Scott Creek/Mann Creek
Nitrate Degraded Ground Water
Quality Summary Report

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Idaho Department of Environmental Quality Boise Regional Office

Scott Creek/Mann Creek Nitrate Degraded Ground Water Quality Summary Report

Prepared by: Linda Boyle
Water Quality Science Officer
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Introduction

Background

The Ground Water Monitoring Technical Committee (committee) was formed by the Idaho Department of Environmental Quality (IDEQ) as recommended in the Idaho Ground Water Quality Plan (Ground Water Quality Council 1996). This committee is composed of various federal, state, and local agencies. The purpose of the committee is to coordinate and administer ground water quality protection for the state. A major task for the committee is the coordinated effort to address degraded ground water quality.

The committee developed criteria for delineating priority areas. A "Group 1" area is any area where greater than 25% of nitrate sample locations (wells/springs) have values greater than 5 mg/l. The purpose for the delineation of areas was to focus on those areas that require ground water studies and/or interagency coordination actions to maintain or improve the ground water quality. Twenty-five "Group 1" areas have been delineated throughout the state. The Scott Creek/Mann Creek area is the highest ranked area with nitrate degraded ground water.

In March of 2000, IDEQ developed a policy which set forth a process to address known areas of ground water quality degradation using existing authorities and local input. State-wide, regional and local monitoring by Idaho Department of Water Resources (IDWR), U.S. Geological Survey (USGS), IDEQ, and the Idaho State Department of Agriculture (ISDA) confirmed significant increasing trends in ground water nitrate concentrations and injury to beneficial uses in several areas of the state. More information on this IDEQ policy to address degraded ground water can be found on the IDEQ webpage at: http://www2.state.id.us/deq/policies/pm00_4.htm.
More information on nitrate can be found at
http://www2.state.id.us/deq/water/gw/nitrates_in_gw.pdf.

No new ground water data were collected for this report. This summary will present the existing ground water data and reports that describe the Scott Creek/Mann Creek area.

Objectives

The objectives of this report are to:

- Identify the hydrogeologic characteristics of the area,
- Review and compile historic ground water quality data,
- Discuss the USGS statistical trend analyses,
- Discuss the management needs of this area to improve the ground water quality.

Project Area

The project area is approximately 31,500 acres. It encompasses the areas of Weiser Flat and Sunnyside. Weiser Flat is located north and west of the City of Weiser, Sunnyside is located south of the City of Weiser.

Climate

The agricultural regions of Washington County and the southern part of Adams County have hot, dry summers and cool winters (Rasmussen 1990). There are significant local variations in climate because of the topography. Weiser, with an elevation of about 2,100 feet, is representative of the drier, warmest part of the two counties.

In January, the mean temperature is about 26 degrees at the lower elevations near Weiser. In July, the average temperature is about 73 degrees at Weiser. The highest temperature on record, which occurred on July 30, 1988, at Weiser, was 107 degrees. The mean annual precipitation is about 11 inches at Weiser. Of this, about 29 percent usually falls in April through September. In 2 years out of 10, the rainfall during this period is less than 5 inches. Thunderstorms occur on about 19 days each year, and most occur in spring and summer. The average seasonal snowfall is about 16 inches at the lower elevations around Weiser. The average relative humidity in the afternoon is about 25 percent in July and 65 percent in January. Humidity is highest at night, and the average at dawn is 60 percent in July and 90 percent in January. The sun shines 85 percent of the time possible in July and 35 percent in January. The prevailing wind is from the southeast in September through April and from the northwest in May through August. Average windspeed is highest, 11 miles per hour, in March (Rasmussen 1990).

Physiography

The area includes nearly level flood plains and very gently sloping to moderately sloping terraces along the rivers and larger streams. Adjacent to the flood plains are high terraces, some of which have been dissected to form rolling hills. A large part of the area consists of gently sloping to very steep basalt foothills and mountains. In the northern part are steep granitic mountains. Elevation ranges from 1,600 feet along the Snake River to about 6,000 feet in the mountains southeast of New Meadows. The elevation at Weiser is 2115 feet. The Snake River flows north along the western edge of the area. The main drainageway is the Weiser River and its tributaries, which flow southwest into the Snake River at Weiser (Rasmussen 1990).

