Lower Boise/Canyon County Ground Water Quality Management Plan

November 2005

Prepared by the Lower Boise/Canyon County Ground Water Quality Management Committee and the Idaho Department of Environmental Quality

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Executive Summary

The Lower Boise/Canyon County Nitrate Priority Area (NPA) is located in the Treasure Valley and encompasses a little over one-half of Canyon County and a portion of Ada County near Kuna. The area covers 238,149 acres, or about 372 square miles, in southwest Idaho. The Canyon County NPA has been placed on the Idaho Department of Environmental Quality (DEQ) nitrate priority list and is ranked the fourth highest in the state in terms of ground water quality degradation. (Information available at http://www.deq.idaho.gov/water/prog_issues/ground_water/nitrate.cfm#ranking)

The area has been impacted by nitrate contamination that may affect an estimated population of 80,806 residents who depend on this aquifer system as their primary source of drinking water. Ground water monitoring in the Lower Boise/Canyon County NPA has demonstrated elevated nitrate levels above the U.S. Environmental Protection Agency's established Maximum Contaminant Levels (MCL) for health concerns. Results of the 640 samples from domestic wells initially considered for the nitrate priority list included 32 percent with nitrate levels above 5 mg/L, the action level, and 9 percent of the wells with nitrate concentrations above the nitrate MCL of 10 mg/L.

To address this issue, the Canyon County Ground Water Quality Management Planning Committee (the Committee) was formed to develop recommended strategies to reduce nitrate levels in accordance with DEQ *Policy to Address Degraded Ground Water Quality Areas* (Policy Memorandum PM-004). The Committee has met in open public meetings since March 2004 to form the recommendations in this document. The Committee has agreed to promote and encourage a voluntary approach for addressing ground water contamination by nitrate in the NPA.

In Canyon County, 48 percent of the population resides on rural property. Most of the residents within this entire area have their own domestic well(s) for their water needs. Unless their wells have been included in a ground water study, their water quality may be unknown.

The Committee identified land-use activities that can potentially affect nitrate levels for ground water. To supplement existing regulations governing these activities, recommendations for each activity are provided in this document. These activities can be summarized as follows:

Agriculture – Employ irrigation and nutrient management techniques.

Industrial Wastewater Land Application – Rely on existing regulatory program.

Residential – Encourage developers and homeowners to conform to guidelines and regulations established for new construction of septic systems and wells.

Residential landscaping and animal pasture activities should follow the suggestions in the agriculture and animal feeding operation portions of this document.

Animal Feeding Operations (AFO) – Recommend separation, minimization, and proper management of waste products for all sizes of animal feeding facilities.

Stormwater – Address through ongoing regulation by local jurisdictions and additional activities in Urbanized Areas (U.S. Census Bureau definition) through implementation of NPDES permits.

The Committee will lead a cooperative effort with DEQ, the Idaho State Department of Agriculture (ISDA), the Public Health Districts and the Idaho Department of Water Resources (IDWR) to implement this plan. Other governmental agencies will also assist in conducting surveys, making presentations, and providing information. Education, public awareness, and adoption of recommendations are key to the success of this plan.

Presently, adoption of this plan is strictly voluntary. A compilation of ground water monitoring data collected by state agencies will be made each year by DEQ, with the support of the Committee. A more extensive review and evaluation of the effectiveness of the plan will be completed periodically as a joint effort among participating agencies and the Committee. At each step, modifications to the plan will be discussed. If improvements to ground water nitrate concentrations are not noted, regulatory intervention may become necessary.

1.0 Introduction

The Lower Boise/Canyon County Nitrate Priority Area (NPA) is located in the Treasure Valley and encompasses a little over one-half of Canyon County and a portion of Ada County near Kuna. The area covers 238,149 acres, or about 372 square miles, in southwest Idaho. The Lower Boise/Canyon County NPA has been placed on the Idaho Department of Environmental Quality (DEQ) nitrate priority list and is ranked the fourth highest in the state in terms of degradation.

The area has been critically impacted by nitrate contamination that may affect an estimated population of 80,806 residents who depend on this aquifer system as their primary source of drinking water. Ground water monitoring in the Lower Boise/Canyon County NPA has demonstrated elevated nitrate levels above the U.S. Environmental Protection Agency's established Maximum Contaminant Levels (MCL) for health concerns. Results of the 640 samples from domestic wells initially considered for the nitrate priority list included 32 percent with nitrate levels above 5 mg/L, the action level, and 9 percent of the wells with nitrate concentrations above the nitrate MCL of 10 mg/L.

Land-use activities that may play a significant role include agricultural fertilization, feedlots, livestock grazing, livestock waste, wastewater land application, stormwater runoff, and septic systems. Older or poorly constructed wells may be one factor in the deterioration of ground water quality by providing a conduit to introduce contamination. This management plan has been developed to educate the public on methods to prevent additional nitrate degradation and to improve existing conditions by education and voluntary actions.

The Committee has met in open public meetings since March 2004 to form the recommendations in this document. The Committee has agreed to promote and encourage a voluntary approach for addressing ground water contamination by nitrates in the NPA. Progress will be based on the evaluation process outlined in Section 6.0 Evaluation of Management Plan Progress and Success.

The objective of the proposed management strategies listed in this plan is to reduce ground water nitrate concentrations from local sources. The goals and objectives for this plan are as follows:

Goal: Reduce the level of nitrate in ground water.
Objective: Reduce sources of nitrate in a responsible and economical manner.

Goal: Actions taken under this Plan should be based on the best available scientific information.
Objective: Identify "hotspots" using results of monitoring studies and target activities to these areas.

Goal: Increase awareness of nitrate levels in ground water and potential health effects.

Objective: Target pregnant women and infants, the highest risk group, as the highest priority for education and outreach activities.

Nitrate as a Contaminant

Nitrate is a form of nitrogen found in the environment and comes from various sources. When plants and other organic matter decompose, nitrogen is converted to inorganic forms, mostly nitrate. Another environmental source of nitrate is discharge from septic or sewer systems. Nitrate also gets into the soil from animal feedlot wastes and nitrogen-based fertilizer application.

The U.S. Environmental Protection Agency (EPA)has established a federal drinking water standard, called a Maximum Contaminant Level (MCL), of 10 milligrams per liter (mg/L) or 10 parts per million (ppm) for nitrate. The Idaho ground water quality standard is also 10 mg/L. Nitrate concentrations of two mg/L or greater generally are considered to be above background in the Treasure Valley. Public water systems are required to sample for various contaminants, including nitrate, on a regular basis. Sampling of private domestic or stock wells is not required.

Infants younger than six months are sensitive to nitrate poisoning, which may result in serious illness or death. The illness occurs when nitrate is converted to nitrite in a child's body. Nitrite reduces oxygen in the child's blood, causing shortness of breath and blueness of skin, a condition called methemoglobinemia. This illness can be a serious condition in which the child's health deteriorates rapidly over a period of days. Other health effects may occur with long-term high exposure to nitrate. These include problems with reproduction and development as well as cancer.

Nitrate is often an indicator of aquifer vulnerability with the presence of higher concentrations of nitrate in ground water associated with land use activities. Whenever nitrogen-containing compounds come into contact with soil, a potential for nitrate leaching into ground water exists. Nitrate is highly soluble (> 1 kg/L) and will stay in solution in the percolation water, after leaving the root zone, until it reaches the ground water. Nutrient leachate usually moves vertically through the soil and dilutes rapidly downgradient from its source.

The primary factors affecting leachate movement are the layering of geologic materials, the hydraulic gradients, and the volume of the leachate discharge. A ground water vulnerability report prepared by the U.S. Geologic Survey (Rupert 1991) shows the Lower Boise/Canyon County area as having a high or very high vulnerability to ground water contamination. In this study, the probability for determining vulnerability was based upon depth-to-water, soils, and recharge.

