Idaho State Department of Agriculture
Division of Agricultural Resources

Southern Washington and Northern Payette Counties Alluvial Aquifer Ground Water Monitoring Results 1996 to 2002

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Introduction

The Idaho State Department of Agriculture (ISDA) developed the Regional Agricultural Ground Water Quality Monitoring Program to characterize degradation of ground water quality from contaminants leaching from agricultural sources. ISDA currently is conducting monitoring at 12 regions in Idaho, including a project in southern Washington and northern Payette Counties (Figure 1). The objectives of the program are to: (1) characterize ground water quality, primarily related to nitrate-nitrogen (NO_3-N) 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 (BMP) and/or regulatory decision making and evaluation processes.

The ISDA Southern Washington and Northern Payette Counties Alluvial Aquifer regional monitoring project began in 1996 as a result of previous monitoring by the Idaho Department of Water Resources (IDWR) and Idaho Farm Bureau. Three water wells in the area, tested during the first round of IDWR's Statewide Ambient Ground Water Quality Monitoring Program, exceeded the Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL)[1] of 10 milligrams per liter (mg/L) for NO_3-N (Neely and Crockett, 1999). To establish this regional monitoring project, ISDA randomly selected domestic wells in the area and coordinated with homeowners to conduct ground water sampling.

Nutrients and common ions were evaluated during the seven years (1996 through 2002) of ISDA's testing. Laboratory results indicated numerous domestic wells in the southern Washington and northern Payette counties area had NO_3-N concentrations that exceeded 10 mg/L during the seven year period. In addition, low level detections of various pesticides were found in sampled wells throughout the 1996 to 2002 testing period.

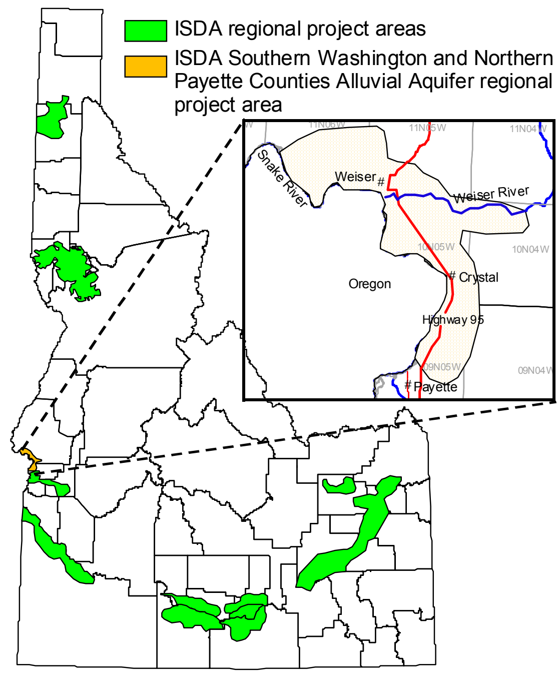

Figure 1. Location of Southern Washington and Northern Payette Counties Alluvial Aquifer regional project and other ISDA regional project areas.

ISDA is currently working to advise residents and officials of the area to minimize further ground water contamination and possible health risks. Ground water monitoring will continue at least through the year 2002 to assist with these efforts.

Methods

To establish this project, ISDA statistically assessed IDWR Statewide Program nitrate, chloride, and atrazine monitoring data. ISDA statistically determined that sampling 50 randomly selected domestic wells would provide adequate data to evaluate overall ground water quality underlying the area. All sampling was conducted

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

after a quality assurance project plan (QAPP) was established. Permission was gained from the land owners prior to sampling.

Nutrients and other common ions were evaluated every year since 1996. 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. Duplicates, splits, and matrix spikes/matrix spike duplicates were collected and submitted as a part of the QAPP.

Pesticide samples collected in 1996 and 1997 were sent to the Washington Department of Ecology (WDOE) Laboratory in Manchester, Washington. Testing for pesticides was accomplished utilizing EPA Methods 1618 and 8085. In 1999 and 2002 samples were sent to UIASL for pesticide analysis. UIASL used 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 Southern Washington and Northern Payette Counties Alluvial Aquifer regional project encompasses an approximately 6 mile wide and 15 mile long area of irrigated agricultural land adjacent to the Snake River (Figures 1 and 4). Diversions from the Snake, Payette, and Weiser Rivers provide the main source of irrigation water in the area. Local irrigation systems vary from the typical and historic practice of flood irrigation to more modern techniques of sprinkler irrigation. Major crops in the area include grain, onions and sugarbeets (University of Idaho Cooperative Extension System, 2002). Additional crops include corn, potatoes, beans, peas, safflower, and alfalfa (Idaho Agricultural Statistics Service, 2002; University of Idaho Cooperative Extension System, 2002).