Geology

The geologic formations in the Weiser River basin have been divided in to (1) pre-Tertiary rocks, undifferentiated; (2) Miocene and Pliocene igneous rocks and associated sedimentary materials of the Columbia River Basalt Group; and (3) Tertiary and

Quaternary sedimentary rocks. All lava flows in the basin are part of the Columbia River Basalt Group, and all overlying sedimentary rocks are of Tertiary and Quaternary age. Sedimentary rocks interbedded with lava flows are included with the Columbia River Basalt Group (Young, Harenberg and Seitz 1977).

Surface exposures of the pre-Tertiary rocks are restricted to a few places on the higher mountains that form the western and eastern drainage divides. These rocks consist of the Seven Devils Group of Permian and Triassic age, which include some sedimentary rocks, and granitic rocks of the Idaho batholith of Cretaceous age (Young, et al. 1977).

The Columbia River Group is the predominant rock type in the Weiser River basin. The group crops out in hill and mountain areas and is exposed in the canyons along the Weiser River. It also underlies the valleys and the broad, undulating plain in the Crane Creek area. The individual lava flows range in thickness from a few feet to about 50 feet (Young, et al. 1977).

The sedimentary rocks of Tertiary and Quaternary age are primarily of laustrine origin and consist mainly of clay and silt. Some sand bodies are included in the sequence, but gravel is uncommon, except in the lowlands near Weiser. A few thin layers of sand and gravel are exposed in terraces along the Weiser River near Midvale and Cambridge. These deposits are generally less than 10 feet thick and occur at very shallow depths. Their areal extent is unknown, but they are thought to be limited to the river flood plain (Young, et. al. 1977).

The sedimentary rocks of the City of Weiser and the agricultural land surrounding Weiser are poorly to well-sorted lacustrine and fluviatile deposits of clay, silt, sand, and some gravel. These sediments exceed 1,500 feet in thickness near Weiser (Howarth 1995).

Hydrogeology

Recharge to the basalt aquifers is primarily from precipitation and stream leakage that enters fractures and joints in the basalts where exposed in the highlands. The sedimentary aquifers are primarily recharged by downward percolation of precipitation, snowmelt, and irrigation water, and leakage from the Weiser River, its tributaries, and irrigation canals (Graham and Campbell 1981).

