

**Lower Boise/Canyon County  
Nitrate Degraded Ground Water  
Quality Summary Report**



**DECEMBER 2001**

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**Idaho Department of Environmental Quality  
Boise Regional Office**

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Nitrate Degraded Ground Water  
Quality Summary Report**

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# Introduction

## ***Background***

The Ground Water 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 delineating of these Group 1 areas were made at a IDEQ regional office scale. The purpose for the delineation of areas was to focus on those areas that require ground water studies and/or interagency coordinating actions to maintain or improve the ground water quality.

The initial process of delineating degraded ground water areas originally identified thirty-three areas throughout the state with nitrate contamination. The close proximity of some of these 33 areas created the need to combine some priority areas for future management purposes. Five of the initial priority areas within Canyon County and Ada County were combined into a single focus area called the Lower Boise/Canyon County area.

In March of 2000, the IDEQ developed a policy which set forth a process to mitigate known areas of ground water quality degradation using existing authorities and local input. Ambient, 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](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](http://www2.state.id.us/deq/water/gw/nitrates_in_gw.pdf).

No new ground water data were collected for this report. This summary of existing data was collected by IDEQ, USGS, IDWR, and ISDA.

## ***Objectives***

The objectives of this report are to:

- Identify the hydrogeologic characteristics of the area,

- Review and compile historic ground water quality data,
- Incorporate the USGS statistical trend analyses into the report,
- Discuss the management needs of this area to maintain or improve the ground water quality.

## ***Project Area***

The priority area encompasses a little over one half of Canyon County and part of Ada County near Kuna. The area covers 238,149 acres, or about 372 square miles in southwest Idaho.

## ***Climate***

The valley has a semi-arid, temperate climate characterized by cool, wet winters and warm, dry summers (Dion 1972). The mean annual temperature is 51 degrees Fahrenheit. The mean annual winter and summer temperature is 33 degrees Fahrenheit and 71 degrees Fahrenheit, respectively. The mean annual precipitation is approximately 11 inches with an approximate low of 6 inches in the southwest part of the Canyon County. The majority of the precipitation falls during the winter as snow (U.S. Department of Agriculture 1972).

## ***Geology***

This area is in the Payette section of the Columbia Plateaus Province. It consists of an upland plain of unconsolidated lacustrine and fluvial materials that has been dissected by the Snake and Boise Rivers. In the Dry Lake area of Canyon County, a few butte-like hills rise above the plain, and the plain is bordered by escarpments 400 to 500 feet high that extend along the Snake River for several miles (U.S. Department of Agriculture 1972).