Shallow ground water conditions exist across much of this area. Typically, depths to ground water are less than 20 feet. A potential source of recharge to this shallow system comes from applied irrigation waters. Shallow subsurface alluvial deposits (primarily gravels) conducive to leaching of contaminants underlie substantial portions of the southern Washington and northern Payette counties area. Potential sources for NO_3-N leaching to ground water in the area include applied nitrogen-based fertilizers, septic systems, cattle manure, legume crops, and wastewater lagoons.

Hydrogeology

Using data from Rasmussen (1976) and the Natural Resources Conservation Service, the top soil is classified into five basic types in the project area: (1) the soil in the northern portion of the project area is a well developed clayey subsoil, (2) the soil directly to the southwest is well drained and deep, (3) on the upper terraces the soil is well drained in most areas, with some discontinuous duripans, (4) the soil near the Snake River is poorly to well drained silt loams and silty clay loams, and (5) the southern most part of the project area has soils that are somewhat poorly to well drained.

The project area lies within the western Snake River Plain, which is a basin filled with sedimentary and volcanic rocks. The sedimentary rocks make up the major portion of the shallow aquifer in the project area (Figures 2a and 2b). The shallow aquifer is composed of

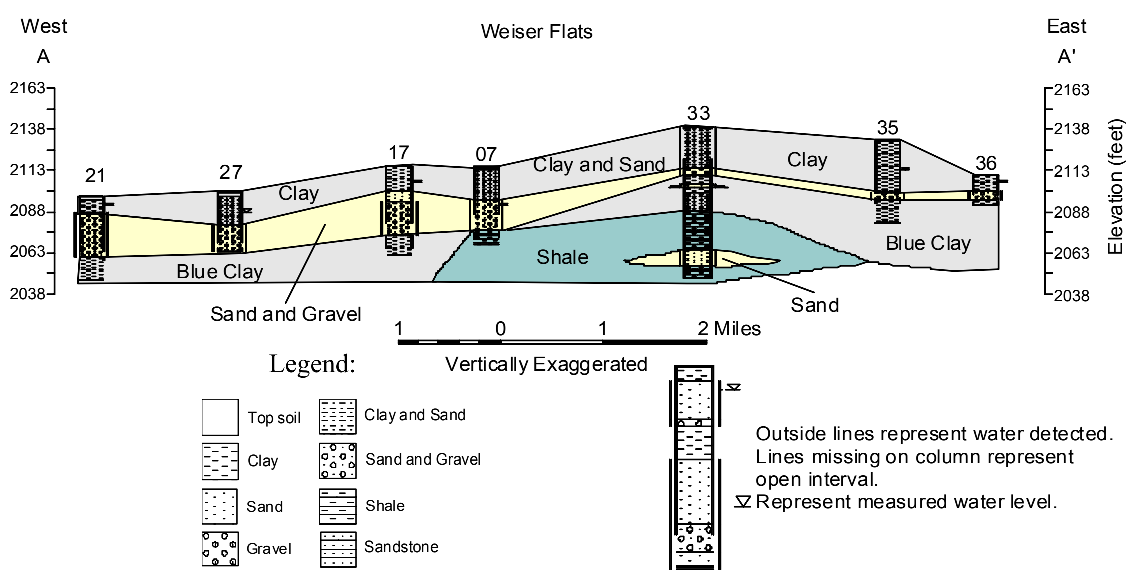

Figure 2a. Cross section of Weiser Flats. See Figure 4 for cross section location.