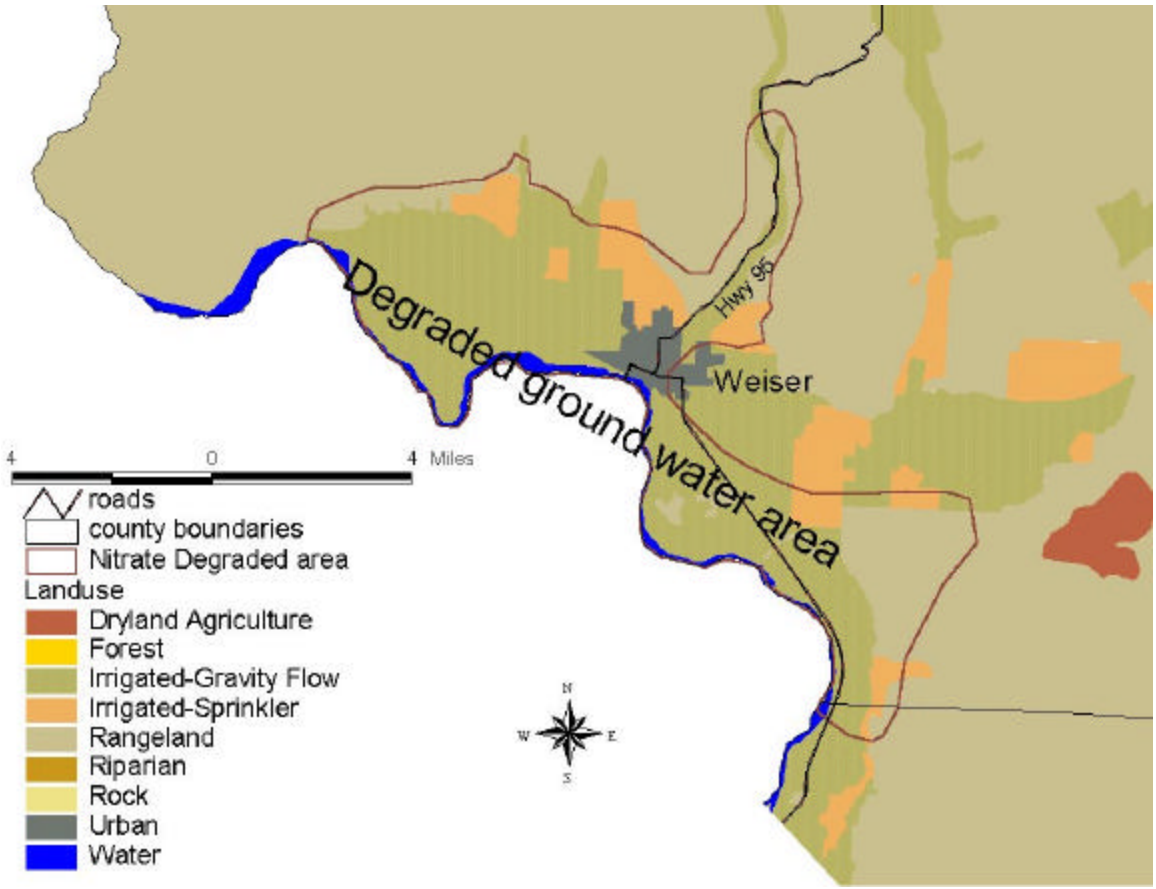
Soil Types

The terraces are Greenleaf-Bissell, which are very deep, well drained soils that formed in lacustrine sediment and alluvium derived from mixed sources. The stream terraces, fan terraces, and alluvial fans are Baldock-Moulton-Cashmere, which are very deep, poorly drained, somewhat poorly drained, and well drained soils that formed in alluvium derived from mixed sources.

Land Use

Irrigated agriculture comprises or about 70% of the total land area in the Scott Creek/Mann creek project area. Irrigated agriculture is surrounded by about 18% range land, with the City of Weiser occupying about 12% urban area in the center. The households outside, and a few inside, the Weiser city limits have their own wells for their domestic water needs. Unless their wells have been included in a ground water study, their water quality will be unknown for agency use.

Figure 1. Land use in the Scott Creek/Mann Creek Nitrate Degraded Ground Water area.



Historic Ground Water Quality Data

A 1956 report (Ross 1956) on the mercury mines near Weiser has interesting information on the area geology. The most abundant rocks near Weiser are moderately consolidated

sandstone and siltstone or shale, with intercalated basalt flows in them. The sedimentary rocks are arkosic, but include some tuffaceous material and a few diatomaceous beds. They are stream, fan, and pediment deposits. To the east are coal seams of little value along Crane Creek. The Idaho Almaden Mines, located east of Weiser, were in operation from 1939 to 1943. In 1940 they were the leading mercury producers in the United States.

Geothermal water was investigated by the Idaho Department of Water Resources (Young & Whitehead May 1975) in the Crane Creek and Weiser Flat areas. The geology of these two areas was found somewhat different. Younger sedimentary rocks were found in the Weiser area. Gravity surveys found that the Weiser area is at the northwest end of a large regional gravity high that is associated with the Snake River Plain, Crane Creek is characterized by an extensive gravity low. Ground and water temperatures were higher in the Crane Creek area, and the dissolved solid concentrations were much higher in the Crane Creek area. The thermal water in Weiser Flat is believed to be cooling young intrusive implanted at a shallow depth in late Miocene or early Pleistocene, which is available by the development of wells. Crane Creek thermal water is determined to be from active and inactive-spring vents from a geothermal convection cell with the presence of a large number on mounds composed of sinter (amorphous siliceous material) at the surface area of the vents.

The Geological Society of America held their 28th annual meeting in Idaho and conducted a geology and paleobotany field trip in the Weiser area (Smiley, Shah & Jones May 1975). The information for this one-day field trip contains information on the general descriptions of rock units and their field relations, their superpositional relations, and paleontology.

The report on the water resources of the Weiser River basin (Young & Seitz 1977) found ground water to be of "good" quality or suitable for present uses. Possible contamination of rural wells by barnyard or septic-tank pollutants was suspected in a few places in the basin. Improper well construction probably permitted these contaminants to enter wells. Constituents sampled showed possible organic pollutants of total nitrite plus nitrate, total phosphorus and chloride. The total nitrite plus nitrate levels found from 1973-74 ranged from 0.63 to 6.3 mg/l. Total phosphorus during the same time frame was 0.09-0.29 mg/l, and chloride was 4.6-45 mg/l.