Nitrate Area Prioritization Process

DEQ chairs the Ground Water Monitoring Technical Committee to compile the state's ground water quality data and to coordinate monitoring activities. This committee is comprised of technical representatives from local, state, and federal agencies and interested parties who have met regularly since 1996 to analyze trends in Idaho's ground water quality. From this process, nitrate became a concern for DEQ due to potential health risks to humans and livestock.

Pursuant to guidance provided in the DEQ Policy Memorandum PM004, "Policy for Addressing Degraded Ground Water Quality Areas," a statewide list of significantly degraded areas for nitrate was identified. The degraded areas were delineated using ground water quality monitoring analytical results from various agencies combined with hydrogeology and land use. The sources providing analytical results include:

Idaho Department of Water Resources (IDWR) – Statewide Ambient Ground Water Quality Monitoring Program

Idaho State Department of Agriculture (ISDA) – Regional and local ground water monitoring quality projects for agricultural related contaminants in agricultural areas

United States Geological Survey (USGS) – Various ground water quality monitoring projects throughout Idaho

Public Water Systems – Required monitoring and reported to Idaho DEQ

Idaho DEQ – Regional and local monitoring projects in response to detections found from other sources including health districts or originating from a complaint

If 25 percent of ground water samples in a hydrogeologically similar area were greater than or equal to one-half the drinking water standard for nitrate (NO3) or 5.00 milligrams per liter (mg/L) for public water systems, the area was delineated as an area of ground water quality degradation nitrate priority area. The drinking water standard for nitrate (NO3) is 10.00(mg/L). In Idaho, 25 areas met the criteria for being degraded by nitrate in the ground water.

The Nitrate Area Priority Ranking Process was developed by DEQ in consultation with the Ground Water Monitoring Technical Committee to provide rationale for numerically ranking areas in Idaho with identified ground water degradation from nitrate and to develop a statewide priority list for implementation of protective management strategies or corrective action measures within these areas.

The prioritization process considered three weighted principal criteria: population, existing water quality, and water quality trends. The population criterion considers the number of people living in the area who are potentially drinking nitrate-degraded water. The water quality criterion considers the concentration of nitrate contamination with respect to drinking water standards, and the water quality trend criterion considers water quality trends over time within each priority area.

The Lower Boise/Canyon County Nitrate Priority (See Figure 1 below) area is ranked as #4, with 32 percent of ground water samples being greater than or equal to one-half the drinking water standard and 9 percent exceeding the standard. A statistical trend analysis by the U.S. Geological Survey (USGS) of ground water quality in the Canyon County/Lower Boise Nitrate Priority area has determined the area to have an increasing trend in nitrate concentrations. The results of the USGS study used to help rank nitrate priority areas can be accessed through the following Web link: Analysis of Nitrate Concentration Trends in 25 Ground Water Quality Management Areas, Idaho, 1961-2001 (available at http://id.water.usgs.gov/PDF/wri024056/trends.pdf).

Data used to score priority areas are updated on a regular basis, and changes to the ranking list are scheduled to be reissued every five years. Monitoring data collected by the IDWR in 2003 indicated that the concentrations of nitrate in this area continue to show an increasing trend and moreover, are increasing in this area more than any other area in the state.

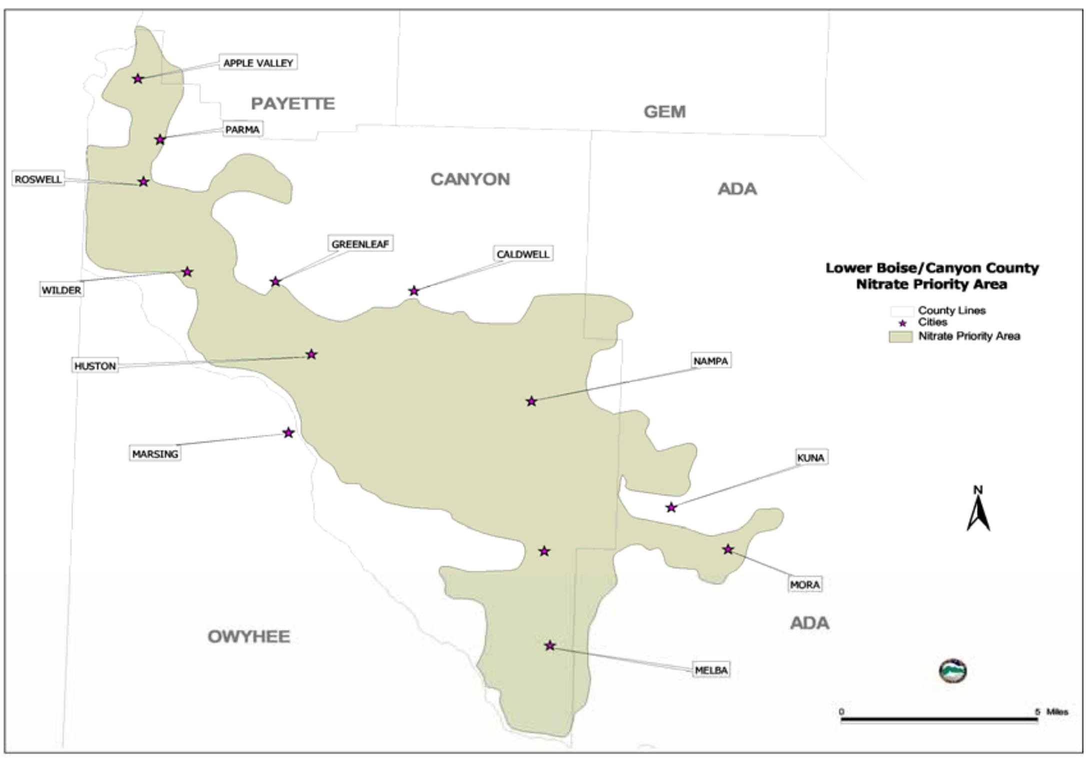


Figure 1. Lower Boise/Canyon County Nitrate Priority Area

2.0 Setting and Hydrogeology

The Lower Boise/Canyon County NPA is located within the western Snake River Plain, which is a topographic depression that extends across southern Idaho into eastern Oregon. The prominent physiographic feature is the Snake River Canyon.

The general stratigraphy of the western Snake River Plain from the surface downward consists of sedimentary deposits underlain by basalt flows, known as the Snake River Group. The Snake River Group is underlain by older sediments and basalt, known as the Idaho Group. The upper thick zone of sediments is up to 6,000 feet thick (Wood and Anderson, 1981). Tertiary volcanics underlie the Idaho Group. The granitic Idaho Batholith is generally considered to be the basement rock.

A substantial, laterally extensive layer of clay is found at depths of 300 to 700 feet below ground surface. The clay is important because it represents a significant aquitard in some areas, separating shallow overlying aquifers from deeper zones. The clay, often described in well logs as having a blue or gray color, has been observed as far west as Parma and as far east as Boise. The clay varies from a few feet to a few hundred feet in thickness. Wood indicates the blue clay is the lower part of the Idaho Group. In general, sediments above the blue clay are coarser-grained sands and gravels than the fine-grained interbedded sands, silts, and clays underlying the “blue clay.”

The drinking water aquifers in the Treasure Valley are grouped into two hydrogeologic systems. The Treasure Valley Shallow system consists of those aquifers that are generally within 250 feet of the land surface and above a distinct layer in the earth known as the “blue clay.” The Treasure Valley Shallow system is made up of gravels and sands with some thin layers of clay between in some places. The Treasure Valley Deep system consists of the aquifers that are generally deeper than about 250 feet and are below the blue clay. These aquifers are made up of fine-grained sands that are usually separated by thick layers of clay whose color is often blue or gray (Neely, 2001).

The recharge to the shallow aquifers is largely from seepage from canal systems and infiltration from irrigated agriculture (Lindholm, 1996; Petrich and Urban, 2004). Additional recharge to the shallow aquifers occurs from interaction with other water bodies (e.g., Lake Lowell), and possibly from upper reaches of the Boise River (e.g., Barber Dam to Capitol Street Bridge) during high flows. Additional recharge sources include mountain front recharge, underflow from the granitic Idaho Batholith and tributary sedimentary aquifers, and direct precipitation.