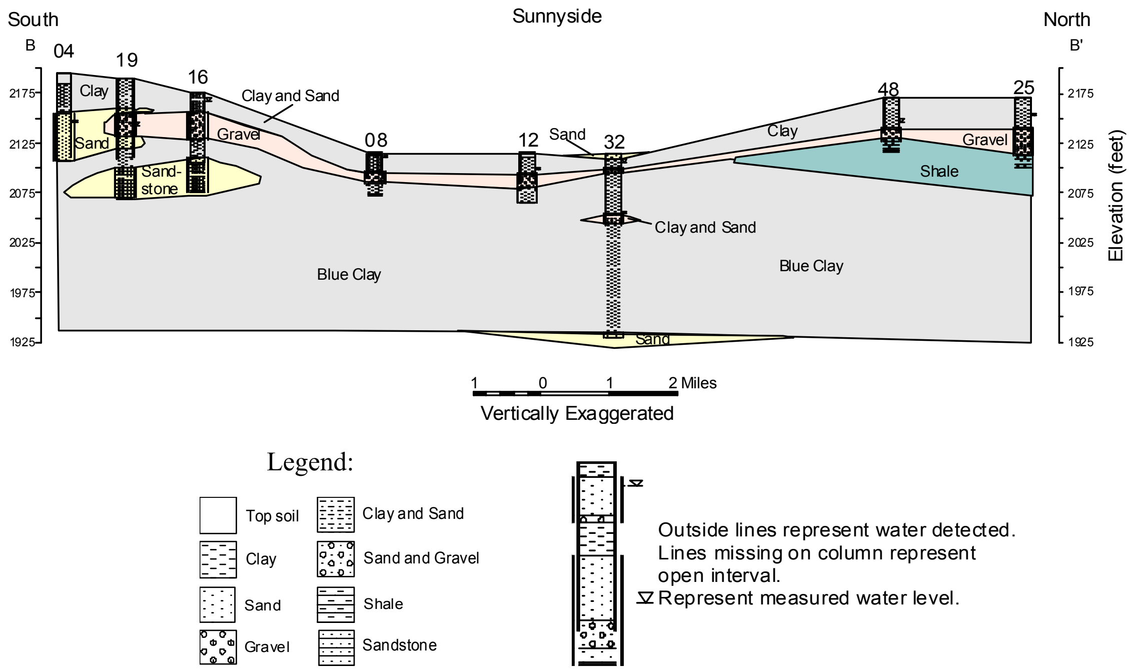

Figure 2b. Cross section of Sunnyside. See Figure 4 for cross section location.

unconsolidated to poorly consolidated clay, silt, sand, volcanic ash, diatomite, freshwater limestone and conglomerates (Newton, 1991). The majority of these sediments were deposited in a fluvial environment (Newton, 1991).

A thick layer of clay underlies the shallow aquifer in the project area. The clay has a blue color, as seen in the cross section constructed using well logs from the project area (Figures 2a and 2b). The clay separates the shallow alluvial aquifer from the deeper sedimentary aquifer (Newton, 1991).

Horizontal ground water flow directions in the project area were determined by contouring static water level measurements using Surfer™ computer software (Figure 3). Static water level measurements were obtained from well drillers' reports for wells in the project area. The accuracy of contouring may be variable due to the time variations in which the measurements were taken. However, the potentiometric surface does correspond with known ground water movement characteristics and theory.

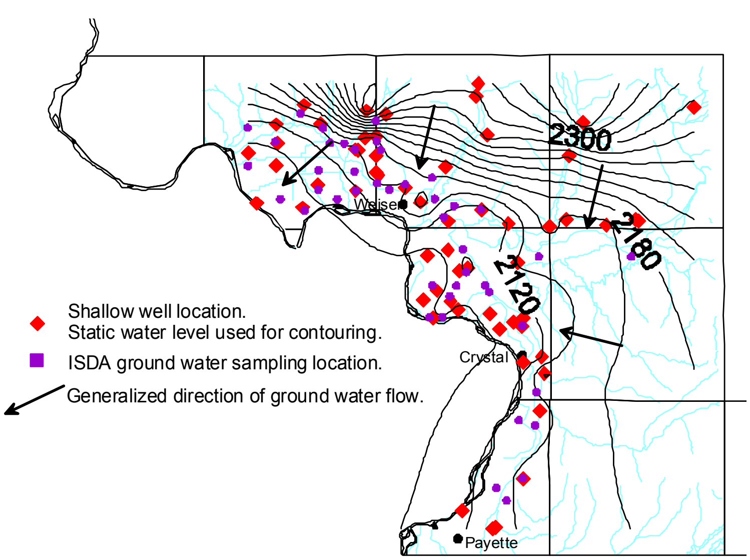

Figure 3. Potentiometric surface map of the project area.

General ground water movement appears to be toward the Snake River, an area of probable ground water discharge. In addition, ground water flow direction appears to correspond to topographic slope, another characteristic common to shallow ground water. In general, the map indicates the general direction of ground water movement is to the southwest near Weiser, and to the west near Crystal (Figure 3).

Results

Sampling results for the first seven years of testing indicate NO_3-N and pesticide impacts have occurred to the shallow alluvial aquifer. Results are summarized and presented in the following sections.

Nitrate

Results of ground water sampling in the project area indicate an increase in the number of wells testing above the MCL for NO_3-N (Figure 4 and Table 1). Table 1 presents the results of NO_3-N analysis of 41 wells that

Table 1. Nitrate-nitrogen results for Southern Washington and Northern Payette Counties regional project, 1996 through 2002.[1]

Concentration Range (mg/L)	Spring 1996 41 Wells	Summer 1996 41 Wells	Spring 1997 41 Wells	Spring 1999 41 Wells	Spring 2000 41 Wells	Spring 2001 41 Wells	Spring 2002 41 Wells
<LDL* (0.033)	8 (20%)	8 (20%)	9 (22%)	7 (17%)	8 (19.5%)	9 (22%)	10 (24%)
LDL to <2.0	5 (12%)	4 (10%)	5 (12.1%)	6 (15%)	3 (7%)	3 (7%)	2 (5%)
2.0 to <5.0	4 (10%)	5 (12%)	3 (7.3%)	5 (12%)	6 (15%)	4 (10%)	4 (10%)
5.0 to <10	12 (29%)	10 (24%)	12 (29.3%)	7 (17%)	8 (19.5%)	7 (17%)	7 (17%)
>10	12 (29%)	14 (34%)	12 (29.3%)	16 (39%)	16 (39%)	18 (44%)	18 (44%)
Median Value	6.5 mg/L	7.4 mg/L	6.1 mg/L	7.9 mg/L	6.7 mg/L	8.0 mg/L	8.1 mg/L
Mean Value	6.7 mg/L	7.2 mg/L	6.9 mg/L	7.8 mg/L	7.6 mg/L	8.1 mg/L	7.8 mg/L
Maximum Value	23 mg/L	19 mg/L	22 mg/L	25 mg/L	27 mg/L	30 mg/L	28 mg/L