The characteristics of Idaho's seventy major ground water flow systems are described in a Idaho Department of Water Resources report (Graham & Campbell 1981). The report states that the Weiser River ground water system is within the Columbia River Basalts that underlie the valley lowlands throughout the basin, and sedimentary valley fill material. The sedimentary aquifer is recharged by precipitation, snowmelt, and irrigation water. Dissolved arsenic may exceed drinking water standards. Levels of iron and manganese and values of pH may not be within the desired drinking water ranges.

U.S. Geological Survey published an Idaho Ground Water Quality summary report in 1986 (Parliman 1986). The sparse ground water quality data throughout the state showed

ground water impacts from agriculture, urban land-use and hazardous waste sites. The report found that the lack of standardized sampling and preservation methods, and comparability if historic and current data may be questionable both within and among agencies.

In 1986 the U.S. Geological Survey compiled references on the Snake River Drainage Basin above Weiser for the Regional Aquifer-System Analysis. A literature search was made and a list of more than 1,100 reports concerning geology and hydrology was compiled (Bassick 1986).

The Division of Environmental Quality compiled information of water quality in the Idaho Snake-Payette Rivers Hydrologic Unit as required by the U.S. Department of Agriculture (Steed, Winter & Cardwell 1993). The Sunnyside area was included in this report. The data generated from the Idaho Division of Environmental Quality and the U.S. Geological Survey showed the ground water in the Weiser Flat has an upward trend in nitrate and pesticides concentrations. The Sunnyside area is one of the major critical areas impacted by nitrates and pesticides. Additional investigation and evaluation is recommended.

In 1995 the Idaho Division of Environmental Quality conducted a ground water study to gather more information on the elevated arsenic levels in a well along Mann Creek (Howarth 1995). Sampling and comprehensive chemical analyses of 14 domestic wells and one surface water location were performed in January 1995. The distribution of arsenic-rich ground water in the study area was found to be random at the scale of this investigation. Some correlation between elevated arsenic concentrations and the elevation of the water-producing strata may exist. Clay-rich sediments which generally occur below coarser-grained alluvial deposits may produce arsenic-rich ground water. Elevated arsenic also appears to be correlated with higher concentrations of sodium, usually above two milliequivalents per liter or 46 milligrams per liter. No evidence was obtained to suggest that elevated concentrations of arsenic in ground water in the study area is caused by human activity.

Technical Results Summary #1, by Idaho Department of Water Resources (Neely 1999) compared the nitrate values in the statewide monitoring wells first round of sampling to the second round of sampling. The first round sampling took place from 1991 to 1994, the second round from 1995 to 1998. Washington County is in the West Central report grouping. The repeat sampling of the wells in the West Central area showed a 44% increase in nitrate levels in some wells, 28% decrease in other wells, and 28% of the wells had no change.

An Idaho State Department of Agriculture February 2000 ground water report (Bahr 2000) explains that ground water in the shallow alluvial aquifer is being impacted from nitrate and pesticides. During the four-year ground water study, median nitrate levels had increased 2.0 mg/l in the wells sampled. Forty-one percent of the wells sampled exceeded the regulatory health standards of 10 mg/l for nitrate. Pesticides found were

detectable, but below regulatory health standards. The most common pesticides detected were Atrazine based products.

Idaho Department of Water Resources compiled nitrate results from the Statewide Monitoring Program of the 1553 monitoring sites sampled from 1991–2000. The technical summary (Neely 2001) states the southwest region is one of the most nitrate impacted areas in Idaho. The southwest region for this report is composed of Washington, Payette, Gem, Canyon, Ada, Elmore, and Owyhee Counties.

The Idaho Department of Environmental Quality summarized the current known status of nitrate in Idaho's ground water (West 2001). The known ground water data shows that the nitrate problem is getting worse. Additional topics in this report are the cost, sources and nitrate trends in Idaho's ground water.

The Weiser River Soil Conservation District requested assistance from the Natural Resources Conservation Service to assess how land use activities, including irrigation and agronomic practices, have impacted the beneficial uses of surface and groundwater resources within the Southern Washington County Water Quality Project Area (U.S. Department of Agriculture Natural Resources Conservation Service assumed 2001). Not all conservation practices applied by producers in the project area have met minimum requirements of the Natural Resources Conservation Service Field Office Technical Guide. The evaluation was to help determine which practices or combination of practices are not being applied according to the Natural Resources Conservation Service Field Office Technical Guide and identify alternatives to address identified resource concerns.

