9.0‰, which would suggest waste sources (Seiler 1996). Deuterium isotope ($\delta^{2}H$) results ranged from -138‰ to -125‰, with a median of -131‰. Oxygen isotope ($\delta^{18}O$) results ranged from -17.8‰ to -16.6‰, with a median of -17.3‰.

Conclusions

In 2023, DEQ sampled 64 total wells in the Ashton/Drummond NPA with 56 of the 64 being sampled for the first time. Thirty-three wells (52%) had nitrate concentrations under the MCL but at or above half the MCL (5 mg/L). Nine wells (14%) were at or above the MCL. This indicates that more than two-thirds of sampled wells show nitrate levels of concern for long-term groundwater quality.

The sulfate to chloride ratio compared to nitrate concentrations along with the boron and bromide analysis suggests an influence of commercial fertilizer in this area with some wells showing a mix of organic sources such as septic or animal waste. Together, these findings highlight the importance of continued monitoring and management in the Ashton Drummond

NPA. DEQ will use the results to evaluate NPAs and determine the extent and level of concern of groundwater degradation.

All Ashton/Drummond NPA sampling results are available at *Ground Water Quality Monitoring and Protection*.

Contact: DEQ Idaho Falls Regional Office, (208) 528-2650

References

DEQ (Idaho Department of Environmental Quality). 2021. *2020 Nitrate Priority Area Delineation and Ranking Process*. Boise ID: DEQ Water Quality Division. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14704.*

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Welhan, J. 2009. *Sources of Nitrate Contamination in Ground Water of Pleasant Valley, Power County, Idaho*. Final Report, DEQ Contract #C654. Idaho Geological Survey, Department of Geosciences, Idaho State University.

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Summary Report: Sand Hollow Groundwater Nitrate Investigation

The Idaho Department of Environmental Quality's (DEQ'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.

The purpose of this project is to collect additional samples from the domestic and monitoring wells in the project area for nitrate analysis. It is a continuation of previous sampling efforts by DEQ used to evaluate sources of nitrate and bacteria in the domestic well.

Background

In 2023, DEQ sampled one domestic and three monitoring wells in southwestern Gem County, Idaho (Figure 1) as part of an ongoing investigation into relatively higher nitrate concentrations in the project area.

In 2013, DEQ responded to a complaint of possible groundwater contamination at a site adjacent to a dairy farm operation. Multiple sources of nitrate with the potential to impact groundwater are present in the area, including agricultural fertilizers, dairy waste applied to fields north and east of the site, septic systems at the residence and dairy, stockpiled solid dairy waste, and a dairy waste lagoon. Land use south and east of the site is generally agricultural, with rangeland to the west and an approximate 1,800-head dairy located adjacent to the north end of the property. Laboratory analyses of groundwater samples collected from the site's domestic well (Well 2232) indicated that nitrate concentrations increased from approximately 8 milligrams per

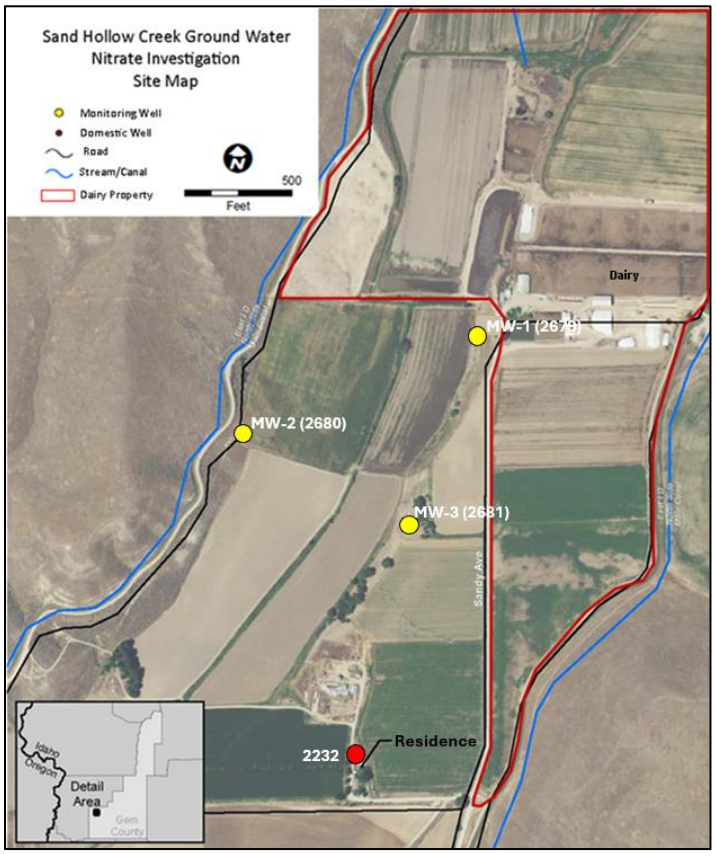


Figure 1. Project site map (modified from Tetra Tech 2019) — Sand Hollow Groundwater Nitrate Investigation.