*LDL - Laboratory Detection Limit

[1]Table 1 statistics are for the same 41 wells sampled each year. ISDA sampled more than 41 wells per sampling year, however only wells that were consistently sampled were used for the statistics.

have been sampled consistently for six years. Approximately 50 wells have been sampled per year; however, only the 41 wells that have been consistently sampled every year are used for statistical analysis in Table 1. In 1998, only 26 wells were sampled. These wells had NO_3-N concentrations greater than 5 mg/L during the 1997 sampling event. The data from 1998 is valuable in assessing the areas with elevated NO_3-N concentrations. However, the data is not used in Table 1 because the number of wells sampled is not consistent with the other monitoring years.

In 2001 and 2002, 18 of the 41 wells had NO_3-N concentrations over the MCL of 10 mg/L; this is a 15% increase from the spring of 1996 and the highest amount of detections over the MCL for all monitoring years (Table 1). A maximum NO_3-N concentration of 28 mg/L was measured from one well location in 2002. The median NO_3-N concentration for 2002 was 8.1 mg/L, the highest out of all six sampling years.

For all years tested, there were numerous detections of NO_3-N over 10 mg/L (Table 1). Nitrate-nitrogen concentrations are most elevated in the area northwest of Weiser and between Weiser and Crystal within Washington County (Figure 4). The number of detections over 10 mg/L are of concern because of potential health risks (Table 1). Seven wells sampled in the northwestern most corner of Payette County and six wells sampled in the Weiser Cover area tested below 5 mg/L for NO_3-N.

There is a difference in NO_3-N concentrations that draw water from the shallow alluvial aquifer above the blue clay layer (Figures 2a and 2b) and NO_3-N concentrations from deeper wells that draw water from the sedimentary aquifer below the blue clay layer. The median value of the 22 wells that are drilled into the shallow alluvial aquifer was 9.75 mg/L for the 2002 sampling event. The median value of the seven wells that are drilled into the deeper sedimentary aquifer was less than the detection limit (0.033 mg/L) for the 2002 sampling event. Three wells draw water from both the shallow and deeper aquifer, and had NO_3-N values that ranged from less than the detection limit to 6 mg/L, with a median value of 2.8 mg/L. It is unknown what aquifer the rest of the wells are drawing from because of missing screen interval information from the well logs.

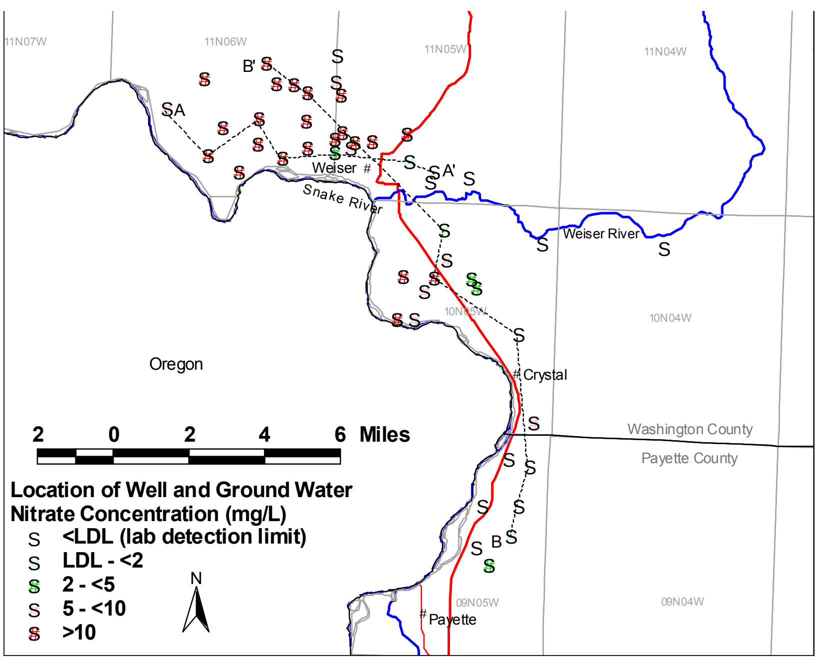

Figure 4. Location of wells sampled by ISDA in Washington and Payette Counties, Spring 2002. Colors represent nitrate-nitrogen concentrations measured in ground water from each well.