The University of Idaho Cooperative Extension System reported (University of Idaho Cooperative Extension System 2001) the findings of the Idaho Farm Bureau Federation's Wellhead Sampling program in Washington County in the spring 1995. Thirty percent of the wells sampled contained nitrate levels greater than 10 mg/l. A greater percentage of wells in this survey exceeded the federal health standards than the other studies in 21 Idaho counties. Nitrate contamination of ground water in Washington County is a serious problem that warrants the immediate implementation of best management practices to prevent further deterioration of water quality.

The IDEQ Source Water Assessment report (IDEQ Feb. 2002) for this area identified and described 17 Public Water Systems within the Scott Creek–Mann Creek hydrologic province. Conceptual models were developed within the province and the adjoining areas. These models delineated the capture zones for 3, 6, and 10-year travel times of the ground water to the wells. A sensitivity analysis was performed to evaluate the model input uncertainty.

US Geological Survey Nitrate Trend Analyses

The USGS was contracted by IDEQ to evaluate the nitrate trends in the nitrate priority areas. The USGS statistically analyzed the known historic ground water data up through 1999. The trend of ground water nitrate concentrations for the Scott Creek/Mann Creek area was statistically found to be increasing. Table 1, page 12, shows the ranking score for the Scott Creek/Mann Creek area. Figure 2, page 13, shows the nitrate statistics and sample locations for the trend analyses. The Scott Creek/Mann Creek area ranked number 1 out of 25 areas throughout the state. Figure 3, page 14, shows all 25 of the nitrate degraded areas throughout the state.

Table 1. Priority Ranking Table for the Scott Creek/Mann Creek area.

Priority Area Number: 1		Priority Area Name: Weiser		
Ranking Criteria			Score	**Comments**
1) POPULATION				
	Points	**Select One**		
a) Within Priority Area				
<1000	1			
1000 to 10,000	2	X	2	Population = 5853
10,000 to 100,000	3			
		Subtotal	**2**	
b) Source Water Protection Areas or Public Water System wells in Priority Area				
0	0			
1 to 20	1	X	1	11 PWS
>20	2			
		Subtotal	**1**	
c) Number of Wells with Nitrate (NO_3) $ 10 mg/l				
0	0			
1 to 2	1			
3 to 5	2			
6 to 9	3			
10 to 15	4			
>15	5	X	5	29 Wells
		Subtotal	**5**	
		Population Score	**8**	
		Max Possible Score = 10		
2) WATER QUALITY				
	% wells	**Nitrate Concentration Criteria**		
Percent of wells with Nitrate (NO_3) $ 2 mg/l	88%	2	1.76	
Percent of wells with Nitrate (NO_3) $5 mg/l	73%	5	3.65	
Percent of wells with Nitrate (NO_3) $ 10 mg/l	45%	10	4.50	
		Water Quality Total	**9.91**	
3) WATER QUALITY TRENDS				
		Select One		
Increasing	10	X	10	
No Discernable Trend	5			
Decreasing trend	0			
		Trend Score	**10**	
		Max Possible Score = 10		
4) OTHER BENEFICIAL USES				
Other beneficial uses are impaired	2	Yes=2 No = 0	No	
		Beneficial use score	**0**	
		Max Possible Score = 2		
		Total Score	**27.91**	

Figure 2. Location of Scott Creek/Mann Creek, Nitrate Sites and Statistics.

