Idaho State Department of Agriculture
Division of Agricultural Resources

Ground Water Quality of Middle Henry's Fork Basin Regional Monitoring Project, 2003-2007

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Introduction

The Idaho State Department of Agriculture (ISDA) developed the Agricultural Regional Ground Water Quality Monitoring Program to characterize degradation of ground water quality from contaminants leaching from agricultural sources. The objectives of the program are to: (1) characterize ground water quality related primarily to nitrate 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 Best Management Practices (BMPs) and/or regulatory decision making and evaluation processes. ISDA is currently implementing 13 of its 15 regional ground water quality monitoring projects (Figure 1). Additional projects are being planned for other areas of the state.

The ISDA Middle Henry's Fork Basin regional monitoring project, located near the town of Ashton, began in 2003 as a result of completion of the Idaho Ground Water Quality Plan and Agricultural Ground Water Protection Plan for Idaho. In part, these documents mandate regional-scale monitoring of aquifers in the state that may be vulnerable to agricultural activities. Additionally, previous monitoring by the U. S. Geological Survey and the Idaho Department of Environmental Quality (IDEQ) in 1997 and 1998 found that about 80 percent of the wells sampled within the project area had nitrate concentrations greater than 5 milligrams per liter (mg/L) and approximately 20 percent of the wells sampled had nitrate concentrations that exceeded the Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL)[1] of 10 mg/L (Yellowstone Conservation District, 2003).

To establish this regional monitoring project, the ISDA randomly selected domestic wells in the project area and coordinated with homeowners to conduct ground water sampling.

[1]MCLs represent the EPA health standard for drinking water.

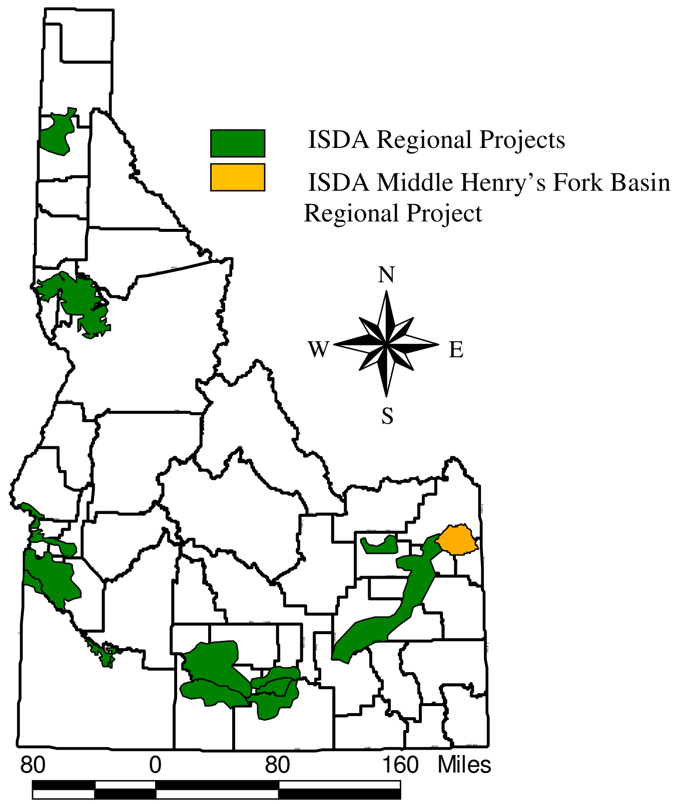

Figure 1. Location of Middle Henry's Fork Basin regional ground water monitoring project and other ISDA regional projects.

Nitrates, pesticides and common ions have been and are currently being evaluated to determine impacts to ground water and to locate potential sources. Laboratory results from testing in 2003 through 2007 indicate areas showing water quality degradation from nitrate and to a lesser extent, pesticides.

Description of Area

The project area is located on the eastern edge of the Snake River Plain, in southeastern Idaho on a basalt plateau, encompassing part of Fremont County, Madison County, and Teton County (Figure 1). The Henry's Fork of the Snake River generally follows the project area's northwest boundary. Elevations range from 5,150 feet in the southwest to 6,230 feet in the east.

Climate

Eastern Idaho's climate generally follows a wet winter-dry summer pattern and has a somewhat greater range between winter and summer temperatures than west and north Idaho. The average annual rainfall in the area is 19.2 inches based on data from 1948 to 2007 for the Ashton station (Station 100470) (WRCC, 2008).

Geology

The geology in the project area is complex with Pleistocene-aged Huckleberry Ridge tuff and Falls river basalt present (IDEQ, 2001[1]). Where the basalt is not exposed at the surface, it is overlain by alluvium, which varies in thickness from a few feet to several tens of feet (Jorgensen Engineering and Land Surveying, P.C., 1999). Loess deposits derived from the wind-blown flood plain of the Snake River Plain are found throughout the project area (IDEQ, 2001[1]).