Pesticides

Samples were collected twice in 1996 and once in 1997 and sent to the WDOE Laboratory in Manchester, Washington. Testing for pesticides was accomplished utilizing EPA Methods 1618 and 8085 with very low detection limits. In 1999 and 2002, samples from all wells were sent to the UIASL in Moscow, Idaho. Samples were tested for various pesticides utilizing EPA Methods 507, 508, 515.1, and 531.1.

Table 2. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring and Summer 1996.[1]

Pesticide Detects	Spring 1996 Number Detects (50 wells)	Spring 1996 Range (µg/L)	Summer 1996 Number Detects (50 wells)	Summer 1996 Range (µg/L)	Health Standard (µg/L)
Atrazine	22	0.007 - 0.57	24	0.003 - 0.48	3 (MCL)*
Atrazine Desethyl	26	0.004 - 0.57	25	0.006 - 0.44	35 (RfD)**
Bromacil	3	0.086 - 1.7	1	0.12	100 (RfD)
Dacthal	1	0.02	0	0	100 (RfD)
Hexazinone	0	0	1	0.005	200 (MCL)
Metolachlor	1	0.03	0	0	100 (HAL)***
Metribuzin	1	0.009	0	0	13 (RfD)
Prometon	1	0.042	5	0.004 - 0.14	15 (RfD)
Propazine	0	0	1	0.007	20 (RfD)
Simazine	5	0.003 - 0.043	3	0.004 - 0.007	4 (MCL)
2,4-D	0	0	2	0.01 - 0.026	70 (MCL)

*MCL - EPA Maximum Contaminant Level

**RfD - EPA Reference Does for lifetime consumption by a 10 kg child

***HAL - EPA Health Advisory Level

[1]Statistics were amended from February 2000 ISDA Technical Results Summary #1

Table 3. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring 1997.[1]

Pesticide Detects	Number Detects (49 wells)	Range (µg/L)	Health Standard (µg/L)
Alachlor	1	0.014	2 (MCL)*
Atrazine	28	0.001 - 0.34	3 (MCL)
Atrazine Desethyl	26	0.003 - 0.41	35 (RfD)**
Bromacil	7	0.004 - 1.1	100 (RfD)
Diuron	3	0.034 - 0.063	9 (RfD)
Hexazinone	3	0.002 - 0.005	200 (MCL)
Methidathion	1	0.043	1 RfD
Metolachlor	1	0.12	100 (HAL)***
Metribuzin	1	0.005	13 (RfD)
Prometon	4	0.003 - 0.068	15 (RfD)
Propazine	2	0.001 - 0.009	20 (RfD)
Simazine	7	0.002 - 0.009	4 (MCL)
2,4-D	4	0.002 - 0.011	70 (MCL)
2,4-Dichlorobenzoic Acid	18	0.0007 - 0.0088	0.1 (RfD)
3,5,6-Trichloro-2-Pyridinol	13	0.0017 - 0.075	3 (RfD)
4-Nitrophenol	1	0.011	6****

*MCL - EPA Maximum Contaminant Level

**RfD - EPA Reference Dose for lifetime consumption by a 10 kg Child

***HAL - EPA Health Advisory Level

****Health standard based on the 1993 Federal Drinking Water Guideline of 60 µg/L (40CFR129) and includes a safety factor of 10 for chronic exposure to children

[1]Statistics were amended from February 2000 ISDA Technical Results Summary #1

Pesticides were detected frequently throughout the project area. However, detections were typically low in concentration. Testing of ground water samples collected during the spring of 1996 detected the presence of atrazine desethyl, atrazine, simazine, bromacil, dacthal, metolachlor, metribuzin, and prometon, in order of most to least frequently detected (Table 2). There were a total of 60 positive pesticide detections in 26 wells. All pesticide detections were below any health standard as set by the EPA or the state of Idaho.

Testing of ground water samples collected during the summer of 1996 detected the presence of atrazine desethyl, atrazine, prometon, simazine, 2,4-D, bromacil, hexazinone and propazine, in order of most to least frequently detected (Table 2). There were a total of 62 positive pesticide detections in 28 wells. The detections were very similar to those of the spring of 1996. All pesticide detections were below any health standard as set by the EPA or the state of Idaho.

In 1997, there were 120 positive pesticide detections in 38 wells. The pesticides detected were atrazine, atrazine desethyl, 2,4-dichlorobenzoic acid, 3,5,6-trichloro-2-pyridonl, bromacil, simazine, prometon, 2,4-D, diuron, hexazinone, propazine, alachlor, methidathion, metolachlor, metribuzin, and 4-nitrophenol in order of most to least frequently detected (Table 3). All pesticide detections were below any health standards as set by the EPA or the state of Idaho.