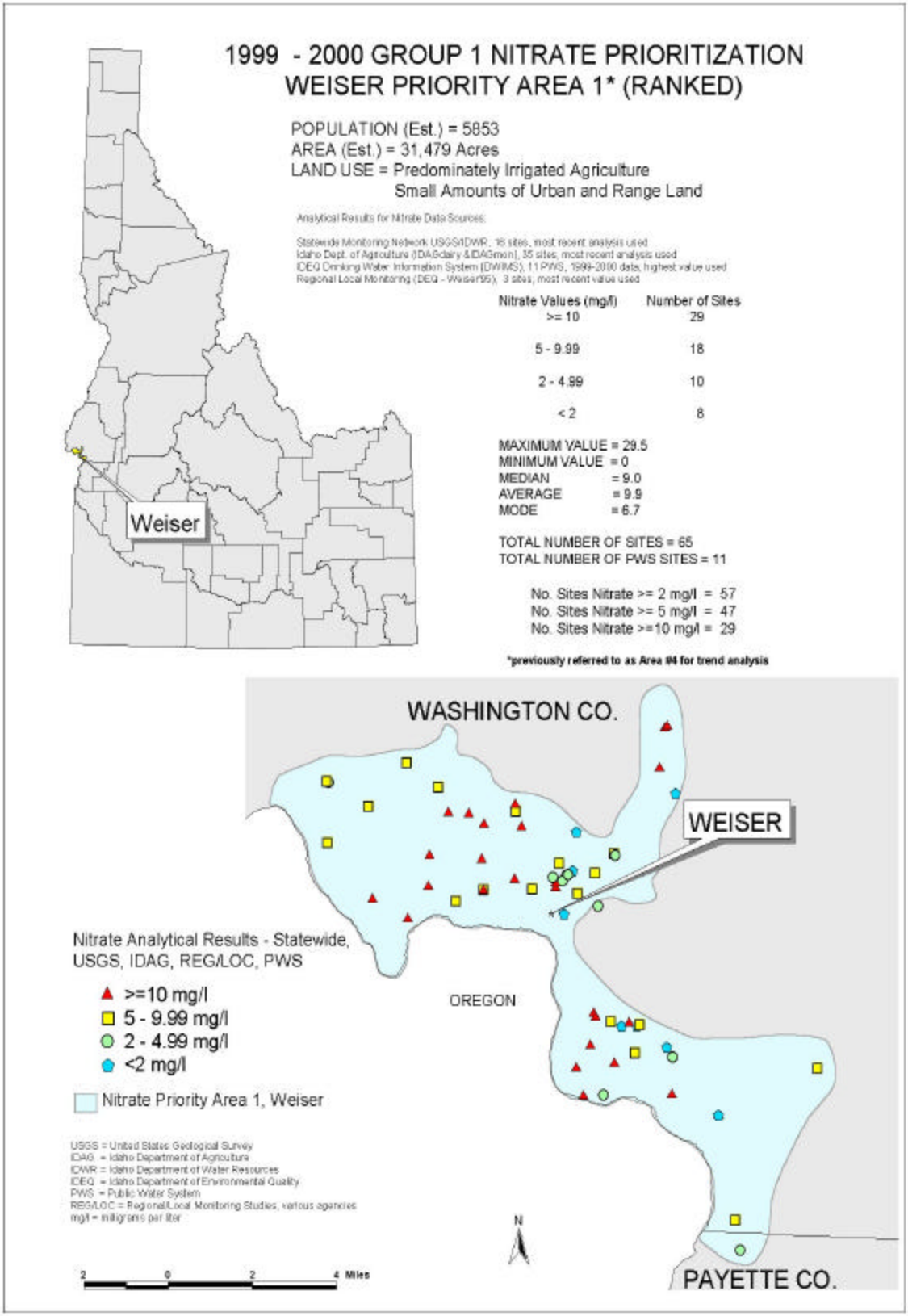
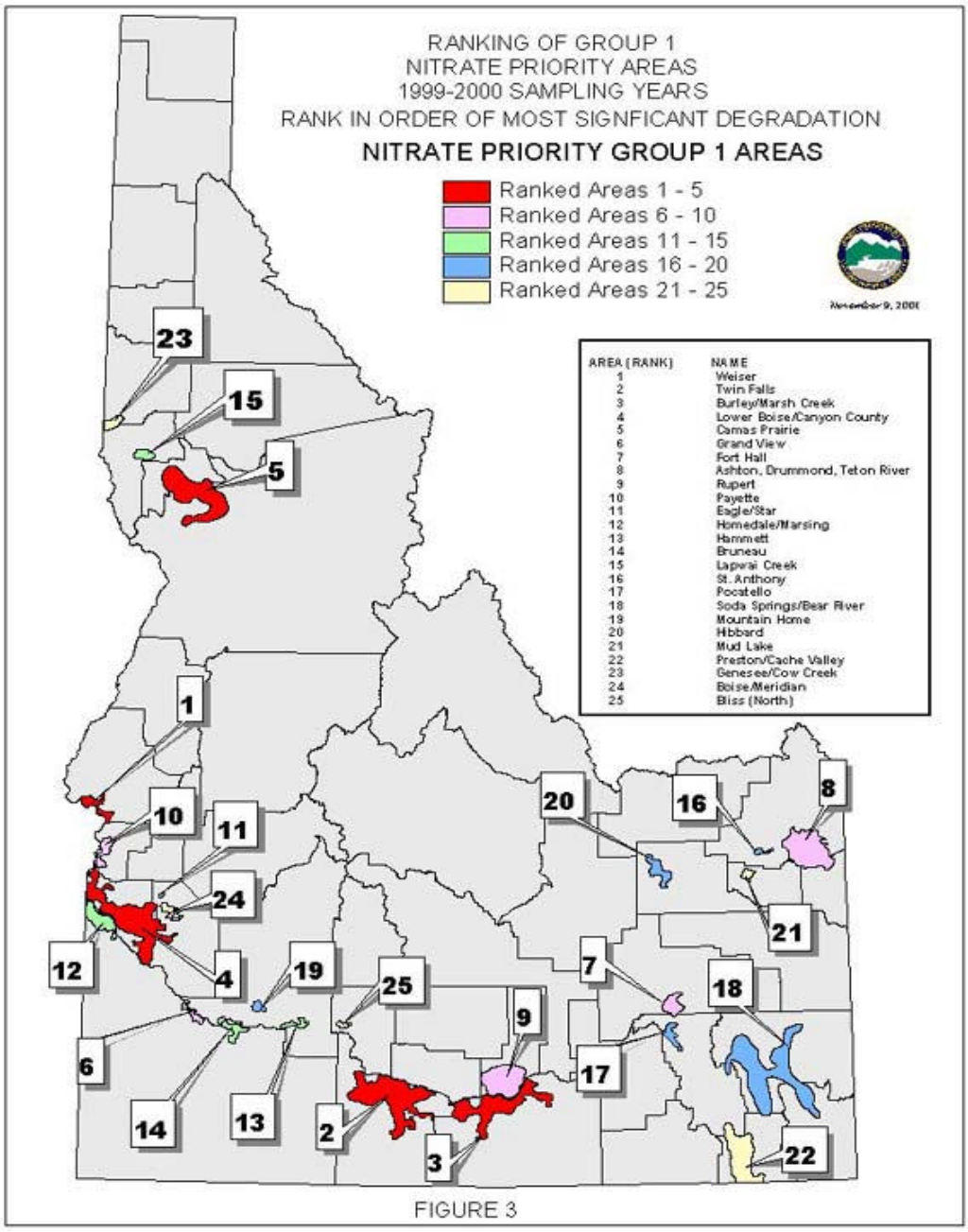