Hydrogeology

The ground water flow of the regional aquifer is to the southwest (Crosthwaite et al., 1970). In the Ashton area, irrigation and seepage from streams has caused an extensive perched aquifer in the basalt above the sillicic volcanic rocks (Crosthwaite et al., 1970). The regional aquifer is recharged by precipitation and by the downward movement of water from the perched aquifer (Crosthwaite et al., 1970).

Ground water underlying the project area is used for human consumption, by private wells and public water systems, and irrigation. Wells within the project area (Figure 2) draw water from Snake River Group basalts or the sillicic volcanic rocks from the Yellowstone Group. The basalt aquifer has adequate water for domestic wells because it has sufficient fracture zones that produce water (IDEQ, 2001[2]). Based on well drillers reports from domestic wells in the project area, average static water levels range from 4 to 280 feet below land surface (bls) (Table 1.)

The aquifer is moderately to highly vulnerable to contamination due to the presence of alluvium material and exposed bedrock, which is conducive to the leaching of contaminates, including pesticides.

Land Use

The project area encompasses many towns including: Ashton, Drummond, Chester, Clementsville, Squirrel, and Felt. The land use in the project area is primarily irrigated agriculture and dry-land agriculture. Major crops in the area include malt barley, wheat, and seed potatoes (IAS, 2007). There are smaller amounts of alfalfa and corn in production as well. A few livestock operations are also located within the area.

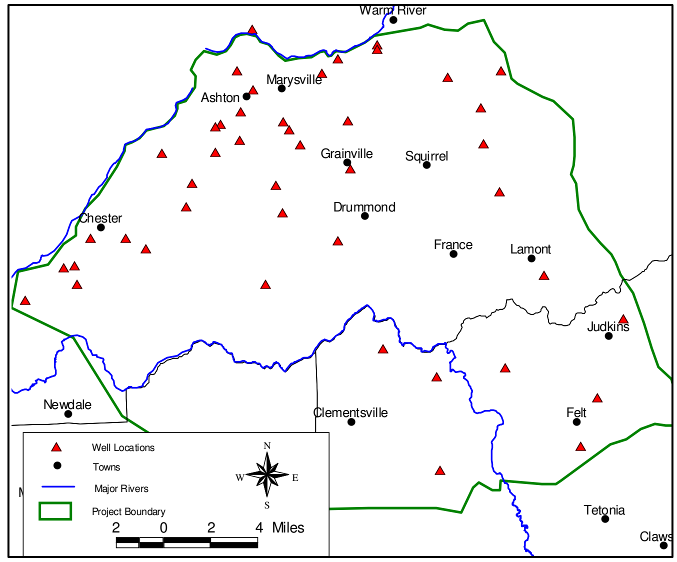

Figure 2. Location of project area and wells.

Table 1. Well information for the 38 domestic wells tested from 2003 through 2007 with verified well logs*.

Well Depth (feet) bls	Number of Wells	Average Static Water Level (feet)	Ranges of Static Water Levels (feet)
<100	10	22.4	4 to 75
100 to <200	10	80.1	28 to 130
200 to <300	9	112	38 to 165
300 to <400	5	223	172 to 310
400 to <500	3	188	25 to 280
500 and above	0	- - -	- - -

* One well did not have a verified well log.

Methods

To establish this project, ISDA staff developed a project boundary based on known aquifer characteristics, land use information and data used to designate the area as an IDEQ Nitrate Priority Area. ISDA statistically determined that sampling 47 randomly selected domestic wells in the study area (Figure 2) would 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 homeowners prior to sampling.

Water samples have been collected annually in the summer from 2003 to 2007. Nutrients and common ions were evaluated each year during this project. Pesticide samples were collected in 2003 and 2006. Additional nutrient and pesticide testing was conducted in the project area for the Ashton Local Project, ISDA Project # 800, from 1998 to 2002. Please refer to http://www.agri.idaho.gov/Categories/Environment/water/gwinorganic.php for those results.

All sample collections followed established ISDA protocols (on file at the ISDA main office in Boise, Idaho) for handling, storage, and shipping. Samples collected were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho. The UIASL analyzed the ground water samples for nitrate, nitrite, ammonia, ortho-phosphorous, chloride, sulfate, bromide, fluoride using EPA Methods 300.0 and 350.1, and pesticides using EPA Methods 507, 508, 515.2, and 632. Duplicates and blanks were collected and submitted as part of the QAPP.

Results

The following section provides a summary of nitrate, pesticide and stable isotope testing from 2003 through 2007. Other water quality data (e.g., sulfate, ammonia, chloride) not presented in this report are available on the ISDA website at http://www.agri.idaho.gov/Categories/Environment/water/gwinorganics.php.

Sampling results indicate some nitrate impacts to the area. The 47 wells selected for this project were sampled in 2003 for both nitrate and pesticides. In the sampling years 2004 through 2007, some wells were not tested for various reasons. Only the 38 wells that were consistently sampled all five years were evaluated for trends in this report (Table 2). The summary statistics for all wells sampled in a given year can be found in Table A-1 in Appendix A.