In 1999, there were 22 positive pesticide detections in 15 wells. The pesticides detected were atrazine, dacthal, and simazine in order of most to least frequently detected

Table 4. Pesticide results for Southern Washington and Northern Payette Counties region project, Spring 1999.[1]

Pesticide Detects	Number Detects (44 wells)	Range (µg/L)	Health Standard (µg/L)
Atrazine	12	0.032 - 1.3	3 (MCL)*
Dacthal	9	0.5 - 20	100 (RfD)**
Simazine	1	0.023	4 (MCL)

*MCL - EPA Maximum Contaminant Level

**RfD - EPA Reference Dose for lifetime consumption by a 10 kg Child

[1]Statistics were amended from February 2000 ISDA Technical Results Summary #1

Table 5. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring 2002.

Pesticide Detects	Number Detects (52 wells)	Range (µg/L)	Health Standard (µg/L)
Atrazine	13	0.027 - 0.1	3 (MCL)*
Atrazine Desethyl	21	0.026 - 0.42	35 (RfD)**
Bromacil	3	0.1 - 2.4	100 (RfD)
Dacthal	9	0.16 - 12	100 (RfD)
Diclofop methyl	2	0.61 - 2.5	1.5 (RfD)
Hexazinone	1	0.15	200 (MCL)
Metolachlor	1	0.26	100 (HAL)***
Metribuzin	1	0.032	13 (RfD)
Prometon	1	0.051	15 (RfD)
Simazine	3	0.02 - 0.35	4 (MCL)

*MCL - EPA Maximum Contaminant Level

**RfD - EPA Reference Dose for lifetime consumption by a 10 kg Child

***HAL - EPA Health Advisory Level

(Table 4). Fewer detections occurred in 1999 versus 1996 and 1997 due to the higher environmental detection limits utilized by the UIASL and the UIASL use of slightly different methods, or potentially less occurrence in ground water. All pesticide detections were below any health standards as set by the EPA or the state of Idaho.

In 2002, there were 55 positive detections in 27 wells. The pesticides detected were atrazine desethyl, atrazine, dacthal, bromacil, simazine, diclofop methyl, hexazinone, metolachlor, metribuzin, and prometon in order of most to least frequently detected (Table 5). All pesticide detections were below any health standards as set by the EPA or the state of Idaho, except for one detection of diclofop methyl. One well had ground water concentrations of 2.5 micrograms per liter (µg/L) of diclofop methyl, which exceeds the EPA Reference Dose (RfD) by 1 µg/L (Table 5). This is the first year that diclofop methyl was detected. This pesticide is registered in Idaho for use on barley and wheat.

Nitrogen Isotopes

Overview

The ratio of the common nitrogen isotope ^{14}N to its less abundant counterpart ^{15}N relative to a known standard (denoted $\delta^{15}N$) can be useful in determining sources of NO_3-N. Common sources of NO_3-N in ground water are applied commercial fertilizers, animal or human waste, precipitation, and organic nitrogen within the soil. Each of these NO_3-N source categories have a potentially distinguishable nitrogen isotopic signature. Figure 5 shows ranges of $\delta^{15}N$ determined through numerous research studies. The graph displays the number of samples tested (y-axis) as compared to the $\delta^{15}N$ results (x-axis) for various NO_3-N sources. Typical $\delta^{15}N$ ranges for fertilizer is $-5^0/_{00}$ to $+5^0/_{00}$, while typical waste sources have ranges greater than $10^0/_{00}$, as seen on Figure 5. Nitrogen isotope values between $5^0/_{00}$ and $10^0/_{00}$ are generally believed to indicate an organic or mixed source.

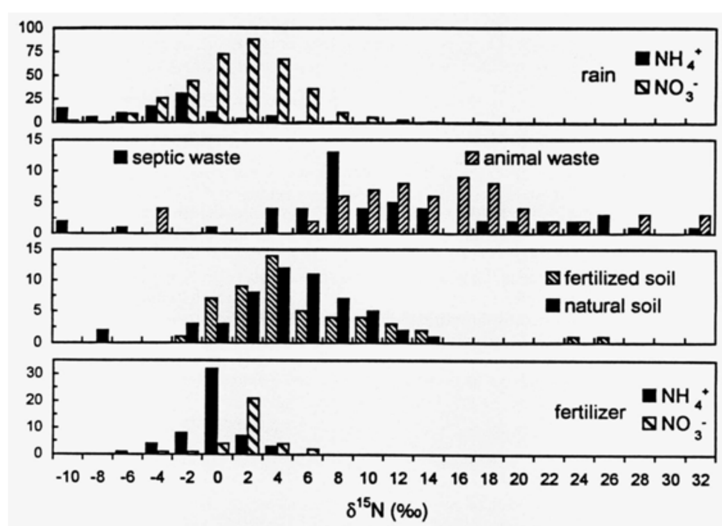

Figure 5. Ranges of $\delta^{15}N$ found in the hydrosphere based on a number of nitrogen isotope studies (after Kendall and McDonnell, 1998.)