Discharge from the Treasure Valley Shallow aquifer system often is to local drains or streams. The time from recharge to discharge in these shallow flow systems (residence times) probably ranges from days to tens of years. In contrast, the Treasure Valley Deep aquifer system is thought to discharge primarily to the Boise and Snake Rivers in the western and southwestern parts of the valley.

The general direction of the ground water movement is dependent on location. The topography, Boise River, Snake River, and irrigation ditches have their own impact on the localized ground water direction. The Treasure Valley Deep aquifer system begins in the eastern part of the valley, as indicated by downward hydraulic gradients in the Boise Fan sediments (Squires et al., 1992).

Ground water for municipal, industrial, rural domestic, and irrigation uses in the Treasure Valley is drawn almost entirely from Snake River Group and Idaho Group aquifers. Many domestic wells draw water from shallow aquifers, such as those in the Snake River Group deposits. Larger production wells for municipal and agricultural uses draw water from the deeper Idaho Group sediments.

Soils

General soil types in the Canyon NPA are mixed alluvial sediments that are well-drained and somewhat excessively drained fine sandy loams, silt loams and loamy fine sands on fans and terraces. Soils affect water quality through pollutant attenuation. The impact to ground water quality from nitrates is dependent on the nature and thickness of unsaturated soil and other geologic materials overlying ground water. Critical soil attributes are organic matter, cation exchange capacity and depth. Appendix A-1 summarizes soil descriptions taken from the Soil Survey of Canyon Area, Idaho (Priest et al., 1972). The descriptions are very general and only consider the major soil units in the area.

Land Use

The land use in the Lower Boise/Canyon County NPA is predominately used for agricultural purposes (See Figure 2 on page 10). The percent of land uses within the boundaries of the NPA have not been calculated. Land uses for Canyon County as a whole are indicative of the land uses with the NPA.

Total percent of land used within Canyon County for agricultural purposes is 79.3 percent, according to Canyon County Assessor's Office 2004 statistics. The remaining 20.7 percent of the land is commercial (.2%), industrial (.2%), residential (8.2%), urban (within city limits – 6.1%), gravel pits (.3%) or exempt (5.8%).

Table 1. Existing Land Use in Canyon County 2004

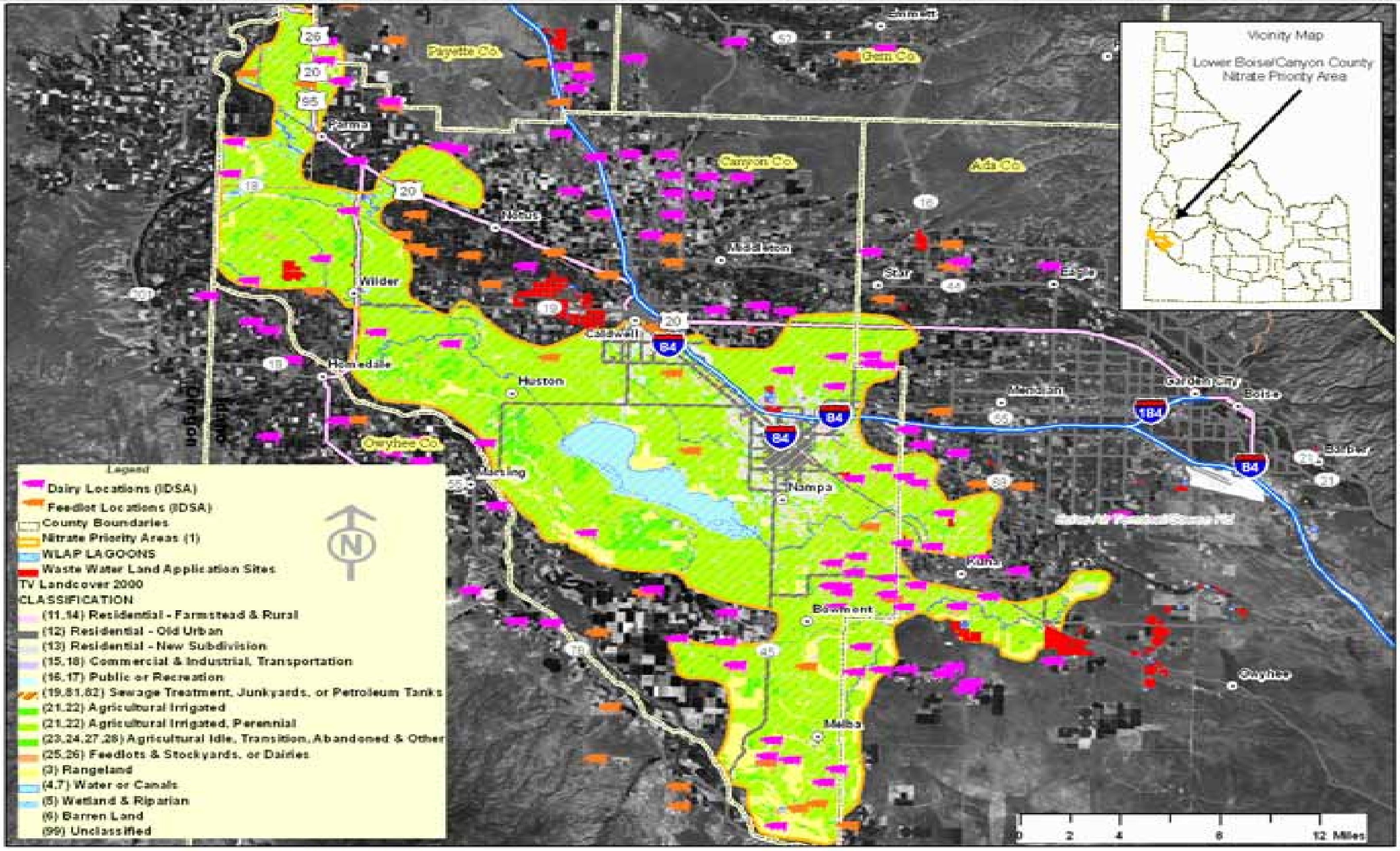
Land Use	Acres	Percent Total
Agricultural (irrigated agriculture and pasture)	273,787	75.3%
Dry Grazing	14,549	4%
Commercial	550	.2%
Gravel Pits	1,028	.3%
Industrial	662	.2%
Residential	29,725	8.2%
Urban (in city limits)	22,082	6.1%
Exempt Lands	21,213	5.8%
Total	363,596	100%
Source: Canyon County Assessor's Office		

Within the NPA, 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 residents in and near the city limits and sanitary sewer services are generally available.

In Canyon County, 48 percent of the population lives on rural property. Residents within this entire area have their own domestic well(s) 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 rural population relies on septic systems for wastewater disposal.

In Ada County, the area in the NPA is mostly zoned Rural Preservation, which is a 40-acre minimum size zone. A farm development right is available on some of the properties in this zone. It allows for a one-acre split on a parcel that has a minimum of 40 acres, but does not allow for more density.

Some areas closer to Kuna are zoned Rural Residential, which is a 10-acre minimum size zone. A nonfarm subdivision may be allowed on parcels with greater than 20 acres in this zone. It allows for a cluster subdivision with 75 percent deed-restricted open space. With the nonfarm subdivision, a community sewer system is required. A community well is required if there are more than 10 lots.



Lower Boise/Canyon County Nitrate Priority Area

Figure 2. Land Uses Within the NPA

Ground Water Quality

The federal drinking water standard, called a Maximum Contaminant Level (MCL) is 10 milligrams per liter (mg/L) for nitrate. The Idaho ground water quality standard is also 10 mg/L.