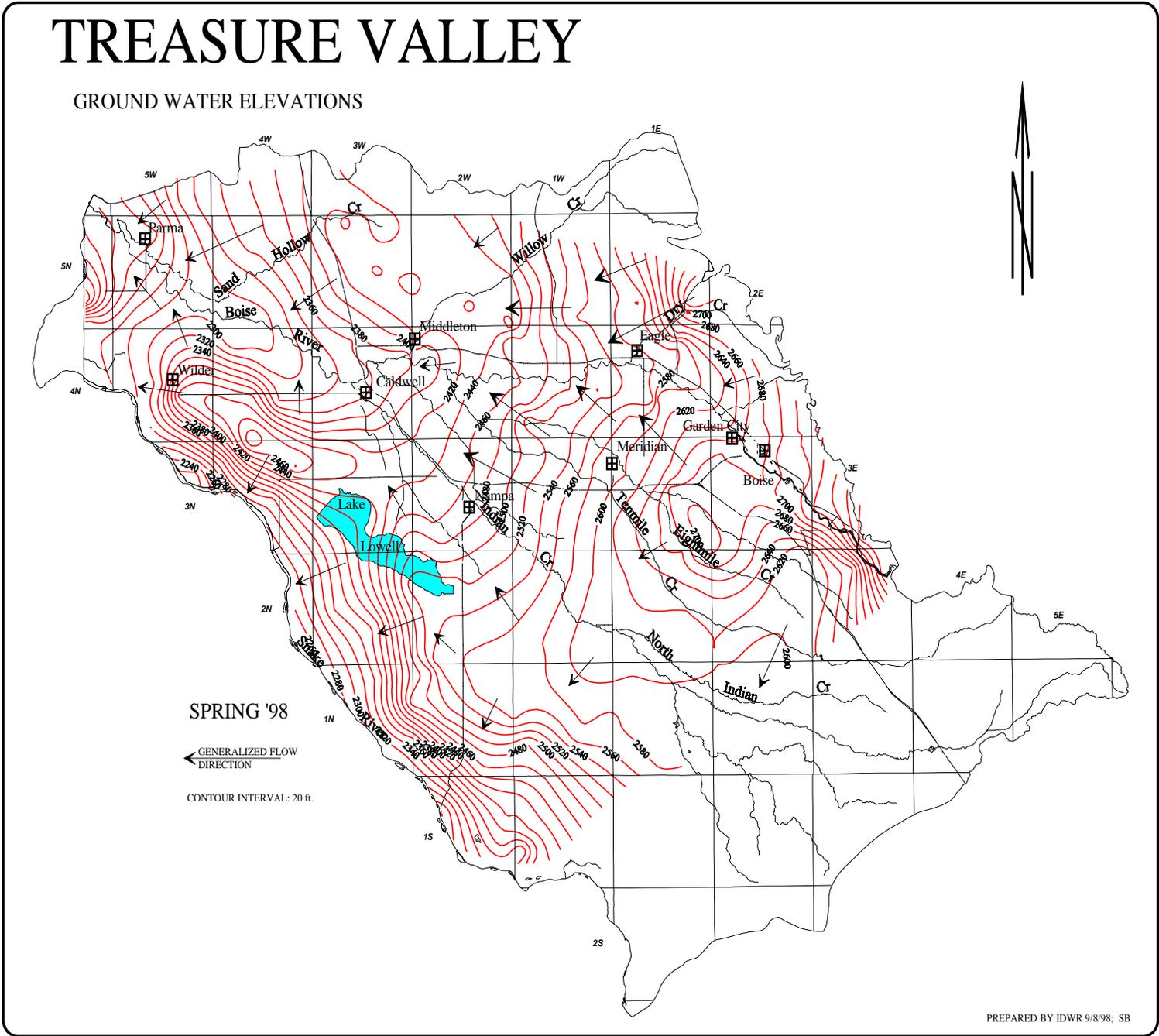
The flood plains of the Snake and Boise Rivers are 1 to 2 miles wide. Terraces that consist of stream-laid and lacustrine deposits rise stepwise above the rivers. Most terraces at low and moderate elevation are not dissected. Bottom lands occur only in small areas along the southern part of the Snake River (U.S. Department of Agriculture 1972). Basalts inundated ancestral valleys and plains. Their resistance to erosion helped preserve the terrace remnants they cap (Othberg 1994).

## ***Hydrogeology***

The valley ground water system is primarily within unconsolidated deposits of silt, sand, clay and fine gravel (Graham & Campbell 1981). Water quality within the Boise River valley ground water system varies by the strata within the sedimentary layers that the water flows through. The zones of the aquifer are interrelated, with clay layers

functioning as limited divisions to the water bearing zones (Neely 1998). The general direction of the ground water movement is dependent on location (Figure 1). The focus of this diagram is on the Treasure Valley, which includes part of Ada County and all of Canyon County. The topography, Boise River, Snake River, and irrigation ditches have their own impact on the localized ground water direction.