Use of nitrogen isotopes as the sole means to determine NO_3-N sources should be done with great care. Nitrogen isotope values in ground water can be complicated by several reactions (e.g., ammonia volatilization, nitrification, denitrification, plant uptake, etc.) that can modify the $\delta^{15}N$ values (Kendall and McDonnell, 1998). Furthermore, mixing of sources along shallow flowpaths makes determination of sources and extent of denitrification very difficult (Kendall and McDonnell, 1998).

Findings

In May of 2000, ISDA chose to conduct $\delta^{15}N$ testing in order to use it as a possible indicator of source(s) of NO_3-N in the ground water. Because of the cost of testing and limited resources, ten wells in the project area were selected for testing. Wells chosen for nitrogen isotope testing had previous NO_3-N concentrations above 10 mg/L. The samples were sent to the University of Illinois, Department of Natural Resources and Earth Sciences (NRES) for $\delta^{15}N$ analysis.

Results of $\delta^{15}N$ testing in May 2000 returned values that ranged from $6.77^0/_{00}$ to $23.62^0/_{00}$ (Table 6). Nine of the wells tested returned $\delta^{15}N$ values that suggested a waste source and one well returned a value that suggested an organic or mixed source.

In November of 2000, ISDA collected water samples from 18 wells spatially distributed over the project area for $\delta^{15}N$ testing. The samples were sent to North Carolina State University for analysis.

Table 6. 2000 $\delta^{15}N$ results for selected wells.

Well ID	$\delta^{15}N$ ($^0/_{00}$) May 2000 (University of Illinois)	$\delta^{15}N$ ($^0/_{00}$) November 2000 (North Carolina State University)
7100201	19.82	3.195
7100501		4.003
7100601		4.663
7100801		5.68
7101101		16.098
7101201	11.22	
7101701		5.133
7102301	11.28	6.317
7102501		7.716
7102701		5.431
7103101		4.848
7103401	20.21	
7103701	23.62	5.239
7103801		5.127
7104001	15.89	3.903
7104101	12.41	7.261
7104201	6.77	
7104701		3.716
7104801	18.42	3.553
7105001		5.83
7105101	17.84	5.374

Results of the $\delta^{15}N$ testing in November 2000 returned values that ranged from $3.195^0/_{00}$ to $16.098^0/_{00}$ (Table 6). Seven of the wells returned $\delta^{15}N$ values that suggested a fertilizer source of NO_3-N, while ten wells had values that indicated an organic or mixed source. One well had a $\delta^{15}N$ value that suggested a waste source. Figure 6 shows the locations and the isotope concentrations of the wells tested in November of 2000. There is a grouping of five wells in which $\delta^{15}N$ values suggest a fertilizer source located northwest of Weiser, corresponding to a location of elevated NO_3-N concentrations within the ground water (Figure 6).

In 2002, ISDA again collected samples for $\delta^{15}N$ analysis. In addition oxygen 18 isotope testing on the nitrate molecule is scheduled to be completed. Results of laboratory testing currently are pending.

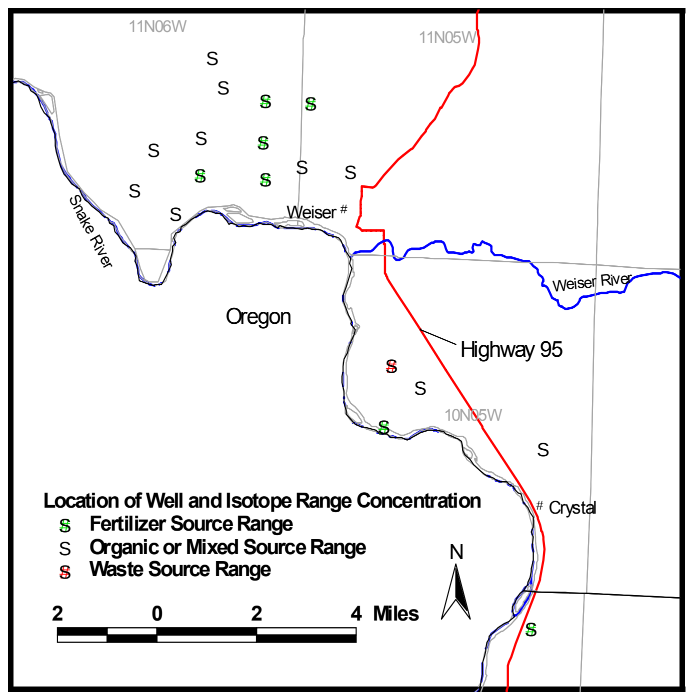

Figure 6. Location of wells sampled by ISDA in Washington and Payette Counties, November 2000. Colors represent possible sources of NO_3-N in ground water from each well based on $\delta^{15}N$ isotope testing.