Figure 3 shows an outline of the Lower Boise/Canyon County Nitrate Priority area, with the majority of the area within Canyon County. The ground water sampling sites are color-coded by nitrate concentration, with red indicating samples exceeding the drinking water standard of 10 mg/L. Yellow indicates nitrate concentrations ranging from 5.00 – 9.99 mg/L. Symbols represent the various sources of analytical results. ISDA sample sites are shown as circles, public water systems as triangles and the remaining agency sampling sites as squares.

Domestic and irrigation wells were used as sampling sites. Wells of varying depths that included both the Treasure Valley shallow and deep aquifers were sampled. The final selection of wells was based on a thorough coverage of the sampling area to eliminate clustering of wells.

USGS ground water monitoring data in the Canyon County ground water quality management area includes 1,670 analyses from 613 wells from 1961to 2001. Of the 523 total wells with nitrate analyses, 364 are domestic wells, 55 are irrigation wells, 50 are monitoring wells, 20 are public water system wells, 10 are stock wells, one is a fire well and the remaining 23 have no use coded to them. The majority of the wells (more than 451) were completed at depths of less than 1,000 feet below the land surface. Wells with nitrate concentrations greater than 5 mg/L were less than 400 feet in depth.

A DEQ Water Quality Status Report for a Canyon County Ground Water Study (December 2000) was prepared based on field investigations conducted by DEQ and USGS during 1996 and 1997. The 1996 work included Nampa and surrounding area, and the 1997 work was conducted along the Boise River from Middleton to the Snake River. The study found nitrate levels exceeded 10 mg/L in 24 of 314 samples (8%). Twenty percent of the wells had nitrate levels between 5mg/L and < 10 mg/L, and 26 percent had elevated nitrate up to 5 mg/L.

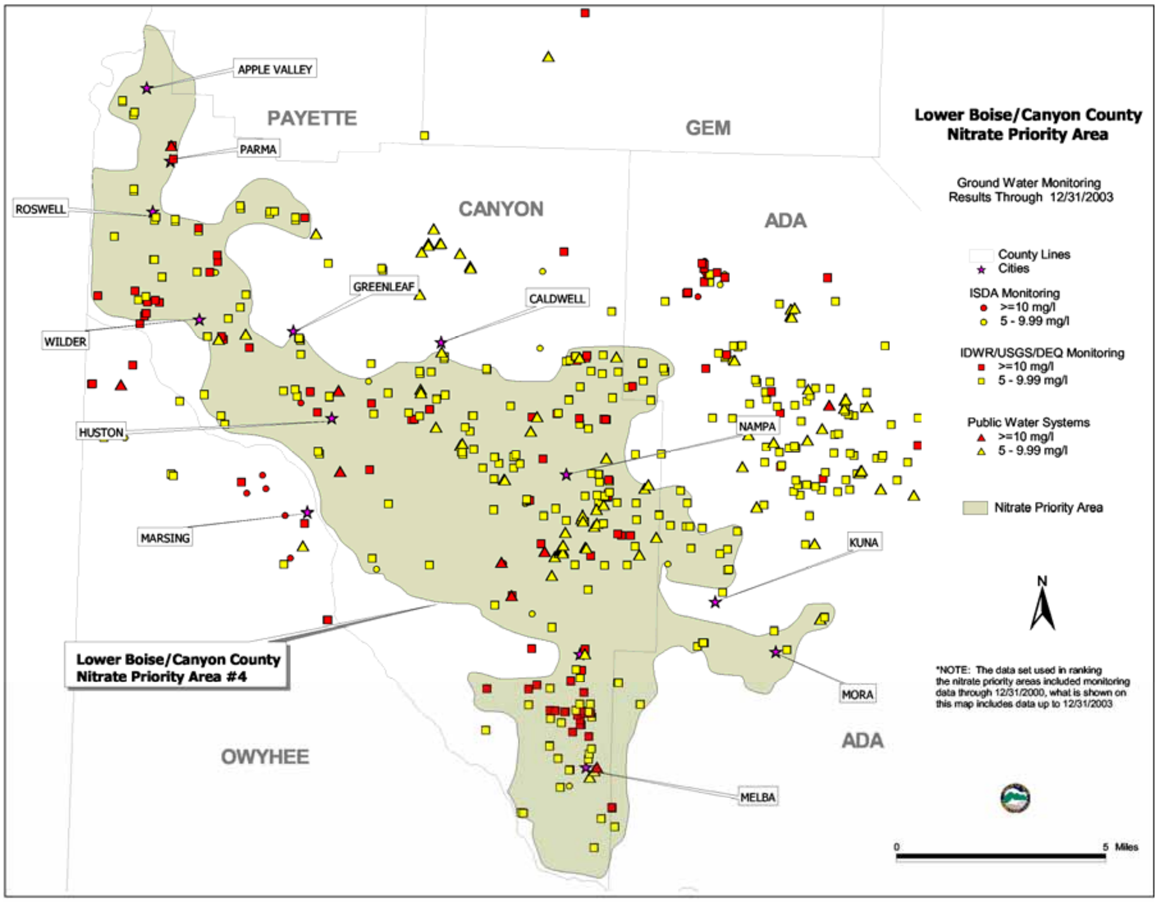


Figure 3. Lower Boise/Canyon County Nitrate Priority Area with nitrate results greater than or equal to one half the drinking water standard.

Nitrate is often an indicator of aquifer vulnerability because higher concentrations are generally caused by land use activities. More recent data collected between 1997 and 2000 show that 35 percent of the statewide program wells in the Treasure Valley Shallow system had nitrate levels equal to or greater than 5 milligrams per liter, and ten percent had concentrations over 10 mg/L (Neely, 2001). Nitrate concentrations of greater than 2.00 mg/L are generally considered to be above the background level in the Treasure Valley, and 10 mg/L nitrate is the drinking water standard. The map below shows the distribution of elevated nitrate concentrations in the Treasure Valley from the statewide program.

In 2003, 64 wells were sampled in the NPA. Three wells (4.5%) had nitrate concentrations greater than 10 mg/L, 12 wells (19%) had nitrate concentrations between 5.0 to < 10 mg/L, and 16 wells (25%) had nitrate concentrations between 2.0 to < 5.0 mg/L (IDWR, 2004). Trend analyses from the Statewide Ambient Ground Water Quality Monitoring Program (Neely, 2004) show an increase in nitrate levels in ground water in the Canyon County NPA.

3.0 Potential Sources of Nitrate Ground Water Contamination

A nonpoint pollutant source is a source of contamination with no visible or obvious point from which the contamination originates. The Committee identified the following land-use activities with practices that could affect ground water nitrate levels. When these land-use practices are managed appropriately, they do not result in water quality degradation. However, land-use practices such as these can lead to decreased water quality when poorly managed or inadequately controlled.

<u>Irrigated Agriculture</u>

The major sources of nitrate from agricultural activities come from all forms of fertilizers, legumes and organic matter. Nitrogen not utilized by plant growth is stored in the soil and can be leached to ground water as nitrate if sufficient water is available to move it through the soil profile.

Irrigated agriculture is the dominant land use in the county, with approximately 273,787 acres, or more than 75 percent of the county under cultivation. Several irrigation methods are used in the Canyon County NPA, including gravity, solid set, hand line, wheel line, drip, surge, and center pivot. All irrigation systems have the potential to increase nitrate levels in ground water. Gravity methods of irrigation are most highly disposed to the leaching of nitrate through the soil profile due to the volume of water applied.

Factors that influence the degree of nitrogen leaching in agriculture areas are soil type, irrigation amounts and practices, nitrogen source and application rate, and the season of application. Over-application of nitrogen can occur in several ways:

- Applying fertilizers at rates greater than crop uptake.
- Failing to account for residual and organic nitrogen sources present in the soil profile, especially nitrogen-fixing crops.
- Inappropriate timing of nutrient application with regard to crop needs.
- Failing to account for other nitrogen sources such as irrigation water.
- Improper handling of solid agricultural wastes.