Nitrate

Results of ground water sampling in the project area suggested an average yearly mean nitrate value of 4.9 mg/L and an average yearly median (50th percentile) nitrate value of 4.1 mg/L for the 2003 to 2007 time period. Yearly mean concentrations ranged from 4.3 to 5.6 mg/L. Yearly median concentrations ranged from 3.8 to 4.8 mg/L. The maximum value ranged from 23 to 48 mg/L (Table 2 and Figure 3).

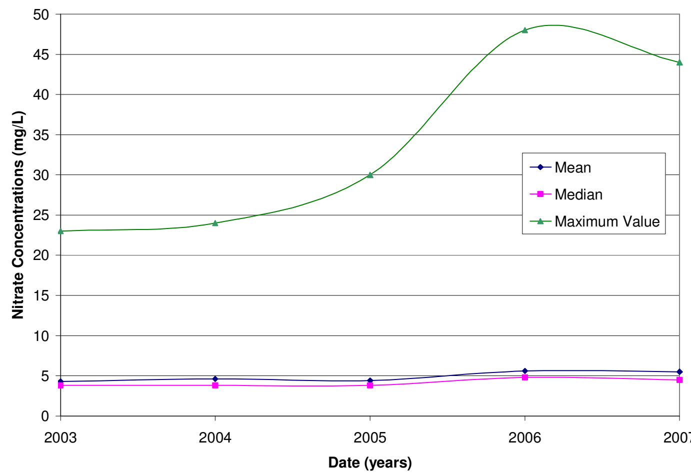

Figure 3. Time series plot of mean, median and maximum nitrate values for the 38 consistently sampled wells from 2003 to 2007.

Based on the evaluation of 38 wells consistently sampled over the five-year period, 2.6 to 13.2 percent of wells exceeded the EPA MCL of 10 mg/L for any given year (Table 2). An overall high value of 48 mg/L

Table 2. Statistical summary of nitrate detections in ground water from 38 domestic wells tested from 2003 through 2007.

Statistical Category	2003	2004	2005	2006	2007
Number of Wells	38	38	38	38	38
Mean (mg/L)	4.3	4.6	4.4	5.6	5.5
Median (mg/L)	3.8	3.8	3.8	4.8	4.5
Max. Value (mg/L)	23	24	30	48	44
< LDL* (0.05)	1 (2.6%)	1 (2.6%)	1 (2.6%)	1 (2.6%)	0 (0%)
LDL to < 2 mg/L	12 (31.6%)	10 (26.3%)	12 (31.6%)	11 (28.9%)	10 (26.3%)
2.0 to < 5 mg/L	11 (28.9%)	11 (28.9%)	11 (28.9%)	9 (23.7%)	12 (31.6%)
5 to < 10 mg/L	12 (31.6%)	13 (34.2%)	13 (34.2%)	12 (31.6%)	13 (34.2%)
10 mg/L or greater	2 (5.3%)	3 (7.9%)	1 (2.6%)	5 (13.2%)	3 (7.9%)

* LDL - Laboratory detection limit.

