



Idaho State Department of Agriculture  
Division of Agricultural Resources

Ground Water Quality Monitoring Results  
Of Mud Lake Area in Jefferson County, Idaho

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### Introduction

The Idaho State Department of Agriculture (ISDA) developed the ISDA Regional Agricultural Ground Water Quality Monitoring Program to characterize degradation of ground water quality by contaminants leaching from agricultural sources. ISDA currently is conducting 12 regional monitoring projects in Idaho with plans to implement further testing in other areas (Figure 1). The objectives of the program are to: (1) characterize ground water quality related to primarily nitrates and pesticides, (2) determine if legal pesticide use contributes to aquifer degradation, (3) relate data to agricultural land use practices, and (4) provide data to support voluntary and/or regulatory implementation and evaluation of Best Management Practices (BMP) for ground water protection.

The ISDA Mud Lake regional monitoring project began in 1998 as a five-year study of the groundwater quality in the area. The project was initiated as a result of a nitrate detection exceeding 10 milligrams per liter (mg/L) northwest of Mud Lake by the Idaho Department of Water Resources Statewide (IDWR) Ambient Ground Water Quality Monitoring Program (Neely and Crockett, 1999). The detection is above the Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) of 10 mg/L. The goal of ISDA is to better understand potential impacts of agricultural practices throughout the Mud Lake area.

### Methods

To establish this project, ISDA statistically assessed IDWR Statewide Program nitrate, chloride, and atrazine monitoring data. ISDA statistically determined that sampling 30 randomly selected domestic wells would

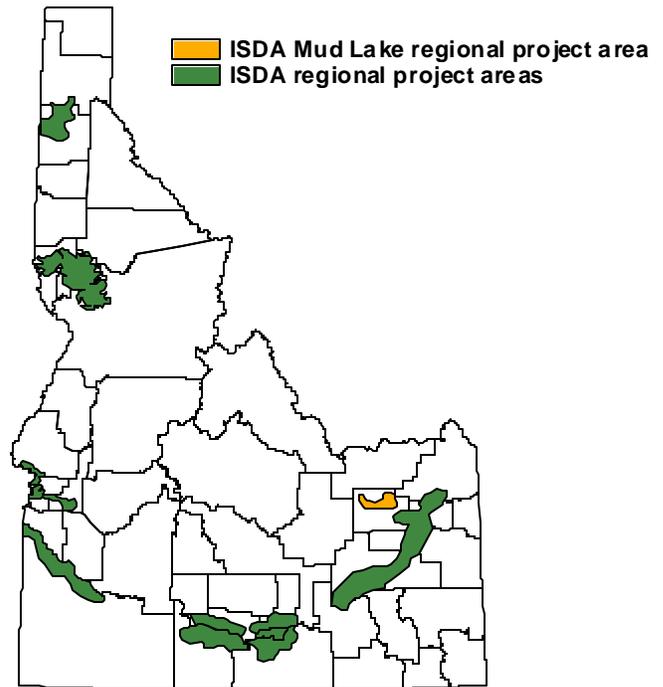


Figure 1. Location of Mud Lake regional project and other ISDA regional projects.

provide adequate data to evaluate overall ground water quality underlying the area. All sampling was conducted after a quality assurance project plan (QAPP) was established. Permission was gained from the land owners prior to sampling.

Nutrients, other common ions, and pesticides were evaluated during the first year (1998) of testing. All sample collections followed established ISDA protocols (on file at ISDA main office) for handling, storage, and shipping. Samples were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho. UIASL conducted tests for nitrate, nitrite, ammonia, orthophosphorus, chloride, sulfate, bromide, and

fluoride using EPA Methods 300.0 and 350.1 and gas chromatography scans for pesticides utilizing EPA Methods 507, 508, 515.1, and 531.1. Duplicates, splits, and matrix spikes/matrix spike duplicates were collected and submitted as a part of the QAPP.

## Description of Project Area

The Mud Lake regional monitoring project area is located within Jefferson County in northeastern Idaho (Figure 1). The 30 randomly selected wells are situated to the west, south and east of Mud Lake (Figure 2). The project boundaries are roughly State Highway 28 to the west, State Highway 33 to the south, and Interstate 84 to the east. There are six well locations that fall just east of the interstate (Figure 2).

The project area lies within the boundaries of the Eastern Snake River Plain Sole Source Aquifer. Ground water depths are greatest to the south of the lake, but get progressively shallower toward the northeast portion of the area. Within the project area, the largest portion (40%) of the sampled wells have well depths of 200 to 300 feet (Table 1). According to lithologic records from well drillers' reports, unconsolidated sands and clays appear in some areas between zero and 100 feet. However, the majority of the sampled wells within the project boundary are completed in water bearing zones of fractured and vesicular (cinders) basalt.