liter (mg/L) in August 2012 to 21 mg/L in October 2015.

DEQ's assessment of the property did not identify any on-site land use changes that could account for the significant increase in nitrate concentrations in the well's groundwater (DEQ 2019). DEQ initiated Sand Hollow Creek's groundwater nitrate investigation to identify potential off-site nitrate sources impacting groundwater at Well 2232.

In December 2016, STRATA (the initial subcontractor on the project) installed three monitoring wells (Wells 2679, 2680, and 2681) at locations estimated to be upgradient or cross gradient of Well 2232 (Figure 1). STRATA installed monitoring wells to identify the groundwater flow direction and assess groundwater quality upgradient of Well 2232. Subsurface lithology at all wells generally consisted of poorly graded sand, silty sand, and clay. DEQ returned to the site to conduct routine sampling in 2017, 2019, and 2022.

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

In 2023, DEQ measured depth to groundwater and sampled from the one domestic and three monitoring wells in the project area. DEQ analyzed samples for a wide range of analytes: nitrate, nitrite, phosphorus, ammonia, calcium, chloride, fluoride, magnesium, potassium, sodium, sulfate, and alkalinity. DEQ provided sample results for the domestic well to the homeowner.

Nutrient Results

Nutrient results (phosphorus, nitrite, nitrate, and ammonia) are presented in Table 1. Groundwater collected from the domestic well had a nitrate concentration of 3.4 mg/L, less than half of the MCL of 10 mg/L and down from 4.03 mg/L in 2022. Monitoring Wells 2680 and 2681 had low nitrate concentrations of 0.12 mg/L and 0.56 mg/L, respectively. However, samples from monitoring Well 2679 exceeded the MCL at 13 mg/L and increased from 11.4 mg/L in 2022. This well is the farthest upgradient from the domestic property and closest to the neighboring dairy. Previous sampling events have also shown this well to be higher in nitrate, but the concentration was much higher when sampled in May 2019 (20.4 mg/L). No wells had detections for nitrite or ammonia, and phosphorus concentrations ranged from 0.11 mg/L to 0.45 mg/L.

Table 1. Nutrient results.

DEQ Site ID	Well Depth	Sample Date	Nutrient Concentration				
			Phosphorus	Nitrite[A]	Nitrate + Nitrite[A]	Nitrate[A]	Ammonia
			mg/L	mg/L	mg/L	mg/L	mg/L
Water Quality Standard:			No Stand.	1	10	10	No Stand.
2232	Unk	7/13/2023	0.23	<0.30	3.4	3.57	<0.050
2679	60	7/13/2023	0.35	<0.30	13	12.9	<0.050
2680	40	7/13/2023	0.11	<0.30	0.12	0.119	<0.050
2681	45	7/13/2023	0.45	<0.30	0.56	0.45	<0.050

Notes: mg/L = milligrams per liter; Unk=Unknown. Well log not found; No Stand = No Primary or Secondary Drinking Water Regulation or Idaho Ground Water Quality Rule standard currently established;

[A] Contaminant with a National Primary Drinking Water Regulation standard.

General Groundwater Geochemistry Results

Water chemistry at all wells was acceptable, with no analytes exceeding set drinking water standards. Previous evaluations have shown that Well 2679 is high in sodium and chloride whereas Well 2232 (domestic) has elevated levels of calcium and bicarbonate. Lab results from 2023 support these findings.

Conclusions

The 2023 sampling confirmed that elevated nitrate remains localized to Monitoring Well 2679, which exceeded the nitrate MCL. The domestic well and two other monitoring wells were below half the MCL. Compared with previous years, Well 2679 concentration remain elevated but lower than 2019 levels. The variable, but elevated concentrations of nitrate in Well 2679 could be due to the fact that the well is located farthest from the residence, and closest to potential sources of nitrate. At this time, DEQ has no further plans to return to the project area and resample.