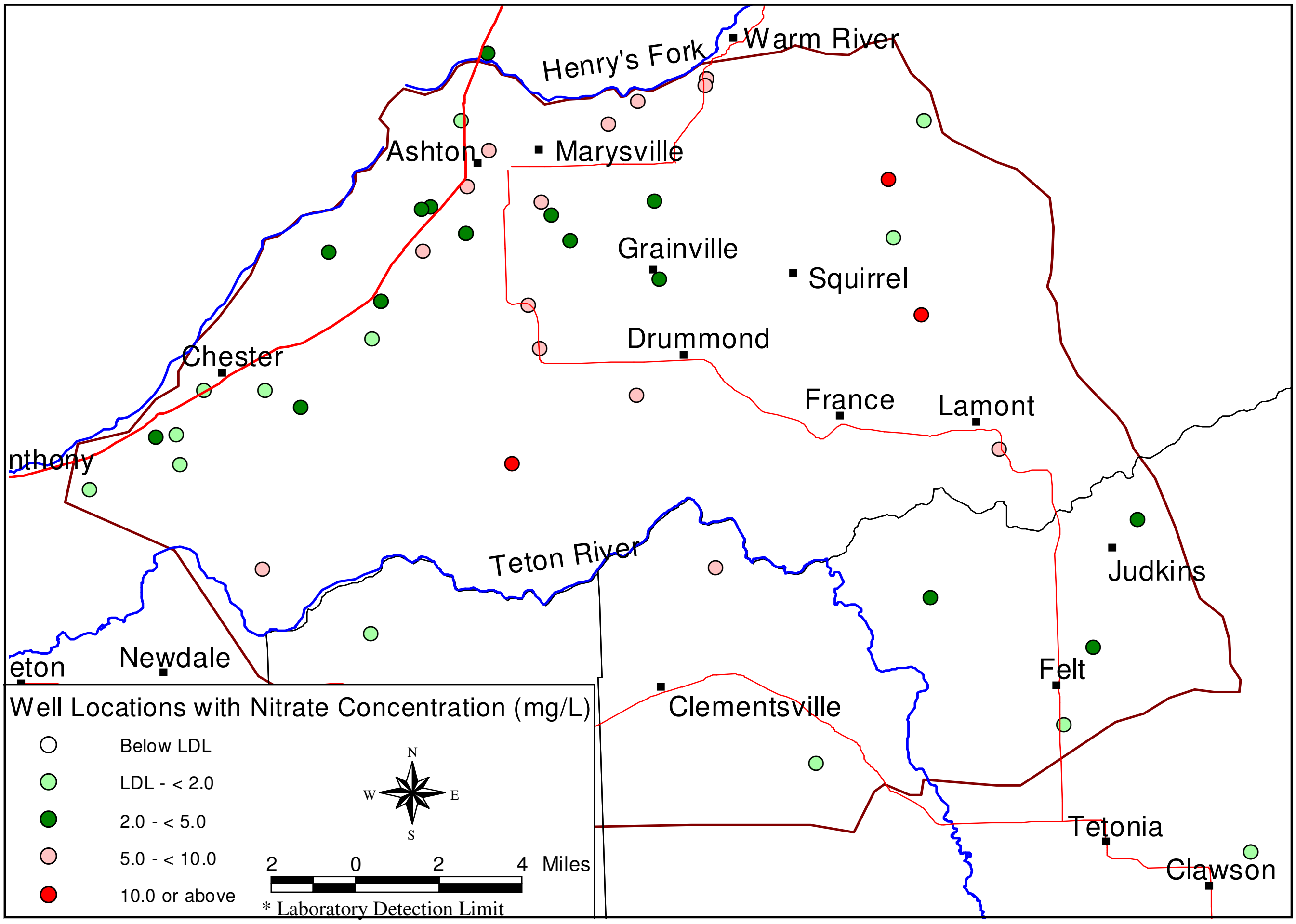

Figure 4. Map of the well locations and ground water nitrate concentrations from the 45 wells sampled in 2007.

occurred in 2006 (Table 2 and Figure 3). The maximum concentrations occurred consistently at a well approximately 3 miles southeast of Squirrel (Figure 4). There was no statistically significant difference in data collected in 2003 when compared to data collected in 2007 at a significance level of 0.05, which suggests that nitrate concentrations in 2007 are relatively unchanged from nitrate concentrations in 2003.

In 2003, 24 wells (approximately 63%) tested below 5 mg/L for nitrate, 12 wells (approximately 32%) had nitrate concentrations between 5 and 10 mg/L, and two wells (approximately 5%) tested greater than 10 mg/L. The maximum concentration in 2003 was 23 mg/L (Table 2).

In 2004, 22 wells (approximately 58%) tested below 5 mg/L, 13 wells (approximately 34%) tested between 5 and 10 mg/L and three wells tested above the MCL of 10 mg/L. The maximum concentration in 2004 was 24 mg/L (Table 2).

In 2005, 24 wells (approximately 63%) tested below 5 mg/L and 13 wells (approximately 34%) tested between 5 and 10 mg/L. The number of wells with concentrations above the MCL of 10 mg/L decreased from 3 wells in 2004 to one well in 2005. The maximum concentration in 2005 was 30 mg/L (Table 2).

In 2006, 21 wells (approximately 55%) tested below 5 mg/L and 12 (approximately 32%) tested between 5 and 10 mg/L. The number of wells with concentrations above the MCL increased from one well in 2005 to 5 wells in 2006. The maximum concentration in 2006 was 48 mg/L (Table 2).

In 2007, 21 wells (approximately 55%) tested below 5 mg/L and 13 wells (approximately 34%) tested between 5 and 10 mg/L. The number of wells with concentrations above the MCL decreased from 5 wells in 2006 to 3 wells in 2007. The maximum concentration in 2007 was 44 mg/L (Table 2). Refer to Figure 4 for a map of 2007 data.

Ground water quality with respect to nitrate appears to be degraded in two general areas. One area is near the towns of Ashton and Marysville and the other area is west and southwest of Drummond (Figure 4). Water quality appears to be good in the western part of the project area, from St. Anthony to Ashton, and in the southeastern area, between Clementsville and Judkins.

Pesticides

In 2003 and 2006, ISDA conducted pesticide sampling in all wells that were part of the project during that year. Additionally, ISDA has conducted one or more follow-up testing events at wells having a positive pesticide detection. The wells were tested for the following pesticide groups: chlorinated acid herbicides using EPA method 515.2, phenyl urea pesticides using EPA Method 632, OP and ON pesticides using EPA Method 507, and chlorinated pesticides using EPA Method 508.