A number of programs and activities address irrigation practices. The University of Idaho's Nutrient and Pest Management Program is an educational effort based on soil testing programs and soil fertility recommendations by soil type and crop. The Natural Resources Conservation Service (NRCS) with the Idaho Soil Conservation Commission and local soil conservation districts, coordinate and implement a number of programs that use cost sharing of best management practices and educational outreach to reduce nutrient loads from agriculture and provide nutrient management planning and engineering technical support, including the Environmental Quality Incentives Program (EQIP), the Soil and

Water Conservation Assistance Program, and the State Water Quality Program for Agriculture.

Animal Feeding Operations (AFO) and Dairies

Sources of nitrate from Animal Feeding Operations (AFO) include runoff, facility wastewater, and manure. An AFO is generally defined as the holding or confining of animals in buildings, pens or lots. Regulations for protecting ground water are in place for larger AFOs (more than 200 dairy cows or 1,000 steers) regarding solid and liquid effluents.

Disposal of on-site animal waste (manure) from AFOs is regulated through a Memorandum of Agreement between EPA, DEQ, and ISDA. Facilities with over one 1,000 animals must have an EPA issued National Pollutant Discharge Elimination System (NPDES) permit as required under federal law, if there is a discharge from the site. A facility with fewer than 1,000 animals may be required to obtain a permit if the ISDA Director determines it is necessary.

ISDA has the authority to promulgate and enforce rules for dairy operations. Non-compliance with the rules or discharge violations may result in revocation of authority to sell milk for human consumption. ISDA also conducts dairy waste inspections to prevent waste releases and evaluate waste collection, treatment, handling, disposal, and management procedures for compliance with the Clean Water Act and ISDA regulations. The practice of exporting waste off-site is currently not regulated by ISDA and was identified as a significant potential source of nitrate contamination.

ISDA also monitors ground water nitrate concentrations yearly at all dairies in Idaho and has authority to conduct follow-up testing and evaluation of dairy operations and wells showing elevated nitrates. Additionally, ISDA has authority to require further compliance and operation changes where there is evidence that a dairy is a source of nitrate and is contributing to aquifer degradation. To date, follow-up has been restricted due to limited staff resources.

Industrial Wastewater Land Application Areas

Wastewater land application facilities generate nutrient-rich process water. Such facilities are among the few sources of nitrate that are already regulated. These facilities are required to obtain a Wastewater Land Application Permit (WLAP) to apply wastewater to land. DEQ's regulatory waste discharge permit system requires land appliers to:

- Schedule process water applications to meet crop nutrient and water needs.
- Develop management plans for irrigation and nutrient use.
- Develop water and nutrient budgets.
- Sample wastewater, ground water, soil and crops as required by permit.

- Prepare reports on how activities are functioning and whether the process is meeting established goals.

Residential Land Uses

Septic Systems

Domestic septic systems may contribute to elevated ground water nitrate concentrations. The standard household septic system is not designed to effectively treat wastewater for nitrates. Properly operating systems deliver a certain amount of nitrate to the ground water (an average of about 45 mg/L nitrate (U.S. EPA 1978)). Generally, this source of nitrate is not a concern when the volume of wastewater is relatively small compared to the volume of ground water. Ground water problems can occur in areas where high septic densities exist. Areas of high septic density occur primarily within the urban growth boundaries of cities or in isolated subdivisions. In low-density settings, the impact to the ground water is low because of dilution by the ground water and the small volume of discharge spread over a large area. However, as densities increase, the discharge volume increases, and may overcome the ground water's ability to dilute the wastes, thereby increasing the potential for contamination.

Idaho's septic system regulations under IDAPA 58, Title 1, Chapter 03, Rules for Individual/Subsurface Sewage Disposal Systems, and IDAPA 58, Title 1, Chapter 15, Regulations Governing the Cleaning of Septic Tanks are fully established. Implementation is primarily through Idaho's public health districts, with technical assistance from DEQ.

The health districts implement the day-to-day activities in the program by conducting site evaluations, issuing system permits, issuing septic tank pumper licenses, and conducting inspections. This entails establishing design standards and accepted waste management practices for private septic systems, establishing the criteria under which sanitary permits are issued to build private septic systems that discharge pollutants to waters of the state, and establishing soil site evaluation standards for placement of septic systems.

DEQ responsibilities include conducting plan and specification reviews, reviewing nutrient-pathogen (N-P) studies, heading the technical guidance committee, and reviewing new technologies and providing training courses for installers and pumpers.

Other Residential Activities

Several other activities associated with residential development were also identified as possible contributors to nitrate problems in residential areas:

- Excessive fertilization related to landscaping, lawns, and gardens

- Over-watering related to landscaping, lawns, and gardens
- Well construction, well abandonment, wellhead management and well location
- Animal pastures and/or ranchettes (small residential acreages)

The combination of these activities with septic system discharge makes residential developments a potential source of nitrate contamination in ground water.

Contaminated water moving down a well casing from the land surface to ground water or moving between aquifers via well bores can contribute to the nitrate contamination problem. Improperly sealed wells can facilitate water movement, possibly carrying contaminants from land surface to the ground water or between aquifer units.

Locating a septic system or other contamination source too close to or up-gradient from a poorly sealed well may cause the well to capture contaminated water and allow contaminated water to move further into the aquifer or between aquifers. Improperly abandoned wells provide a direct connection between the surface and the aquifer, which could allow surface contamination a direct path to ground water.

Pasturing animals on small acreages can degrade ground water if not managed properly. Pasture management involves more than just grass care. It involves managing the interrelationships among animals, plants, and soil (Jensen 2002).

Information for rural residential homeowners is currently available from the Cooperative Extension Service and through the Home*A*Syst Project (H*A*S). The H*A*S is designed to help homeowners become aware of conditions or practices on their properties that increase the risk of drinking water contamination. The H*A*S materials allow homeowners, farmers, or ranchers to assess practices and activities for their potential to contaminate ground water. Fact sheets provide information about practices and structures that can help reduce the risk of ground water contamination. The Idaho Association of Soil Conservation Districts coordinates this project.

<u>Stormwater Disposal</u>

Land development increases stormwater runoff volumes and pollutant concentrations. Stormwater runoff contains a variety of contaminants, including nutrients. Nitrate has a low-to-moderate ground water contamination potential for both surface percolation and subsurface infiltration/injection practices because of its relatively low concentrations found in most stormwater (Pitt, et al., 1994).

The most common methods of stormwater management include ponds (retention, detention, evaporation, and infiltration), seepage beds, swales, or some combination.   Practices which infiltrate stormwater have the greatest potential to contribute nitrate to ground water.

Over the past thirty years, a number of local jurisdictions have implemented stormwater management functions at various levels of authority. These entities may have requirements for the detention or retention of stormwater runoff when development occurs. In practice, the jurisdictions that require on-site control of post-development flows expect retention of runoff. This is because few developments have access to a drain, canal, or water body for an off-site discharge.

In addition, federal stormwater regulations require some municipalities, construction sites greater than one acre, and certain types of industrial facilities to obtain permits from EPA to discharge stormwater. In the Lower Boise/Canyon County Nitrate Priority Area, permits are required for Nampa, Caldwell, and urbanized areas, as defined by the U.S. Census Bureau, within Canyon County. Federal regulations require that municipalities implement programs to control runoff from new development and redevelopment.

4.0 Nitrogen Budget

A nitrate budget was developed for potential sources of nitrogen (referred to as loads) that may impact water resources—especially ground water resources—within the boundaries of Canyon County. A description of how the nitrate budget was developed is included in Appendix B; results are displayed in Figure 4 below. The largest potential source of nitrogen that could impact ground water in Canyon County is nitrogen from fertilizer applications (47.7%). The second largest potential source of nitrogen is from dairy and cattle operations (37.5% overall). The remaining 14.8percent of the potential nitrogen sources can be attributed to domestic/urban waste (0.4%), other livestock (4.6%), legume crops plowed down (6.1%), industrial sources (2.4%), and precipitation sources (1.4%).