All Sand Hollow groundwater nitrate investigation sampling results are available at *Ground Water Quality Monitoring and Protection*.

Contact: DEQ State Office, (208) 373-0502

References

DEQ (Idaho Department of Environmental Quality). 2019. *2019 Groundwater Quality Monitoring Projects Summary Report.* Boise, ID: DEQ. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/17199*.

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STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2023 Summary Report: DEQ-IDWR Groundwater Monitoring Project

The Idaho Department of Environmental Quality's (DEQ'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.

The Idaho Department of Environmental Quality partnered with the Idaho Department of Water Resources (IDWR) to collect nitrogen isotope samples from select wells to help evaluate groundwater quality in Idaho. Nitrogen isotope ratios, denoted as $\delta^{15}N$, can help determine potential sources of nitrate in groundwater.

Background

The IDWR Statewide Ambient Groundwater Quality Monitoring Network assesses groundwater quality across Idaho. DEQ partnered with IDWR to collect samples for $\delta^{15}N$ analysis from wells with elevated nitrate throughout the state. Samples were selected for $\delta^{15}N$ analysis based on nitrate concentrations. IDWR staff collected groundwater samples during statewide network sampling events, and DEQ paid for the analysis. New $\delta^{15}N$ data will assist in future nitrogen source evaluation.

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

IDWR collected 30 samples for the stable nitrogen isotope $\delta^{15}N$ analysis from 30 domestic wells across Idaho. Wells that had concentrations of nitrate greater than 5 milligrams per liter (mg/L), or half the EPA MCL of 10 mg/L, were selected for $\delta^{15}N$ analysis.

Nitrogen Isotope Results

The $\delta^{15}N$ results are presented in Table 1 and Figures 1 and 2. The $\delta^{15}N$ ratios ranged from 2.0 per mil (‰) to 12.8‰. Two of the 30 samples (6.67%) had a ratio consistent with inorganic sources (<4.0‰). Twenty-two samples (73.33%) had ratios consistent with a mixed or organic source of nitrogen (4.0‰ – <9.0‰). Six samples (20%) had ratios consistent with waste (animal or human) sources of nitrogen (≥9.0‰; Seiler 1996).

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Table 1. 2023 Nitrate and nitrogen isotope ratios.

IDWR Site ID	Map ID	$\delta^{15}N$ ‰	Nitrate (mg/L)
33N 02W 10AAB1	N-1	12.8	17
11N 06W 20BAA1	N-2	7.7	5.8
09N 03W 30BAC1	N-3	11.7	8.1
08N 05W 26ABB1	N-4	3.7	7.3
07N 05W 33CDB1	N-5	4.2	7.7
07N 02W 34ACC1	N-6	4.7	5.4
05N 01W 33ACD1	N-7	8.7	4.5
04N 02W 36CCC1	N-8	7.1	6
03N 02W 12BAB1	N-9	10.6	6.8
03N 01E 15CBD1	N-10	9.5	9.2
02N 02W 23ABD1	N-11	6.4	5
01S 02W 09CBA1	N-12	8.1	9.8
03S 06E 22AAA1	N-13	8.8	5.1
05S 06E 01AAD1	N-14	5.9	14
11S 16E 09CCC1	N-15	5.2	6.5
11S 17E 02ABB1	N-16	7.0	4.5
10S 18E 04CDA1	N-17	4.9	5
08S 18E 33CCC2	N-18	7.6	8.6
11S 20E 10AAD1	N-19	5.2	8.4
11S 21E 07BBC1	N-20	10.5	14
08S 22E 35BAA1	N-21	5.7	5.5
08S 23E 15BAD2	N-22	5.2	5.2
09S 25E 27CDD1	N-23	5.8	10
09S 29E 05DDD3	N-24	4.6	9.4
14N 18E 35DCD1	N-25	7.4	7.1
04N 27E 31CDC1	N-26	7.2	4.6
02S 36E 33AAC1	N-27	5.5	4.8
08N 38E 30DBD1	N-28	2.0	8.5
09N 44E 30CBB1	N-29	9.8	29
07N 45E 20BAB1	N-30	6.4	7.7