**Table 1.** Project well information.

Well Depth (feet)	Number of Wells	Median Static Water Level	Dominant Geology
< 100	5 (16.7%)	25	Sand and Clay/ Vesicular basalt
100-200	8 (26.6%)	61	Vesicular basalt
200-300	12 (40.0%)	170	basalt
> 300	5 (16.7%)	190	basalt

Land use within the Mud Lake area is primarily agriculture. Much of the area is dominated by irrigated agriculture. Corn, alfalfa, wheat, barley, oats, and potatoes are the chief crops grown in Jefferson County (Idaho Agricultural Statistic Services, 2000). Additionally, there are several small dairy operations and other live-stock raising activities in the area. These activities as

well as other possible human sources within the local communities and from rural residences (e.g., septic systems) have the potential to impact ground water quality of the area.

Ground water of the Mud Lake area has been identified as a nitrate priority area of concern by the Idaho Department of Environmental Quality (IDEQ, 2002). Based on a ranking system developed by the Idaho Ground Water Monitoring Technical Committee, the area is currently ranked 21 out of 25 nitrate priority areas in the state. Priority areas with lower numbered rankings have higher priority in terms of degraded water quality and potential human health impacts (IDEQ, 2002).

## Results

Sampling results for the first four years of testing indicate that some nitrate and pesticide impacts have occurred to the aquifer. Results are summarized and presented in the following sections.

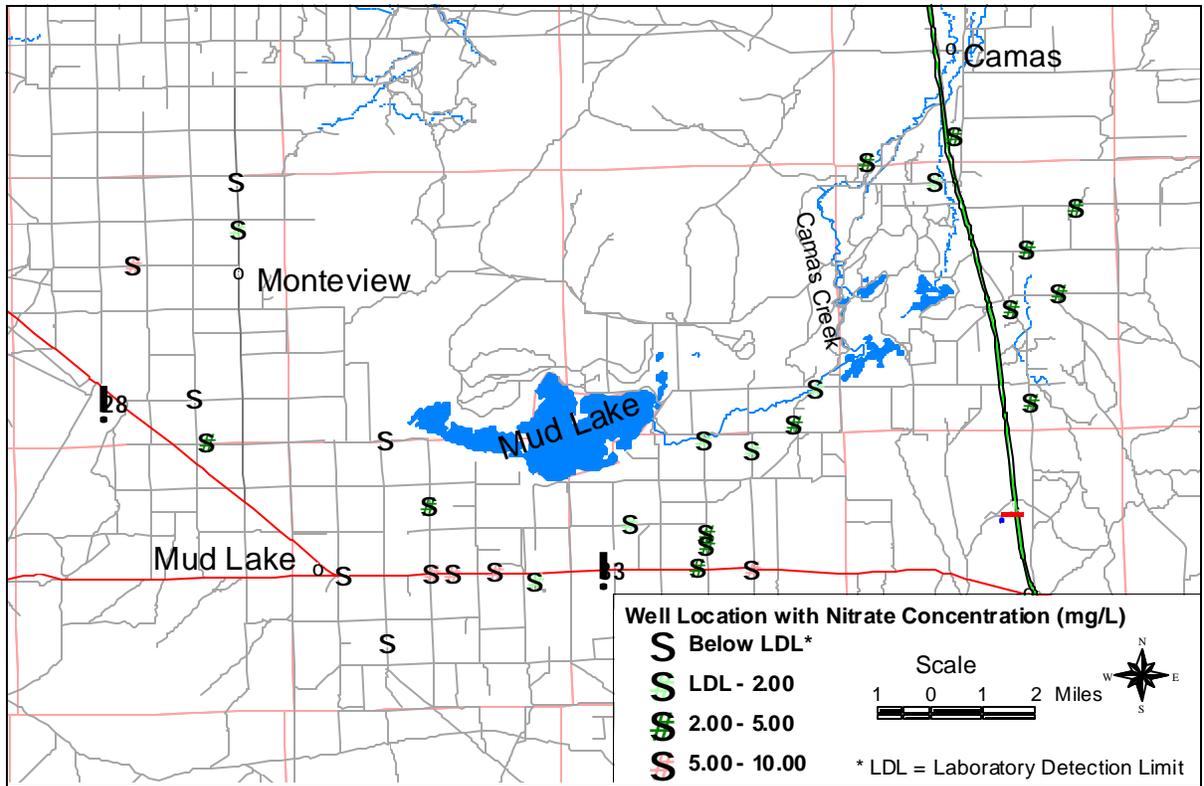
### Nitrate

Results of ground water sampling from 1998 to 2001 suggest a slight increasing trend in ground water nitrate concentrations. This is indicated by increasing median levels over the four year period (Table 2). In 1998, median levels were at 2.0 mg/L. More recent testing in 2001 indicate median levels to be at 2.5 mg/L. Maximum nitrate concentrations have fluctuated between 6.2 mg/L in 1999 to 6.6 mg/L in 2001. Nitrate testing results indicate that most ground water nitrate concentrations range from 2.0 mg/L to 5.0 mg/L. (Table 2 and Figure 2). No samples from the 30 wells have exceeded

**Table 2.** Nitrate statistics from 1998 to 2001 testing.

Conc. Range (mg/L)	1998 no. and % of wells	1999 no. and % of wells	2000 no. and % of wells	2001 no. and % of wells
< LDL*	6 (20%)	6 (20%)	5 (17%)	5 (17%)
LDL -2.0	9 (33%)	6 (20%)	8 (27%)	7 (23%)
2.0 -5.0	10 (30%)	13 (43%)	11 (37%)	13 (43%)
5.0 -10.0	5 (17%)	5 (17%)	6 (20.0%)	5 (17%)
10.0	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Median	2.0 mg/L	2.4 mg/L	2.6 mg/L	2.5 mg/L
Max.	6.5 mg/L	6.2 mg/L	6.3 mg/L	6.6 mg/L

\*LDL = Laboratory detection level



**Figure 2.** Location of wells and ground water nitrate concentration ranges from ISDA sampling in 2001.

the EPA MCL of 10 mg/L over the four-year period in which ISDA has implemented the Mud Lake regional project.