**Figure 1. Ground Water Direction in the Treasure Valley**



## ***Soil Types***

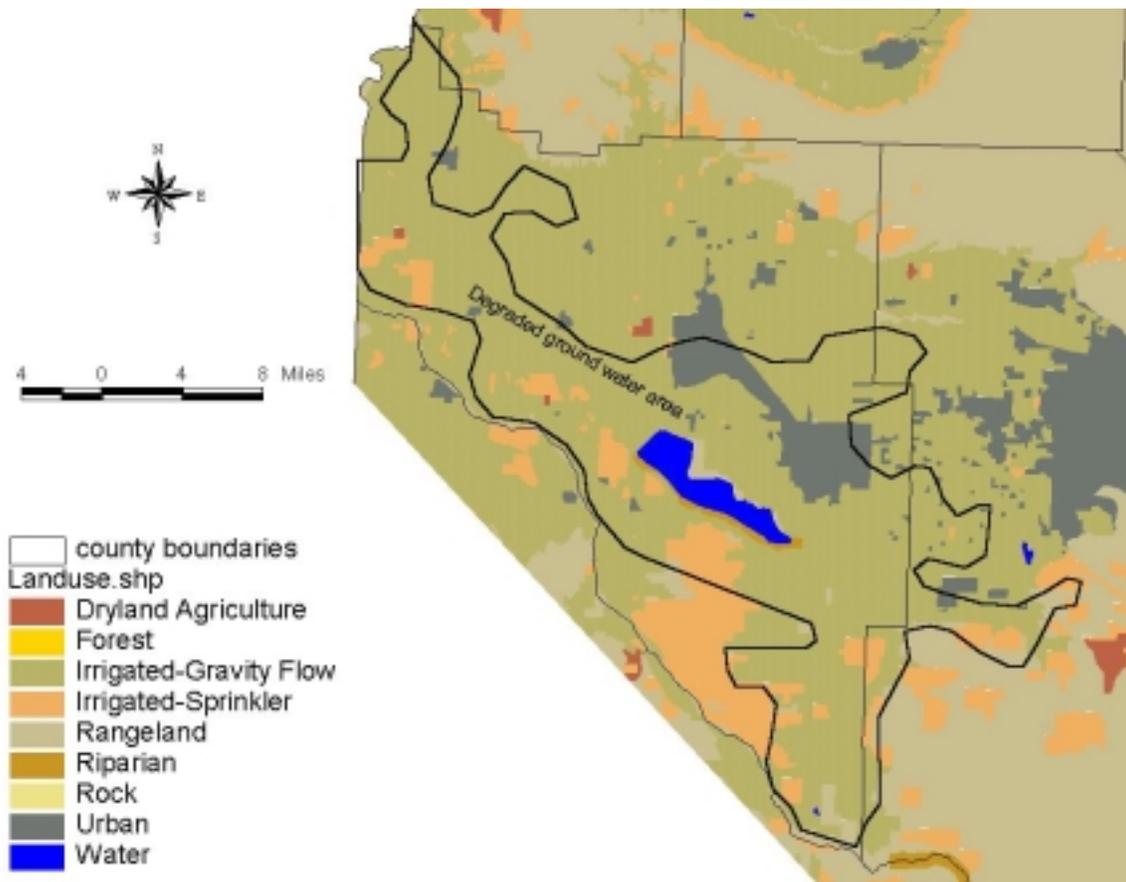
The general soil types are mixed alluvial sediments of the Turbyfill-Cencove-Feltham association. The soils are well-drained and somewhat excessively drained fine sandy loams and loamy fine sands on fans and terraces (U.S. Department of Agriculture 1972; 1980).

## ***Land Use***

The land use in this area is predominately used for agricultural purposes. Total percent of land used within Canyon County for agricultural purposes is 84.3%, according to the Idaho Department of Commerce 2001 statistics. Forty-eight percent of the population live on rural property in Canyon County. These residents within this entire area have their own domestic well or wells for their water needs. Unless their wells have been included in a ground water study, their water quality will be unknown for agency use.

The cities of Nampa, Caldwell and Kuna are currently experiencing rapid growth of their city population. Other cities in this area are experiencing moderate growth. The cities in this area have public drinking water systems available to the residents in and near the city limits. Idaho Department of Commerce statistics show that 52% of the urban population in Canyon County lives on 2.9% of the land. The remaining 12.2% of the land is range land (7.7%), forest (3%), and water (2%0). See figure 2, page 7, of the diagram of the land use in Canyon County and part of Ada County.