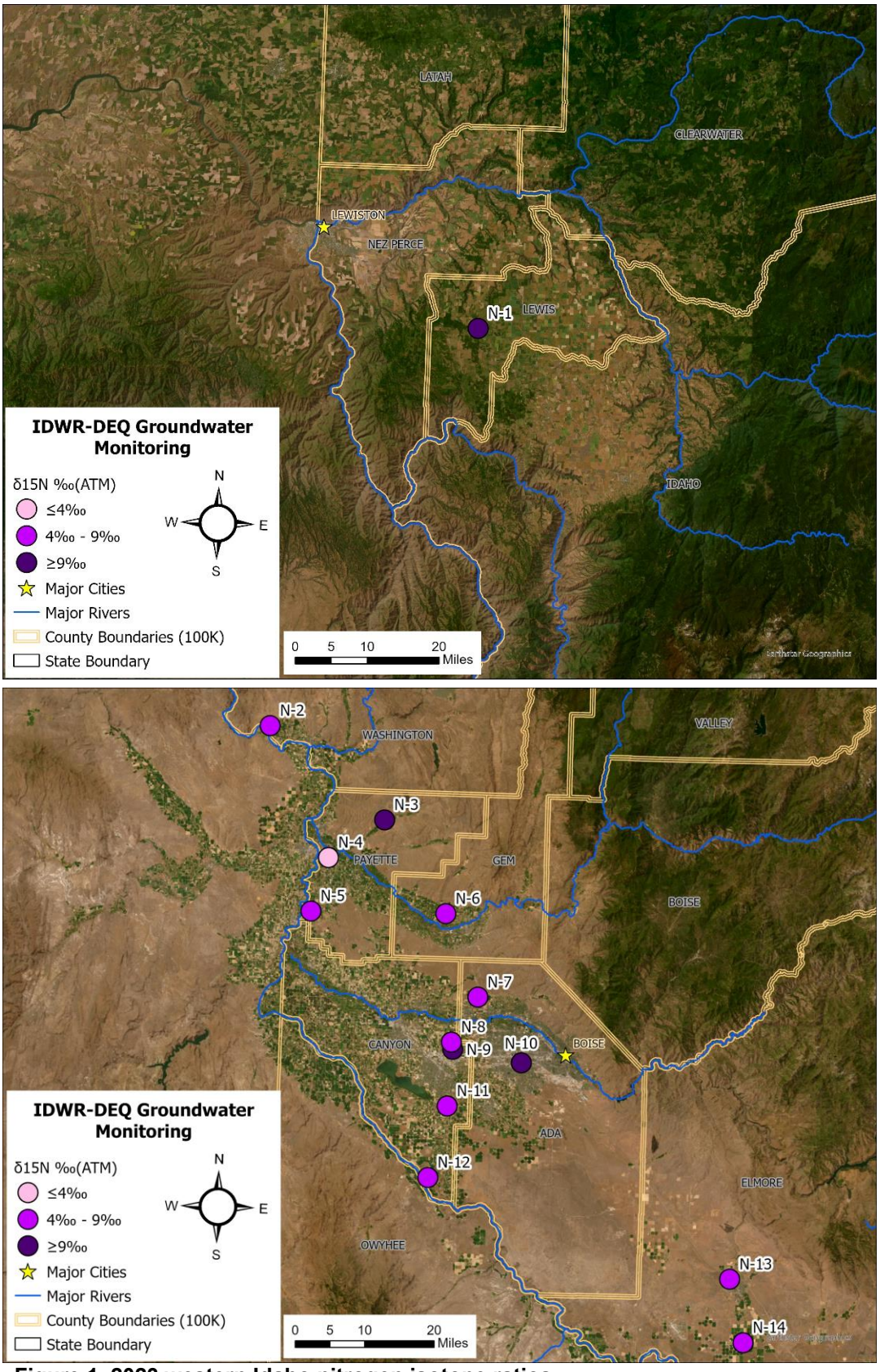


Figure 1. 2023 western Idaho nitrogen isotope ratios.