Figure 3. Nitrate Degraded Areas in Idaho.



Discussion and Recommendation

In March of 2000, DEQ developed a policy that set forth a process to address known areas of ground water quality degradation using existing authorities and local input. State-wide, regional and local monitoring by IDWR, USGS, IDEQ, and ISDA confirmed significant increasing trends in ground water degradation and/or injury to beneficial uses across the state. As ground water degradation and/or injury to beneficial use is identified, a Degraded Ground Water Quality Area Management Strategy Implementation Plan (Ground Water Management Plan) will be developed.

The development of the Ground Water Management Plan will require public involvement from a community-based advisory group. The Ground Water Management Plan will emphasize ground water education and best management practices which can be utilized to improve the ground water quality. Project presentations will be conducted to educate landowners and interested citizens and to foster participation in implementation of best management practices. The Scott Creek/Mann Creek advisory group held their first meeting to start this process on October 11, 2001 at the Weiser City Hall.

Local government entities will benefit from this project by having a reduction of the amount of nitrogen entering their drinking water resource. Private landowners will benefit by improving their drinking water beneficial uses without negative impact to property sales and values. Government agencies have a vested interest in protecting the public health and beneficial uses for the citizens of Idaho.

The work on developing the Ground Water Management Plan must address all land use activities that have the potential to impact the ground water. The ground water data that has been collected to date, throughout the state, has shown ground water impacts at wastewater land application sites, agricultural locations, residential septic systems, chemical stockpiles, spills, landscape care, and from wells that may be old and worn out or poorly constructed.