**Figure 2. Land Use in Lower Boise/Canyon County.**



## **Historic Ground Water Quality Data**

In 1991 a ground water vulnerability report (Rupert 1991) shows this area as having a high or very high vulnerability to ground water contamination. The probability for determining vulnerability was based upon depth-to-water, soils and recharge.

A 1993 report (Steed 1993) compiled available data to determine the ground water quality assessment for the Snake-Payette Rivers hydrologic Unit. The data for this report was made available from USGS WATSTORE, University of Idaho Cooperative Extension, and the Idaho Farm Bureau 1991 Nitrate Reconnaissance ground water quality surveys. The compilation and analyses of the data available for this report listed west Canyon County area as a critical ground water quality area.

In 1997-98 DEQ conducted a ground water study in Arena Valley (west of Wilder) near a waste water land application site after DEQ received numerous ground water complaints from area domestic well owners. The permit conditions of the waste water land application site required the sampling of seven monitoring wells prior to using the site for land application in 1992. Four of those monitoring wells exceeded 10 mg/l. The site began use as the waste water land application site in December 1993. In 1997 and 1998 DEQ sampled at 21 domestic wells, 2 irrigation wells, and 1 spring for this ground water study. Four of the sampled locations exceeded 10 mg/l, two locations had nitrate levels between 5 mg/l and but less than 10 mg/l, eight locations had nitrate levels between 2 mg/l and 5 mg/l, and ten locations showed nitrate at non-detectable levels. The elevated nitrate locations are west to southwest of the waste water land application site and the known nitrate degraded ground water area (unpublished report on SSI Food Services, Inc.).

Trend analyses from the Statewide Ambient Ground Water Quality Monitoring Program (Neely 1998, 1999 and 2001) show an increase in nitrate levels in ground water in Ada County and Canyon County Treasure Valley Deep and Treasure Valley Shallow hydrogeologic areas. The report stated that the ground water was suitable for human consumption at most sites.

A ground water follow-up study (Boyle 1999) for areas of identified ground water contamination was conducted in 1998. Two of the six locations in this area were chosen because of previously identified ground water contamination with elevated nitrates. The area near Huston had elevated nitrate and arsenic in two wells which were near a well with known elevated nitrate levels. Additional work is recommended in this area. The area north of Nampa had elevated nitrate in one previously sampled well, only. Two wells sampled near this well did not have elevated nitrate levels (1.05 and 2.7 mg/l). The regulatory level for nitrate is 10 mg/l, based upon health reasons is established by the Environmental Protection Agency.

The ground water data from the 2000 ground water characterization study conducted by IDEQ and US Geological Survey (USGS) showed wells in this area with elevated nitrate (Boyle 2000). The purpose of this study was to determine the overall ground water quality from a simplistic random well selection. Elevated nitrate levels were found in wells near Parma, Roswell, Wilder, south of Caldwell, north of Nampa, and southeast of Nampa.

The revised 2001 University of Idaho Water Quality Brochure #6 explains the results of the Idaho Wellhead Sampling Program conducted by the Idaho Farm Bureau Federation in February 1991. This study collected nitrate results from 450 domestic wells in Canyon County. The nitrate results showed that 40% of the wells had nitrate >2 mg/l, 52% had nitrate between 2 and 10 mg/l, and 8% exceeded 10 mg/l.

A 2001 report (West 2001) summarized data and provided information on the extent of nitrate pollution in Idaho. Additional topics in this report are the cost, sources and nitrate trends in Idaho's ground water.

## **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 for the Lower Boise/Canyon County area was statistically found to be an increasing trend of the nitrate levels in the ground water. Table 1, page 11, shows the ranking score for the Lower Boise/Canyon County area. Figure 3, page 12, shows the nitrate statistics and sample locations for the trend analyses. The Lower Boise/Canyon County area ranked number 6 out of 25 areas throughout the state. Figure 4, page 13, shows all 25 of the nitrate degraded areas throughout the state.