This does not mean the results of this evaluation should be interpreted to indicate that localized problems cannot occur from smaller sources of nitrogen. It means the bulk of potential nitrogen loading that can occur to ground water in Canyon County can be expected to come from farming and livestock operations within the county.

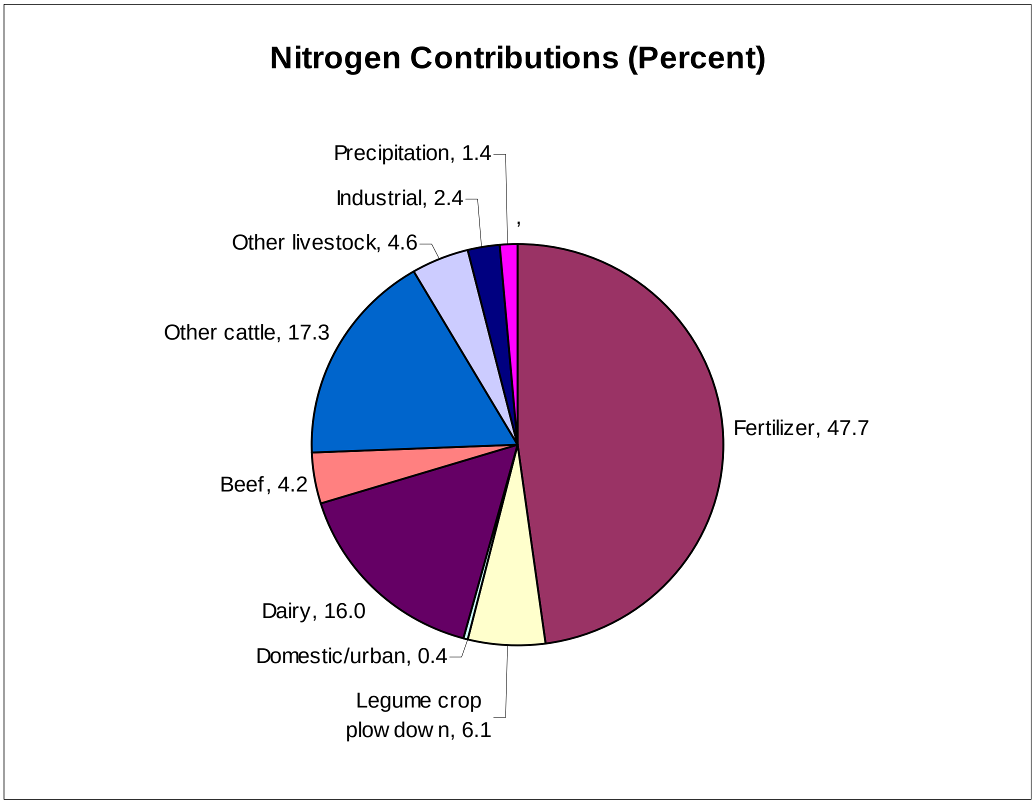


Figure 4. Estimated nitrogen loading for Canyon County, by source.

5.0 Recommended Strategies

A variety of tools can be utilized in the implementation of strategies to reach the stated goals of the plan. These can be generally categorized as education, on-the-ground actions, preventative maintenance, and program coordination.

- Technical assistance programs consist of literature, videos, workshops, etc. that can be shared with residents and local agencies. Sources of this information include DEQ, the ISDA, the University of Idaho Cooperative Extension Service, the Soil Conservation Commission, and local Soil Conservation Districts.

- Information/education programs are closely tied to the technical assistance program, but expanded to include a more broad-based public education program. Educational efforts should be tied together and targeted. Education should be the responsibility of many entities, governmental and private. Outreach efforts will be more successful if they address the primary motivators for behavioral change, which are money and the perception of risk. Included in the expanded program are public meetings, speaking engagements, educational activities in conjunction with local schools, workshops, and a series of public service messages through a variety of media including newspaper, television, and radio.

- Best Management Practices (BMPs) include structural, vegetative, and managerial strategies for agriculture, stormwater management, and rural residential land use activities. BMPs are a practice or combination of practices determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated.

The planning committee considers education to be one of the most effective methods for meeting the goals of this plan. On-the-ground application of effective BMPs is also crucial to achieving nitrate reductions.

DEQ, the Planning Committee, affected private landowners, and other agencies will cooperatively implement the plan with input from stakeholders through follow-up meetings. DEQ will oversee and track overall progress and monitor the ground water system. DEQ will coordinate implementation of this plan with other water quality planning documents and implementation plans, including the *Lower Boise Sediment and Bacteria Total Maximum Daily Load Implementation Plan* and source water protection plans developed for public drinking water systems. DEQ will also work with local governments on urban/suburban issues.

Stakeholders (landowners, local governing authorities, taxpayers, industries, and land managers) are the most educated regarding pollutant sources and will be called upon to help identify the most appropriate control actions for each area.

The following tables provide an initial list of proposed management strategies developed by the Committee. Potential participants are also identified.

Table 2. Education/Outreach Strategies

Implementing Entity	Strategy
Cooperative Extension Service, Committee	Provide education to all fertilizer users through Extension Service agents, workshops, a Web site, and materials such as newsletters and fact sheets. Information should address proper irrigation water application and fertilizer application procedures, rates (based on University of Idaho guidance), and timing, with consideration for crop up-take, migration of excess nitrates, and impacts to ground water.
Cooperative Extension Service	Encourage ongoing outreach and provision of information by Cooperative Extension Service to small acreage operations and part-time agricultural operations (hobby farms).
ISDA, SCDs, NRCS	Continue to educate operators on impacts to ground water and BMPs through nutrient management planning process. Update operators annually through annual site visits and evaluation. Provide additional public outreach as needed.
DEQ, Health Districts	Distribute educational materials to at-risk populations to increase awareness of nitrate contamination and associated health problems.
DEQ, Health Districts	Request analytical labs that report nitrate results include information concerning MCL and health effects to homeowners who submit samples for testing.
Cooperative Extension Service, Committee	Distribute University of Idaho publications to homeowners in priority areas through mass mailings or through distribution by local retailers, and develop new publications, as needed. Educational materials should address fertilizer/pesticide application rates and impacts to ground water.
SCDs, ISDA	Promote Home-A-Syst and Farm-A-Syst Programs to general public, producers, and new homebuyers through real estate agencies and bonding institutions.
Health Districts	Provide general brochure information on types of septic systems and their maintenance. Provide information to developer about septic system alternatives when applying for a septic permit and to homeowners when replacement systems are needed.
Committee, all agencies	Tie all education efforts together. Develop a Web site that provides information about all nitrate sources and the connection to ground water quality. Utilize resources of private sector for outreach and education (e.g. distribute information to new residents through title companies).
DEQ, Committee	Work with communities to promote proper fertilizer application in parks, cemeteries, schools, and golf courses.

Table 3. Studies/Research

Implementing Entity	Strategy
DEQ, IDWR, USGS, ISDA	Utilize GIS and conduct monitoring using a systematic approach, through coordinated efforts by all agencies, to characterize land use activities and their impacts. Develop ground water monitoring projects to determine the actual contributions of septic systems, residential fertilizer use, and agricultural fertilizer use. Evaluate seasonal nitrogen loading, with evaluation of soils and fertilizer load. Evaluate impact over time of "optimum" application rates and rates over "optimum." Determine the proportional contribution of "normal" application to the amount of nitrate concentration present in the area. Identify where CAFOs are located in a Nitrate Priority Area and collect site-specific data.
ISDA	Continue to use isotope testing to characterize source of nitrates, where appropriate.
IDWR	Strengthen and improve the availability and quality of data available through IDWR Clearinghouse.
Committee, all agencies	Identify hotspots and associated sources, by industry or region, through best available scientific information and lab analysis that include approved Quality Assurance/Quality Controls. Efforts to identify hotspots should be criteria-driven. Well logs could provide information. Focus implementation activities on hotspots in Nitrate Priority Area.
DEQ	Follow up on nutrient pathogen study with monitoring and modeling to determine accuracy and value.
Committee	Investigate change to current restriction of domestic irrigation limits of one-half acre to allow more pumping of shallow aquifer (< 30 feet in depth) with IDWR through pilot project so that nitrate in ground water can be used (remediation). Track fertilizer application and perform nutrient budget as part of project.
DEQ	Refine criteria used to establish nitrate priority areas. Use existing level 2 nutrient/pathogen studies and best available scientific data to refine nitrate priority areas.
ISDA	Research alternative operation and remediation techniques for use in animal feeding operations (e.g. permeable barriers, anaerobic digesters).