Figure 5 shows the pesticide detections for the Middle Henry's Fork Basin regional project for 2003. A summary of the pesticide detections from 2003 can be found in Table A-2 in Appendix A.

All detections were below any health standards set by the EPA or the state of Idaho. All detections, except the triallate detection north of Squirrel, fall into the Level 1 category established by the Idaho Pesticide Management Plan (PMP), which is a detection that is less than 20% of the reference point or health standard. The triallate detection fell into the Level 2 category, which is a detection that is greater than 20% to less than 50% of the reference point. In response to the Level 2 triallate detection, ISDA began sampling the well yearly for pesticides. In 2004 the triallate detection increased to a Level 3, or 50% to 100% of the reference point. In 2005, the detection increased to a Level 4, or greater than 100% of the reference point. ISDA conducted a follow up sampling project in response to the Level 4 detection to determine the extent of elevated triallate concentrations in the ground water. For a summary of the follow-up sampling, refer to the PMP Response

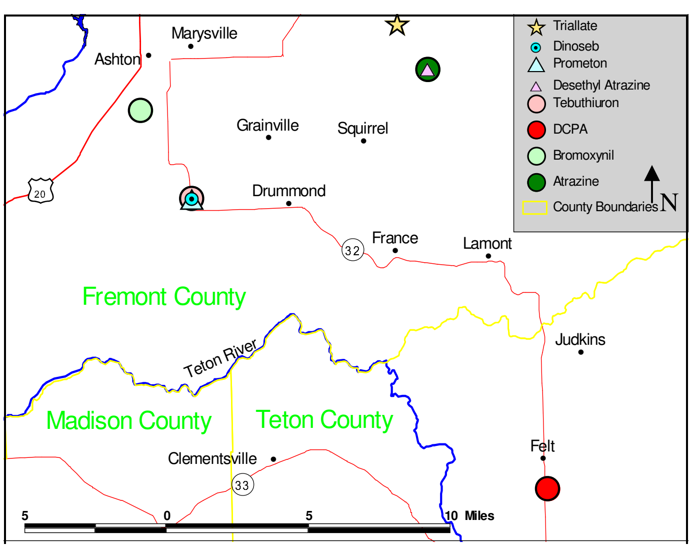

Figure 5. Pesticide detections in 2003.

Monitoring Report at: http://www.agri.idaho.gov/Categories/Environment/Water/WaterPDF/gwreports/pmpmonitoring.pdf.

In 2006, a total of 45 wells were sampled for pesticides; 11 wells had one or more pesticides detected within the ground water (Figure 6). A summary of the pesticide detections from 2006 can be found in Table A-3 in Appendix A.

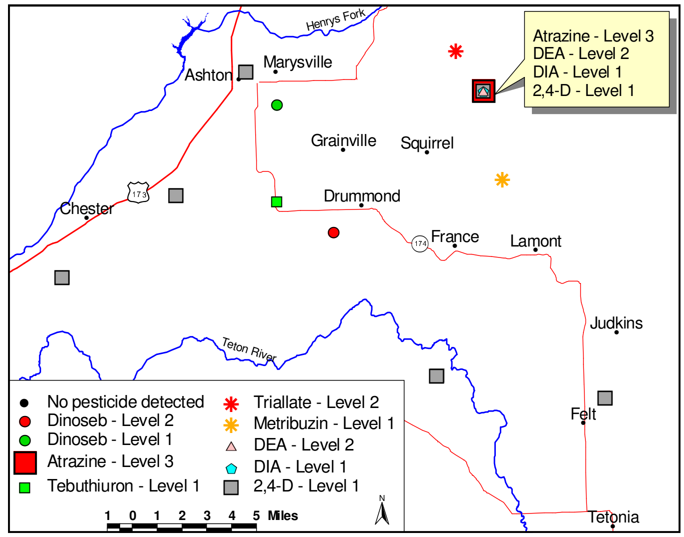

Figure 6. Pesticide detections in 2006.

The most frequently detected pesticide was 2,4-D, which was detected in six wells. Dinoseb was detected in two wells. Desisopropyl atrazine and desethyl atrazine, breakdown products of the pesticide atrazine, were each detected in one well. In addition, atrazine, metribuzin, tebuthiuron, and triallate were each detected in one well.

All detections were below any health standards set by the EPA or the state of Idaho. One well located southwest of Drummond had a Level 2 dinoseb detection. One well located east of Ashton had Level 2 desethyl atrazine and Level 3 atrazine detections. One well located north of Squirrel had a Level 2 triallate detection. Each well that had a Level 2 or greater detection in 2006 was re-sampled in 2007 for pesticides. The wells with the Level 2 dinoseb, Level 2 desethyl atrazine, and Level 3 atrazine detections all dropped to Level 1 detections. The well with the historic triallate detections remained at a Level 2 detection in 2007. ISDA worked with the owner of the well with high triallate detections on implementing pesticide application BMPs to improve wellhead protection and has seen ground water quality improvements as the well water has decreased from a Level 4 detection in 2005 to a Level 2 detection in 2007.