**Table 1: Priority Ranking Table for the Lower Boise/Canyon County Area.**

Priority Area Number: 4		Priority Area Name: Lower Boise/Canyon Co.		
Ranking Criteria			Score	Comments
<b>1) POPULATION</b>				
	Points	Select One		
<b>a) Within Priority Area</b>				
<1000	1			
1000 to 10,000	2			
10,000 to 100,000	3	X	3	Pop. = 80,806
		<b>Subtotal</b>	<b>3</b>	
<b>b) Source Water Protection Areas or Public Water System wells in Priority Area</b>				
0	0			
1 to 20	1			
>20	2	X	2	149 PWS
		<b>Subtotal</b>	<b>2</b>	
<b>c) Number of Wells with Nitrate (NO<sub>3</sub>) ≥ 10 mg/l</b>				
0	0			
1 to 2	1			
3 to 5	2			
6 to 9	3			
10 to 15	4			
>15	5	X	5	59 Wells
		<b>Subtotal</b>	<b>5</b>	
		<b>Population Score</b>	<b>10</b>	
		<b>Max Possible Score = 10</b>		
<b>2) WATER QUALITY</b>				
	% wells	Nitrate Concentration Criteria		
Percent of wells with Nitrate (NO <sub>3</sub> ) ≥ 2 mg/l	63%	2	1.26	
Percent of wells with Nitrate (NO <sub>3</sub> ) ≥ 5 mg/l	32%	5	1.60	
Percent of wells with Nitrate (NO <sub>3</sub> ) ≥ 10 mg/l	9%	10	0.90	
		<b>Water Quality Total</b>	<b>3.76</b>	
<b>3) WATER QUALITY TRENDS</b>				
		Select One		
Increasing	10	X	10	
No Discernable Trend	5			
Decreasing trend	0			
		<b>Trend Score</b>	<b>10</b>	
		<b>Max Possible Score = 10</b>		
<b>4) OTHER BENEFICIAL USES</b>				
Other beneficial uses are impaired	2	Yes=2 No = 0	No	
		<b>Beneficial use score</b>	<b>0</b>	
		<b>Max Possible Score = 2</b>		
<b>Total Score</b>			<b>23.76</b>	

**NITRATE PRIORITY AREA # 4  
LOWER BOISE/CANYON COUNTY**

Nitrate Concentrations: (mg/l)

Minimum Value	0.0
Maximum Value	33.4
Average Value	4.2
No. Samples $\geq$ 10	59
No. Samples 5 – 9.99	148
No. Samples 2 – 4.99	199
No. Samples < 2	234
No. Samples $\geq$ 2	406
No. Samples $\geq$ 5	207
No. Samples $\geq$ 10	59
% Samples $\geq$ 2	63%
% Samples $\geq$ 5	32%
% Samples $\geq$ 10	9%
Total Samples	640
No. PWS Samples	149
No. SMN Samples	382
No. IDAG Samples	63
No. REG/LOC Samples	46

PWS = Public Water Systems

SMN = State Wide Monitoring Network

IDAG = Idaho Dep. Of Agriculture Studies

REG/LOC = Regional/Local Monitoring DEQ/USGS and DEQ/IDAG Projects

Regional/Local Monitoring projects include:

1998 Follow-up Study, DEQ, (DEQ-misc. & 98followup)

1994 DEQ, (DEQ-perk)

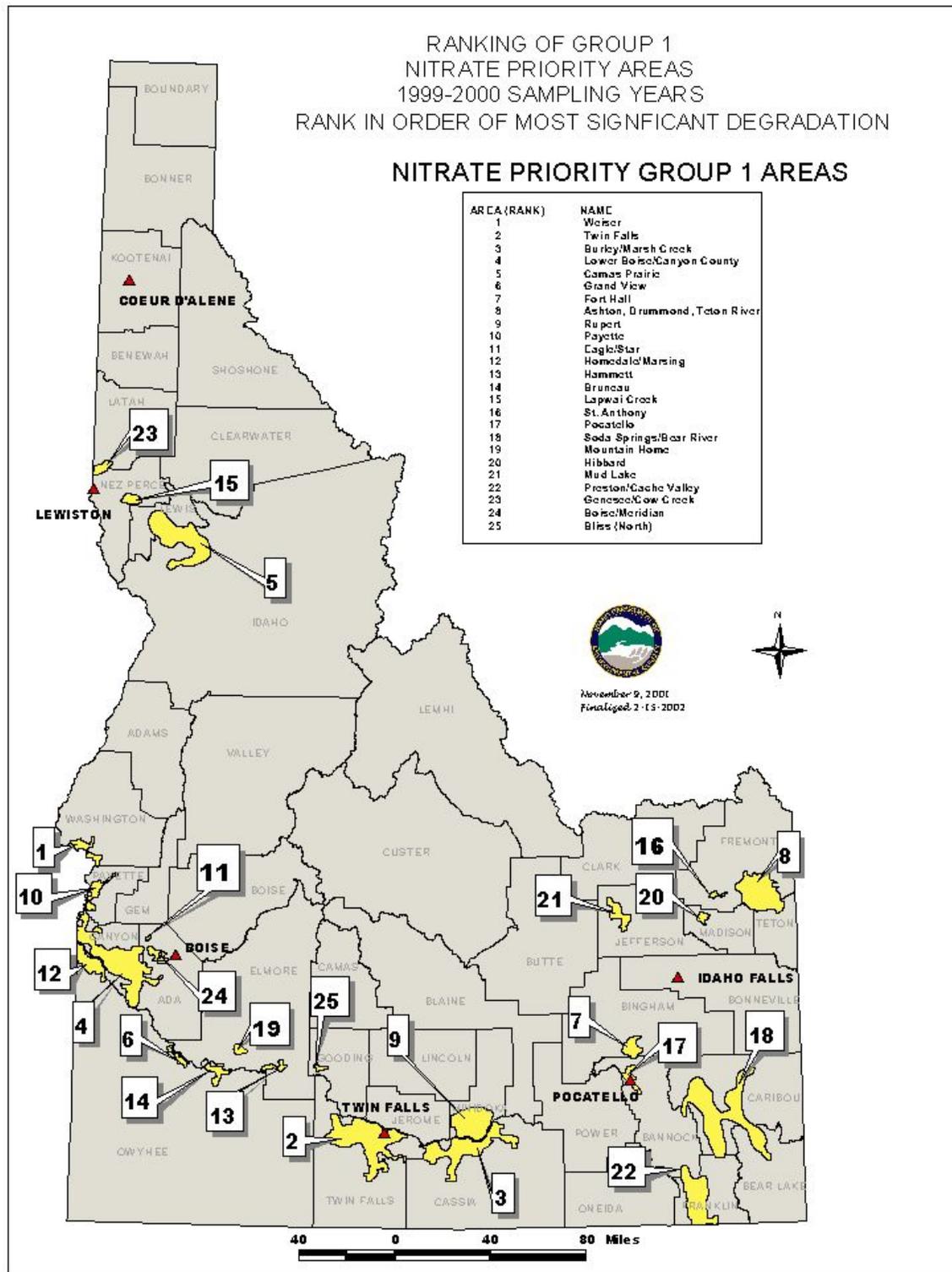
1997 DEQ, Arena Valley, (DEQarena)

1996 DEQ/USGS (96Nampa)

1997 North Canyon Co. Study, DEQ/USGS, (Cordr97a)



Figure 4.



## Discussion and Recommendation

In March of 2000, DEQ developed a policy that set forth a process to mitigate known areas of ground water quality degradation using existing authorities and local input. Ambient, 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. These areas are being identified and delineated. 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.

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 and no possible negative impact to property sales and values. Government agencies have a vested interest in protecting the public health and beneficial uses of 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 has shown ground water impacts at wastewater land application sites, agricultural locations, residential septic systems and 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 and it's citizens through improvements to ground water quality and better management of the resource. IDEQ, therefore, recommends moving forward with the development of a Ground Water Management Plan for Lower Boise/Canyon County Nitrate Degraded Ground Water Area.

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