Table 4. Irrigated Agriculture Strategies

Implementing Entity	Strategy
Committee, ISDA, SCDs, ISCC, NRCS	Implement a demonstration project that will pay participants for yield losses if they occur when using University of Idaho fertilizer application guidelines.
ISDA, SCDs, ISCC, NRCS	Continue to use the ISDA "One Plan" to help farmers in priority areas develop BMPs.
ISDA, SCDs, ISCC, NRCS	Continue to work with producers to develop nutrient/irrigation management plans.
ISDA, SCDs, ISCC, NRCS	Promote/conduct soil testing. Use only labs on approved list of North American Proficiency Testing Program.

Table 5. Animal Feeding Operation Strategies

Implementing Entity	Strategy
ISDA, SCDs, NRCS	Include USDA or state recommendations for amount of land required for each animal in a CAFO operation to spread manure based on nitrogen application, crop uptake, and soil sampling.
Committee, ISDA, SCDs, NRCS	Increase funding/resources for ISDA for follow-up evaluations at CAFOs with high nitrates. Evaluate number of problems and plan additional funding for agency and contractor resources.
Committee	Support legislation for activities by ISDA to control third-party manure management through nutrient management planning activities.
ISDA, SCDs, NRCS	Large CAFOs should be regulated as industrial facilities. New applications pose a different scenario than existing operations. Require ground water testing and/or nutrient loading study (nutrient/pathogen type study) for all proposed CAFOs, especially in areas with higher risk potential (e.g. shallow ground water, fractured rocks). Develop approval criteria that consider the results of this ground water monitoring. Determine the potential impacts of animal feeding operations and dairies to ground water based on ground water separation, soil profiles, and animal density per acre through CAFO siting team. Approval criteria (currently used for new subdivisions) should also apply to all new land use changes (Including CAFOs). Wastewater treatment and boundary restrictions currently apply only to subdivisions, but should apply to all.

Counties	Identify specific areas or zones where new CAFOs should not be located, and where they will be compatible with existing land uses. Need to identify how we want the county to develop. This can be done through ongoing development of the Comprehensive Plan and Map. Do not continue to rely on Conditional Use Permits to control land use changes. Establish minimum distance for new residential subdivisions in relation to CAFOs. Wind and geography should be considered in placement.
Committee	Support legislation to require nutrient management plans for all animal feeding operations.

Table 6. Septic System Strategies

Implementing Entity	Strategy
DEQ, health districts	Continue to require nutrient/pathogen studies in Nitrate Priority Areas. Work with developers upfront on treatment solutions, using best available scientific information.
DEQ, health districts	Target septic systems for upgrades or retrofits in Nitrate Priority Area. Provide funding through grants or loans for upgrades or retrofits.
Committee, DEQ, health districts	Explore installation of sewer or creation of Unified Sewer Districts in high-growth areas and in areas of impact.
Committee, DEQ, health districts	Encourage cities to give higher funding priority to sewer systems in Nitrate Priority Areas.
Committee, DEQ, health districts	Encourage cities to allow access for hookup of sewer projects (high pressure systems) outside of the city where feasible. These systems would include annexation agreements.

Table 7. Land Application of Wastewater

Implementing Entity	Strategy
DEQ	Utilize information generated at land application sites to refine nitrate budget for certain crops.

DEQ, permittees	DEQ will continue to work with facilities to issue and/or re-issue wastewater land application permits to land apply wastewater, prevent runoff, and protect ground water quality. Implementation will rely on the current permitting practices of DEQ with input from the land appliers. Additionally, appliers will commit to the continued use of the Operation and Management Plans and Monitoring Plans required by their permits.

Table 8. Well Construction/Abandonment

Implementing Entity	Strategy
Committee, IDWR	Encourage highway departments to inventory shallow injection wells.
Committee, IDWR	Encourage proper well abandonment. Encourage government support and potential funding of this effort (e.g., loans).
Committee, IDWR	Provide information to homeowners on potential problems with older systems due to backflow problems.
Committee, IDWR	Promote testing of injection wells and discontinue use if they become contaminated.

Table 9. Funding

Implementing Entity	Strategy
Committee	Seek Section 319 monies to implement nutrient/irrigation management demonstration projects and educational activities. Seek EQIP and other funding opportunities. Agencies can assist.
Committee	Set priorities for where money will be spent. Determine cost/benefit relationship of each strategy and use to set priorities.

Table 10. General Strategies

Implementing Entity	Strategy
Committee, agencies	Begin implementation by getting support of county commissioners, followed by town hall meetings.
Committee, all agencies	Encourage closer cooperation among agencies as part of implementation activities (e.g. DEQ/IDA, IDWR/health districts, USGS)
Committee	Solicit support and resources from agricultural organizations for plan activities, notably education.
Committee, IDWR, drillers, health districts	Encourage agency communication and exchange of information with well drillers. Establish a dialogue among well drillers, IDWR, health districts.
Committee	Implement pilot projects first to see what is practical.

Counties	Encourage Transfer of Development Rights (TDRs) to be reconstituted and used in Canyon County.
Committee	Investigate legislative options to increase gray water use and continue to promote gray water use.

6.0 Plan Evaluation

The primary goal of this plan and the state Ground Water Quality Rule is to reduce the contamination of nitrate in the aquifer so that the area is no longer on the statewide nitrate priority list. Due to the slow nature of ground water movement, it is not anticipated that quantitative reductions in nitrate levels will occur during early implementation of the plan. Therefore, qualitative measures will be used to evaluate the progress and success of the plan in the short term (1 – 5 years). Once the plan is in place and is being implemented, the Committee recommends that the following activities occur to evaluate progress made in reducing nitrate contamination of the ground water.

- The Committee will meet annually to review implementation activities that have occurred and evaluate available monitoring results.
- The Committee will evaluate plan effectiveness and modify as needed.
- The Committee will annually evaluate plan activities based on population and land use changes.

A compilation of findings from federal, state, and local agencies will be made each year. DEQ, with the support of the Committee, will be the lead entity to compile and provide this information. The first review will be scheduled for 2006.

The qualitative evaluation will assess whether appropriate institutions promoted the plan recommendations and will include the documentation of activities, practices, and alternatives that have been adopted to reduce nitrate loading to the ground water. This evaluation will also consider whether protection strategies are still being promoted and what percentage of the citizens, businesses, and other organizations are participating in the plan.

Periodically, a quantitative evaluation will be performed on a longer interval to document the trend of nitrate levels since implementation of the plan. The ISDA (Ground Water Program) and IDWR (Statewide Ambient Ground Water Quality Monitoring Program) will continue to sample for nitrate on a regular basis. DEQ will assist with or will conduct follow-up activities that may include monitoring in response to detections of concern in public water systems or from other agencies. Determination of the success of this management plan will depend on the results of ongoing trend analyses, based on statistical analysis of monitoring results from the state monitoring networks. These activities will be a joint effort among DEQ, ISDA, SWDH, IDWR, and this Committee.

At each step, the Committee and governmental agencies will need to determine whether this management plan is addressing the ground water contamination concerns adequately or whether modifications need to be made to the plan to better enable success. If no improvements are noted, regulatory activities may be initiated per the Ground Water Rule (IDAPA 58.01.11.400.03).