Overall, the majority of wells showed no detections and have good water quality with respect to pesticides. ISDA will continue to work with the homeowner and growers in the area to prevent pesticide impacts.

Nitrogen and Oxygen Isotopes

Overview

The ratio of the common nitrogen isotope $_{14}$N to its less abundant counterpart $_{15}$N (denoted δ^{15}N) can be useful in determining sources of nitrate. Common sources of nitrate in ground water are from applied commercial fertilizers, animal or human waste, precipitation, residues from legume crops, and other organic nitrogen sources within the soil. Each of these nitrogen source categories may have a distinguishable nitrogen isotopic signature. Figure 7 illustrates ranges of δ^{15}N determined through numerous research studies. Typical δ^{15}N ranges for fertilizer and waste are –5 per mil ($^{0}/_{00}$) to +5$^{0}/_{00}$ and greater than 10$^{0}/_{00}$, respectively. Numbers between 5$^{0}/_{00}$ and 10$^{0}/_{00}$ generally are believed to indicate an organic or mixed source. (Kendall and McDonnell, 1998).

The use of nitrogen isotopes as the sole means to determine nitrate source should be done with great care. δ^{15}N values of fertilizer and animal waste in ground water can be complicated by several reaction(e.g., ammonia volatilization, nitrification, denitrification, ion exchange, and plant uptake) that can significantly modify the δ^{15}N values (Kendall and McDonnel, 1998).

Furthermore, mixing of sources along shallow flowpaths makes determination of sources and extent of denitrification very difficult (Kendall and McDonnell, 1998).

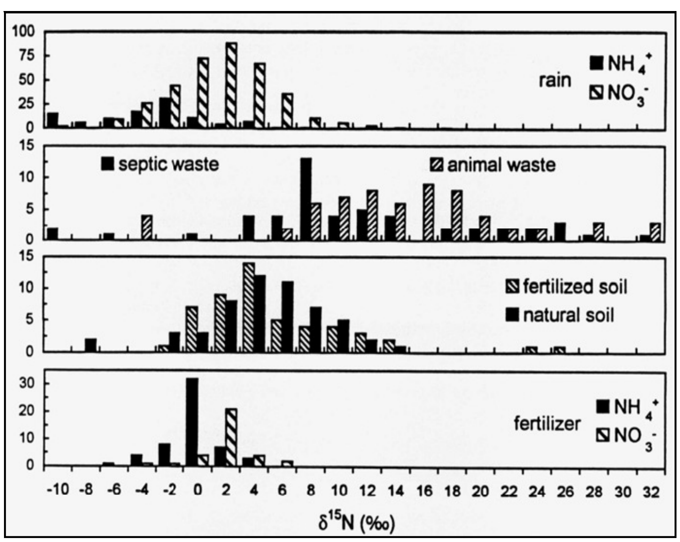

Figure 7. Ranges of δ^{15}N found in the hydrosphere based on a number of nitrogen isotope studies (after Kendall and McDonnell, 1998).

Findings

ISDA Water Program staff conducted δ^{15}N testing in order to use it as a possible indicator of source(s) of nitrate in the ground water. Only a portion of the wells in the area were selected for testing and included all wells exceeding 10 mg/L for nitrate and a number of spatially distributed wells with nitrate detections above 5 mg/L (Table 3).

Table 3. Isotope results from 2004 and 2005.

Well ID	$\delta^{15}N_{AIR}$ (°/oo)	
	2004	2005
8050201	9.71	6.06
8050301	8.68	7.63
8050401	10.20	- - - -
8050801	8.10	- - - -
8050901	- - - -	6.62
8051201	8.95	6.94
8051301	11.94	10.19
8051401	7.62	8.13
8051901	7.85	- - - -
8052401	7.56	8.00
8052801	6.56	7.36
8053201	- - - -	6.98
8053501	7.51	6.93
8053901	9.02	- - - -
8054601	9.96	10.48
8054801	8.95	9.21
8054901	9.96	9.32
8055001	7.89	- - - -
8055201	9.56	7.69

- - - - Sample was not taken.

Seventeen sites were initially selected in the study area to conduct isotope testing in 2004 (Table 3). In 2005, two additional wells were test for δ^{15}N, while five from the 2004 sampling event were not re-tested.

In 2004, two wells (8050401 and 8051301) tested above 10$^{0}/_{00}$ for δ^{15}N, which is consistent with the δ^{15}N signature of a waste source, either animal or human. The remaining 12 wells (86%) had δ^{15}N signatures consistent with an organic or mixed source (Table 3).

In 2005, well 8050401 was not tested, well 8051301 remained above 10$^{0}/_{00}$ for δ^{15}N and an additional well (well 8054601) tested over 10$^{0}/_{00}$ for δ^{15}N (Figure 8). The remaining 12 wells (86%) tested in 2005 had δ^{15}N values between 6 and 10$^{0}/_{00}$, which are consistent with an organic or mixed source (Table 3).