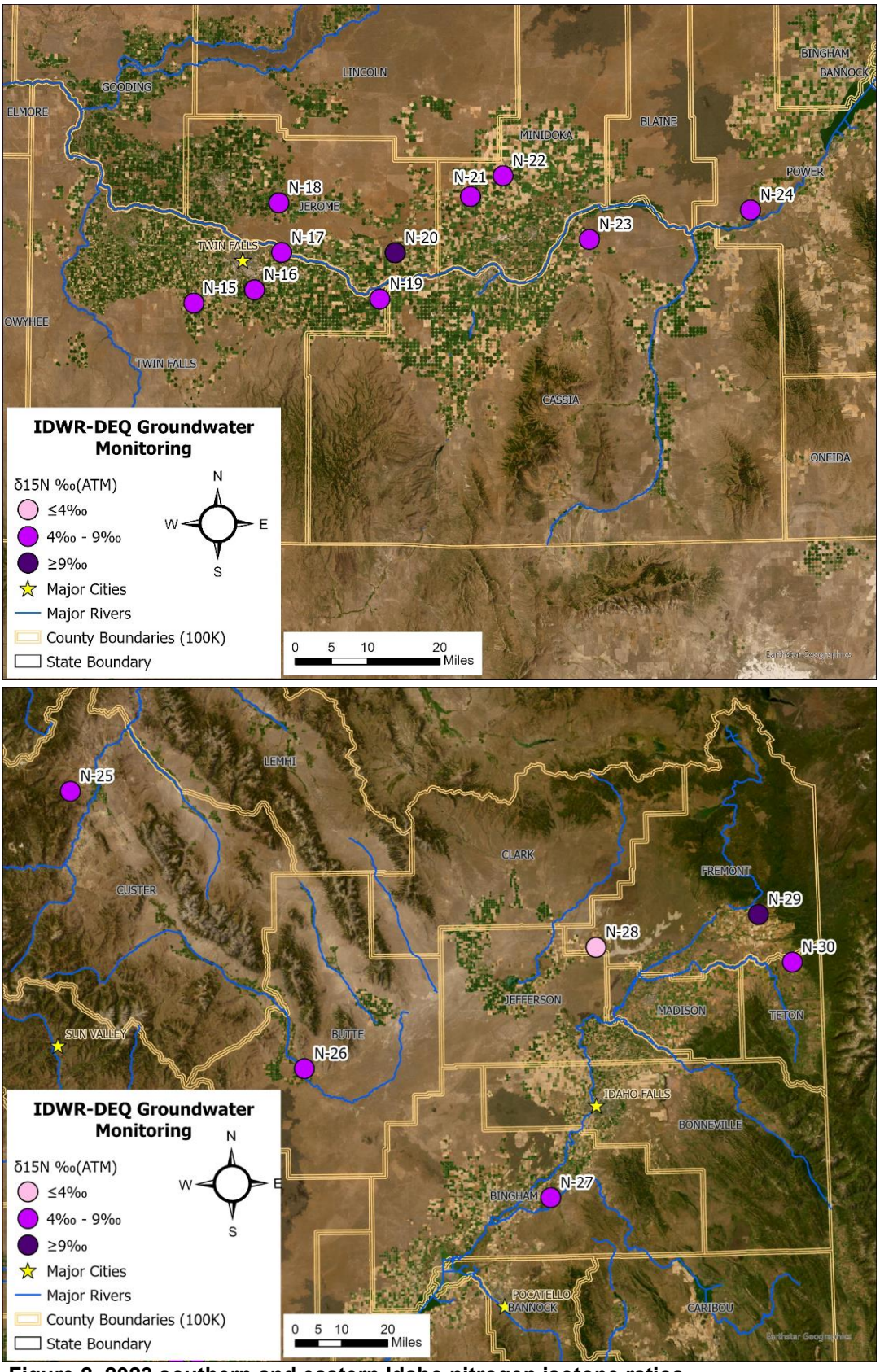


Figure 2. 2023 southern and eastern Idaho nitrogen isotope ratios.

Conclusions

The cooperative project between IDWR and DEQ resulted in the cost-effective collection of additional $\delta^{15}N$ data. The isotope results suggest that most elevated nitrate in groundwater is linked to mixed or organic sources, with a smaller contribution from inorganic fertilizer and notable detections consistent with animal or human waste. These findings highlight the importance of continued monitoring to better distinguish between land-use related inputs (fertilizer vs. septic/manure) and to guide management strategies in affected areas.

All sample results from this DEQ-IDWR collaborative monitoring project are available in *IDWR's Environmental Data Management System database.*

Contact: DEQ State Office, (208) 373-0502

References

IDAPA. 1997. "Ground Water Quality Rule." Idaho Administrative Code. IDAPA 58.01.11.200.

Seiler, R.L. 1996. *Methods for Identifying Sources of Nitrogen Contamination of Groundwater in Valleys in Washoe County, Nevada*. US Geological Survey Open-File Report 96-461.