MBAS, FWA, Boron, and Caffeine

In November of 2000, eighteen wells were tested for methylene blue active substances (MBAS), fluorescent whitening agents (FWA), boron, and caffeine. These four substances are found in waste water and can be used as indicators of waste water influence within a ground water system. Table 7 shows the data from the eighteen wells that were analyzed for the four substances. There were no detectable residues of caffeine in any of the samples. The results for MBAS were very low with respect to the background levels. There is no indication of waste water influence from the MBAS concentrations. The concentrations of boron and FWA within the ground water samples indicate potential waste water influence on the ground water. However, linear regression analysis suggests there is no correlation between NO_3-N ground water concentrations and MBAS, caffeine, boron, or FWA ground water concentrations.

Table 7. MBAS, FWA, boron, and caffeine results for southern Washington and northern Payette Counties regional project, November 2000.

ISDA Well ID	MBAS[1] (µg/L)	Caffeine (µg/L)	Boron (mg/L)	FWA[2] (µg/L)
7100201	BDL[3]	ND[4]	0.16	0.72
7100501	BDL	ND	0.073	0.14
7100601	BDL	ND	0.097	0.37
7100801	7	ND	0.093	0.54
7101101	7.9	ND	0.37	1.2
7101701	7.6	ND	0.073	0.14
7102301	6.1	ND	0.093	0.49
7102501	8.7	ND	0.24	0.46
7102701	6.1	ND	0.1	0.48
7103101	ND	ND	0.065	0.9
7103701	7.5	ND	0.16	0.9
7103801	BDL	ND	0.07	0.18
7104001	6	ND	0.096	0.16
7104101	BDL	ND	0.2	0.52
7104701	ND	ND	0.13	0.17
7104801	BDL	ND	0.14	0.26
7105001	6.3	ND	0.085	0.2
7105101	BDL	ND	0.096	0.26

[1]Methylene blue active substances
[2]Fluorescent whitening agents
[3]Below detection limit (0.033 µg/L)
[4]Non detect

from the deeper sedimentary aquifer beneath the clay layer.

Numerous types of pesticides were detected; the most common detections were atrazine and atrazine desethyl. In 2002, the number of detections of pesticides increased from the 1999 sampling. The pesticide diclofop methyl was first detected in 2002. One well had a diclofop methyl ground water concentration of 2.5 µg/L, which is 1 µg/L over the EPA RfD.

The concentrations of boron and FWA detected within the ground water samples during November 2000 indicate potential waste water influence on the ground water. However, there is no correlation between NO_3-N ground water concentrations and MBAS, caffeine, boron, or FWA ground water concentrations as suggested by linear regression analysis.

Agricultural practices are likely a contributor to NO_3-N and pesticide detections in the ground water of this project area. Testing results indicated NO_3-N and pesticide impacts to shallow ground water of the project area are widespread. This is common in sparsely populated rural areas that have high agrichemical input agriculture with mostly furrow irrigation overlying a shallow alluvial aquifer. Leaching of applied commercial fertilizers is probably a major cause of NO_3-N entering the ground water.

Conclusions

Ground water within the shallow alluvial aquifer of the project area is being impacted from NO_3-N and pesticides. The high NO_3-N concentrations and the large number of NO_3-N detections within the project area cause concern over the contamination of ground water. Pesticide detections were low in concentration; however, there is concern about multiple pesticide detections per sampling well and potentially detrimental health effects.

In 2002, 18 or 44% of the wells sampled exceeded the EPA MCL of 10 mg/L for NO_3-N; a 15% increase from the spring of 1996. Areas having the highest NO_3-N concentrations are northwest of Weiser and between Weiser and Crystal within Washington County. Wells that are drawing water from the shallow alluvial aquifer located above the regional blue clay layer generally have higher NO_3-N concentrations than wells that draw water

Recommendations

To determine if current farming practices are contributing to ground water degradation and to locate other potential contaminant sources, ISDA recommends continued and more intensive monitoring in the project area.

Testing should include, but not be limited to:

- Continued ISDA ground water monitoring for nutrients, common ions, and pesticides.
- Continued ISDA isotope testing to determine possible NO_3-N sources and relative ages of ground water.
- Soil sampling and soil pore water sampling.
- ISDA best management practice (BMP) effectiveness monitoring as BMP programs are implemented.

ISDA further recommends that measures to reduce NO_3-N and 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 current pesticide application practices to non-crop areas, such as roadsides, railroad areas, etc.

ISDA recommends that the Weiser River Soil Conservation District and the Payette Soil and Water Conservation District lead an agricultural response process to create a plan of action to address these ground water contamination issues. The soil and water conservation districts should work with local agrichemical professionals, landowners, agencies, and the Idaho Department of Environmental Quality Weiser Nitrate Ground Water Protection Committee to implement this process and seek funding to support these efforts. ISDA will support these local partners in seeking funding and implementing a comprehensive program.

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