Analysis of denitrification as a significant source of

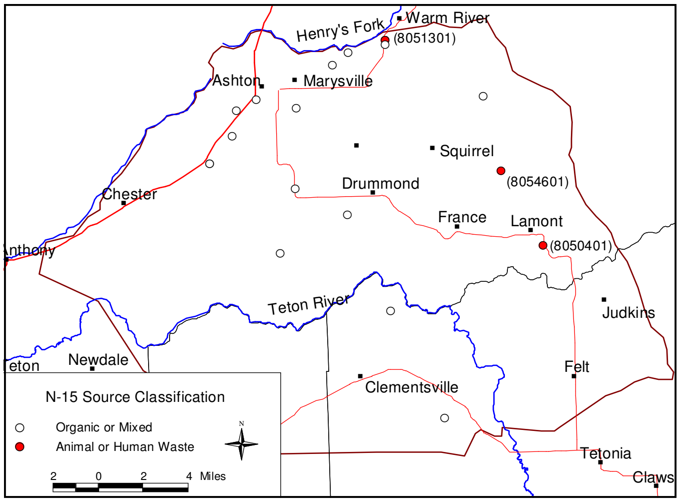

Figure 8. Results of $\delta^{15}N$ analysis in 2004 and 2005. All wells tested in 2004 indicated the same potential source in 2005 with the exception of well 8054601, which indicated a potential organic or mixed source in 2004 and a potential waste source in 2005 (the 2005 result for well 8054601 is shown on the map).

isotope enrichment was not completed as oxygen isotope ($\delta^{18}O_{NO3}$) testing was not conducted for this project. The process of denitrification is thought to enrich $\delta^{15}N$ and $\delta^{18}O_{NO3}$ by 2:1 (Kendall et. Al, 1995).

Conclusions

Ground water monitoring results within the project area indicate that there are some impacts occurring from nitrate. Mean and median ground water nitrate concentrations remained relatively constant over the five year sampling period analyzed in this report. For each sampling year, approximately 5% or less of the 38 wells sampled had nitrate concentrations exceeding the EPA MCL of 10 mg/L. The areas that had the highest nitrate concentrations were between Ashton and Marysville and southwest of Drummond. Water quality appears to be good in the western part of the project area, from St. Anthony to Ashton, and in the southeastern area, between Clementsville and Judkins. The majority of wells sampled were less than 300 feet bls.

Potential sources of the ground water nitrate contamination in the area include the application of nitrogen based fertilizers, crop residue, land application of manure, livestock manure, and septic tanks.

Pesticide detections were generally low in concentration; however, there is concern about multiple pesticide detections per well. Three wells have had elevated levels of either triallate, atrazine, desethyl atrazine, or dinoseb and are being monitored on a yearly basis. Overall, the majority of wells showed no detections and have good water quality with respect to pesticides.

Recommendations

ISDA recommends continued monitoring and evaluation in the project area. ISDA also recommends the continuation of ground water quality education and the implementation of agricultural BMPs through continued coordination with the Yellowstone Soil Conservation District and the Idaho Soil Conservation Commission.

ISDA recommends a variety of actions to be taken by area landowners, producers, agencies and local governments to mitigate and prevent further contamnation of the aquifer in the project area. Also, citizens living in the area and agencies should take measures associated with wells, well drilling, and drinking water management to prevent adverse health affects.

Agricultural, Agrichemical, and Animal Waste Management

ISDA recommends that measures to reduce nitrate and pesticide impacts on ground water be addressed and implemented. The ISDA recommends that:

- Producers and agrichemical professionals conduct nutrient, pesticide, and irrigation water management evaluations.
- Producers follow the Natural Resources Conservation Service Nutrient Management Standard (590) when using commercial fertilizers and/or animal waste.
- Producers and Confined Animal Feeding Operations (CAFOs) manage animal waste in a manner limiting impact to ground water. Ground water protection measures are necessary when storing, handling, hauling, and applying animal waste. For technical assistance, contact ISDA engineers and certified nutrient management planners.
- Pesticide applicators utilize the ISDA Container Recycling Operation Program and the Pesticide Disposal Program. Information regarding these free programs can be found on ISDA's website: http://www.agri.idaho.gov.
- Producers, noncrop applicators, and agrichemical dealers follow the NRCS 595 Pesticide Standard for pesticide storage, containment, mixing, loading, rinsing, disposal, and application practices in the project area.
- Pesticide products that are least likely to leach be chosen for the soil types in this project area.
- Producers consider utilizing Integrated Pest Management techniques in this area.
- Applicators and homeowners assess lawn and

garden practices, especially near wellheads.
- Applicators and homeowners apply pesticides according to the pesticide labels.
- Local residents assess animal and animal waste management situations near wellheads.
- Applicators assess current pesticide application practices to non-crop areas (examples: roadsides, canal banks, driveways, etc.).