Five wells have consistently been above 5.0 mg/L for nitrate (Table 2 and Figure 2). Four of these wells are located in proximity to State Highway 33 along the southern boundary of the project (Figure 2). One well, also consistently above 5.0 mg/L, is located approximately two miles to the east of Montview (Figure 2). Wells located east of Mud Lake generally have shown nitrate levels between the laboratory detection limit (0.033 mg/L) and 5.0 mg/L. A small area in the vicinity of the town of Mud Lake is typically below 0.033 mg/L (Figure 2).

## Pesticides

Samples were collected at 30 wells in 1998 and sent to UIASL in Moscow, Idaho. Low level detections of the pesticide dacthal (DCPA) were found at two well locations (Table 3). The detections were considerably below the health standard of 100 µg/L. Two other com -

**Table 3.** Pesticide testing results from 1998.

Pesticide Compound	Number of Detects	Range (µg/L)	Health Standard (µg/L)	UIASL Detection Limits (µg/L)
Dacthal	2	0.04 - 1.5	100 (Rfd*)	0.016
2,4-DCBA	3	0.12 - 0.27	0.10 (Rfd*)	0.010
3,5-DCBA	1	0.31	N/A	0.012

\*Rfd = Child - based references dose for lifetime consumption by a 10 kg child.

pounds, 3,5-dichlorbenzoic acid (3,5-DCBA) and 2,4-dichlorobenzoic acid (2,4-DCBA), were found in four well samples during the 1998 testing period (Table 3). Because of limited use of the compound in pesticides, ISDA currently is working to determine if the DCBA detections are actually a pesticide compound or from another possible source.

In 1999 and 2000, follow-up monitoring was conducted at the five wells that previously tested positive in 1998. No pesticides were detected at any of the locations from the follow-up testing. During 2001 testing, ISDA ran

domly tested one-third of the wells for carbamates (class of insecticide). Laboratory results indicated that no carbamates were present in the selected domestic wells.

## Conclusions

The results from this monitoring project indicate that nitrate levels range from no detections to a high of 6.6 mg/L. Overall, the majority of nitrate detections have been below 5.0 mg/L from sampling during 1998 to 2001. However, median nitrate values show a slight, but gradual increasing trend. Six wells have had nitrate levels above 5.0 mg/L. Prior detections above 5.0 mg/L from previous monitoring in the area were, in part, the criteria used by IDEQ to establish the nitrate area of concern near Mud Lake (IDEQ, 2002). The 5.0 mg/L (half the EPA MCL) level was selected by IDEQ as a preventative measure to deal with nitrate impacts to ground water prior to levels becoming a health concern.

Although several pesticide detections were found in ground water samples from 1998, follow-up monitoring in 1999 and 2000 were absent of positive pesticide detections. Pesticide impacts to ground water of the area appear to be minimal. ISDA will continue to test for pesticides in the Mud Lake area as funds are available.

ISDA currently is working to advise residents and officials of the area to protect ground water quality. Ground water monitoring will continue yearly through 2002 to assist with these efforts.

## Recommendations

ISDA recommends continued monitoring in the project area. ISDA further recommends that measures to reduce nitrate impacts and future pesticide impacts on

ground water be addressed and implemented. ISDA recommends that:

- Growers and agrichemical professionals conduct nutrient, pesticide, and irrigation water management evaluations.
- Producers follow the Idaho Agricultural Pollution Abatement Plan and Natural Resources Conservation Service Nutrient Management Standard.
- Producers and agrichemical dealers evaluate their storage, mixing, loading, rinsing, containment, and disposal practices.
- Homeowners assess lawn and garden practices, especially near wellheads.
- Local residents assess animal waste management practices.
- State and local agencies assess impacts from private septic systems.
- Home and garden retail stores establish outreach programs to illustrate proper application and management of nutrients and pesticides.
- Responsible parties assess pesticide application practices to protect ground water.

## References

Idaho Agricultural Statistics Service, 2000. 2000 Idaho Agricultural Statistics, 65p.

Neely, K. W., and Crockett, J. K., 1999. Nitrate in Idaho's ground water: Idaho Department of Water Resources Technical Results Summary No. 1, 12 p.

Idaho Department of Environmental, 2002. [Http://www2.state.id.us/deq/water/gw/nitrate/nitrate\\_ranking.htm](http://www2.state.id.us/deq/water/gw/nitrate/nitrate_ranking.htm)