It is believed that the development and implementation of these Ground Water Management Plans will yield benefits to the state through improvements to ground water quality and better management of the resource. IDEQ, therefore, supports the development of a Ground Water Management Plan for Scott Creek/Mann Creek Nitrate Degraded Ground Water Area.

References

Bahr, Gary; and Rick Carlson February 2000. Southern Washington and Northern Payette Counties Alluvial Aquifer. Idaho State Department of Agriculture Division of Agricultural Resources. ISDA Technical Results Summary #1. 4 pp. http://www.agri.state.id.us/PDF/gw/WashPaySum2.pdf

Bassick, M.D. 1986. Compilation of References of Geology and Hydrology of the Snake River Drainage Basin above Weiser, Idaho. U.S. Geological Survey Open-File Report 86-245. 133 pp.

Graham, William G. and Campbell, Linford J August 1981. Groundwater Resources of Idaho. Idaho Department of Water Resources. 100 pp.

Howarth, Rob September 1995. An Evaluation of Arsenic in Ground Water in a Portion of Washington County, Idaho. Idaho Department of Health and Welfare Division of Environmental Quality. Ground Water Quality Technical Report # 6. 30 pp. http://www2.state.id.us/deq/water/gw/gw_reports.htm.

Neely, Kenneth W.; and Janet K. Crockett April 1999. Nitrate in Idaho's Ground Water. Idaho Department of Water Resources. Technical Results Summary #1. 12 pp. http://www.idwr.state.id.us/planpol/techserv/gwmon/statewide.htm

Neely, Kenneth W. 2001. Nitrate Results from the Statewide Program, 1991-2000. Idaho Department of Water Resources. 28 pp. http:/www.idwr.state.id.us/planpol/techserv/gwmon/statewide.htm.

Parliman, D.J. 1986. Idaho Ground-Water Quality. U.S. Geological Survey Water Supply Paper 2325. 8 pp.

Rasmussen, Lawrence M. 1990. Soil Survey of Adams-Washington Area, Idaho, Parts of Adams and Washington Counties. U.S Department of Agriculture and Soil Conservation District. 428 pp.

Ross, Clyde P. 1956. Quicksilver Deposits Near Weiser, Washington County, Idaho. Geological Survey Bulletin 1042-D. U.S. Government Printing Ofiice, Washington. 29 pp.

Smiley, Charles J.; Shah, S.M.I.; and Jones, Robert W. May 1975. The Later Tertiary Stratigraphy and Plaeobotany of the Weiser Area, Idaho. Information Circular #28. Idaho Bureau of Mines and Geology. 13pp.

State of Idaho Department of Environmental Quality February 2002. Source Area Delineation Report, Scott Creek – Mann Creek Hydrological Province. State of Idaho Department of Environmental Quality. 16pp.

Steed, Robert; Gerry Winter; and John Cardwell 1992. Idaho Snake-Payette Rivers Hydrologic Unit Ground Water Quality Assessment. Idaho Department of Health and Welfare Division of Environmental Quality. Ground Water Quality Technical Report # 3.

U.S. Department of Agriculture Natural Resources Conservation Service no date, assumed 2001. Preliminary Investigation Southern Washington County Water Quality

Project Washington County, Idaho. Requested by Weiser River Soil and Water Conservation District. 36 pp.

University of Idaho Cooperative Extension System January 2001. Idaho Wellhead Sampling Program. Nitrate Sampling. Washington County April 1995. University of Idaho Water Quality Brochure # 32. 5 pp. http://www.uidaho.edu/wq/wqbr/wqbr32.html.

West, Donna 2001. Nitrates in Ground Water A Continuing Issue for Idaho Citizens. Idaho Department of Environmental Quality. Ground Water Quality Information Series #1. 21 pp. http://www2.state.id.us/deq/water/gw/nitrates_in_gw.pdf

Young, H.W., Harenberg, W.A., and Seitz, Harold R. 1977. Water Resources of the Weiser River Basin, West-Central Idaho. Idaho Department of Water Resources Water Information Bulletin #44. 101 pp.

Young, H.W., Harenberg, W.A., and Whitehead, R. L. May 1975. Geothermal Investigations in Idaho, Part 3, An Evaluation of Thermal Water in the Weiser Area, Idaho. Idaho Department of Water Resources Water Information Bulletin #30. 35 pp.