Monitoring

To determine if current agricultural and pesticide application practices are contributing to ground water degradation and to locate other potential contaminant sources, the ISDA recommends continued and more intensive monitoring in the project area. Monitoring efforts could include, but not be limited to:
- The continuation of ground water monitoring from domestic wells to track changes over time related to nutrients, common ions, and pesticides.
- Conduct follow-up monitoring near areas of elevated nitrate concentrations.
- Conduct BMP effectiveness monitoring.
- Additional N^{15} isotope or other source tracking or determination sampling and evaluation.

Private Well and Septic Tank Management

Domestic drinking water wells within the project area should be protected to provide the best possible drinking water. The ISDA suggests the following options:
- Residents sample their own wells for nitrate and bacteria on a regular basis, such as once per year.
- Activities near wellheads be done in a manner not to impact well water quality.
- Homeowners consider using the Home*A*Syst program to conduct self assessments related to wellhead protection.
- Construction of new wells or deepening of existing wells in the area be completed with the planning and design considerations to provide potable water.
- Homeowners manage private septic systems properly.

Ground Water Protection and BMP Response Effort

The ISDA recommends that the Yellowstone Soil Conservation Districts continue their efforts of working with local land owners, agrichemical professionals, CAFO operators, county and city officials, and other agencies to implement BMPs and seek funding to support the implementation of these and other recommendations. The ISDA will support these local partnerships in seeking funding and implementing a comprehensive program.

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Appendix A

Table A-1. Statistical summary of nitrate concentrations in ground water from all wells sampled each year from 2003 to 2007.

Statistical Category	2003	2004	2005	2006	2007
Number of Wells	47	44	49	45	45
Mean (mg/L)	4.38	4.52	4.73	5.68	5.02
Median (mg/L)	3.6	3.7	3.7	4.9	4.3
Max. Value (mg/L)	23	24	30	48	44
< LDL* (0.05)	1 (2.1%)	2 (4.5%)	1 (2.0%)	1 (2.2%)	0
LDL to < 2.0 mg/L	16 (34%)	12 (27.3%)	15 (30.6%)	13 (28.9%)	13 (28.9%)
2.0 to < 5.0 mg/L	14 (29.8%)	13 (29.5%)	15 (30.6%)	11 (24.4%)	15 (33.3%)
5.0 to < 10.0 mg/L	13 (27.7%)	13 (29.5%)	15 (30.6%)	13 (28.9%)	14 (31.1%)
10.0 mg/L or greater	3 (6.4%)	4 (9.1%)	3 (6.1%)	7 (15.6%)	3 (6.7%)

Table A-2. Summary of pesticide detections in ground water from the 47 wells tested in 2003.

Pesticide Detections	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
Atrazine	1	0.04	- - - -	- - - -	3 (MCL)[1]
Bromoxynil	1	0.46	- - - -	- - - -	140 (RfD)[2]
Dacthal (DCPA)	1	0.16	- - - -	- - - -	70 (HAL)[3]
Desethyl Atrazine	1	0.12	- - - -	- - - -	- - - -[4]
Dinoseb	1	0.37	- - - -	- - - -	7.0 (MCL)
Metribuzin	1	2.4	- - - -	- - - -	70 (HAL)
Prometon	1	0.06	- - - -	- - - -	100 (HAL)
Tebuthiuron	1	0.38	- - - -	- - - -	500 (HAL)
Triallate	1	0.17	- - - -	- - - -	0.45 (DWLOC)[5]

[1]MCL – EPA Maximum Contaminant Level
[2]RfD – EPA Reference Dose
[3] HAL – EPA Lifetime Health Advisory
[4] Breakdown product of atrazine, MCL for atrazine (3 µg/L) is used as health standard.
[5]DWLOC – EPA Drinking Water Level of Comparison

Table A-3. Summary of pesticide detections in ground water from the 45 wells tested in 2006.

Pesticide Detections	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
2,4-D	6	0.23 - 2.2	0.77	0.54	70 (MCL)[1]
Atrazine	1	2.2	- - - -	- - - -	3 (MCL)
Desethyl Atrazine	1	1.4	- - - -	- - - -	- - - -[2]
Desisopropyl Atrazine	1	0.07	- - - -	- - - -	- - - -[2]
Dinoseb	2	0.26 - 2.5	1.38	- - - -	7.0 (MCL)
Metribuzin	1	0.04	- - - -	- - - -	70 (HAL)[3]
Tebuthiuron	1	0.86	- - - -	- - - -	500 (HAL)
Triallate	1	0.09	- - - -	- - - -	0.45 (DWLOC)[4]

[1]MCL – EPA Maximum Contaminant Level
[2] Breakdown product of atrazine, MCL for atrazine (3 µg/L) is used as health standard.
[3] HAL – EPA Lifetime Health Advisory
[4]DWLOC – EPA Drinking Water Level of Comparison