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Appendix A. Active Committee Participants

Committee Participants

The following individuals actively participated in the meetings and discussion that contributed to the development of this Plan.

Stakeholders

Joe Canning, B&A Engineers
Jim Carrie, Snake River Building Contractors Association
Gary Duspiva, Well Driller
Sid Freeman, Farmer
Joyce Griffith, Caldwell Planning & Zoning Commission
Claudia Haynes, Citizen
Glenn Koch, Citizen
Mike McEvoy, Farm Bureau
Diane Sanders, Ada County Development Services
Marcella Stewart, Ada County Soil Conservation Commission
Rick Wells, Caldwell City Council Member
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Ken Neeley, IDWR
Jerry Neufeld, Cooperative Extension Service
Deb Parliman, USGS
Marv Patton, ISDA
Pam Smolczynski, DEQ
Paul Wakagawa, DEQ

Appendix B. Soil Information

Soils Information

Table A-1 summarizes soil descriptions taken from the Soil Survey of Canyon Area, Idaho (Priest et al., 1972). The descriptions are very general, and only consider the major soil units in the area.

Table A-1. Soil Association, Locations and General Characteristics

Soil Association	General Location	Characteristics
Turbyfill-Cencove-Feltham	Northwest to south along the Snake River including terraces near Sunnyslope, Central Cove and Apple Valley.	Composed of fine sandy loams and loamy fine sands. Generally moderate and is well to somewhat excessively drained
Greenleaf-Nyssaton-Garbutt	Northwest portions of NPA including the high lake terraces and alluvial fans located north of the Boise River near Parma and south of the Boise River near Greenleaf and Wilder.	Composed of silt loam to loam material and are well drained
Scism-Bahem-Trevino	Southern portions of NPA located on the high plateaus and terraces south of Lake Lowell and extend from Dry Lake and Lakeview to Bowmont and Melba.	Shallow to deep and composed of well drained silt loams. The soils overlie alluvial sediments or basaltic bedrock.
Minidoka-Marsing-Vickery	Central to southern portion of NPA found on the high ridges north and south of Lake Lowell.	Silt loams and loams over hardpan or gravel on high terraces.
Power-Purdam	Northern portion of NPA on the high river terraces south of the Boise River near Caldwell, north of Nampa, and near Huston.	The soils located on the high parts of the terraces are well drained, while the soils on the narrow bottom lands of streams and drainages are poorly drained in some areas. The soils are composed of silt loam or loam with a silty clay loam or silt loam subsoil.
Moulton-Bram-Baldock	Bottomlands along the Boise River	Composed of fine sandy loams to silt loams of the association and are somewhat poorly to moderately well drained.
Power-Potratz	High terraces and uplands east and southeast of Nampa	Deep to moderately deep and composed of well drained silt loams. On the higher parts of the terrace, well drained and mainly underlain by basalt.

Appendix C. Nitrate Budget

Nitrogen Loading Evaluation

Canyon County, Idaho

Developed by the Idaho Department of Environmental Quality

May 2005

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Purpose

The purpose of this report is to present an evaluation and summary of the potential sources of nitrogen (referred to as *loads*) that may impact water resources—especially ground water resources—within the boundaries of Canyon County.

Specific Objectives

The objectives of the nitrogen loading evaluation include the following:

- Obtain data on crops grown in the county and estimate, where practical, the nitrogen requirement for the major crops for the most recent year of record.
- Estimate the amount of nitrogen that may be released when legume crops are plowed under.
- Obtain census data for the county and estimate the potential nitrogen loading from domestic waste water treatment systems.
- Obtain livestock data for the county and estimate the potential nitrogen loading from animal wastes.
- Estimate the nitrogen loading from any permitted industrial wastewater land application sites in the county.
- Estimate nitrogen loading to the hydrologic cycle from atmospheric contributions in the form of precipitation for the county.

Limitations of the Data Used in the Evaluation

The following limitations apply to the data used in this evaluation of nitrogen loading:

- Some subtotals and totals are rounded. Therefore, the sum of individual values in the text will not always add up to the values in the tables.
- Data sources spanned 1999 to 2004, but data for all of the objectives listed above were not always available for the same year for all of the sources of nitrogen tabulated in this evaluation.
- Although the population in Canyon County continues to grow, areas under cultivation vary year by year for the crops noted, with the variation often highly dependent upon the predicted availability of irrigation water.
- Livestock numbers also vary and are dependent upon a number of factors, including international marketing.
- The data for the nitrogen sources falls within a five year time span (1999-2004) that is believed to provide reasonably comparable data.

Findings

Estimated nitrogen loadings for each of the categories identified in the study objectives are presented in the following sections.

Nitrogen Loading from Crop Fertilization

Estimates of nitrogen loading from crop fertilization (Table 1) were compiled using acreage data and recommended fertilization rates. Important information regarding the sources used for these estimates includes the following:

- Actual commercial fertilizer application rates are not available for Idaho, but the ***2002 Census of Agriculture County Data*** states that 131,460 acres in Canyon County were treated with commercial fertilizer, lime, and soil conditioners.
- An alternative approach can be used to estimate the amount of nitrogen that may have been applied to crops. Nitrogen application rates can be estimated by calculating the amount of nitrogen fertilizer that is recommended for application by using guidelines recommended by the University of Idaho (Tindall, 1991). The application rate used in this evaluation assumes the presence of some residual nitrogen in the soil. A mid-point value for the application rate is used where the guidelines allow this interpolation or other rate as recommended in Tindall (1991).
- Corn and oats are divided into two categories unlike the other crops. These crops are listed as grain and silage (corn) and grain and hay (oats) to allow the separation of the potential nitrogen loading because silage and hay are fed to livestock where the potential nitrogen loading also is estimated. The census only reports oats harvested as grain so it is assumed the balance is harvested as hay for livestock feed. This approach minimizes the double counting of nitrogen loading as fertilizer and again as animal waste. It is recognized that some portion of the locally grown grain will be used as livestock feed but the amount used in this manner is not known. Further complicating this aspect of the potential loading is the importation of grain and other protein supplements for livestock feed but this aspect of the evaluation is believed to be accounted for in the livestock waste estimates.
- The estimates of crops grown in Canyon County are based on summaries provided by Idaho Agricultural Statistics Service (IASS) from summaries released for 2002, the U.S. Department of Agriculture (USDA) Farm Services Agency (Caldwell), and the ***Idaho Fruit Tree Census 1999***. It should be noted that the **Census** reported significant changes in the acreages of some of the crops noted below compared to the previous census. Acreages for some crops increased dramatically—such as wine grapes, which doubled—but acreages for other crops, dropped by more than half since 1993.
- The values presented in Table 1 are presented for estimating the potential nitrogen load and do not reflect current crop statistics for fruits.
- Estimates of nitrogen fertilizer applied in other agricultural related enterprises are not readily quantifiable given the availability of data and variety of crops raised. For instance, about 4,800 acres are used in Canyon County for nurseries, greenhouses, floriculture, aquatic plants, mushrooms, flower seeds, vegetable seeds, and sod. About 22 acres are used for production of berries. The types of fertilizers used and the applications rates are not known for these enterprises.

Table 1. Nitrogen loading from crop fertilization.

Crop	Crop Year	Acres Harvested (Acre)[c]	Avg. County Yield (units/area)	U of I Guidelines (lbs/acre)	N - Total Required (lbs)
Alfalfa	2003	52,100	5.43 tons/ac	0	0
Barley	2003	4,900	103 bushels/ac	140	686,000
All Bean[d]	2003	12,877	unknown	30	386,310
Corn - grain[d]	2003	16,265	unknown	135	2,195,775
Corn - silage[d,f]	2003	16,265	unknown	130	2,114,450
Oats - grain	2003	300	113 bushels/ac	140	42,000
Oats - hay[f]	2003	2,700	unknown	140	378,000
Onions[d]	2003	4,716	unknown	60	282,960
Peas[d]	2003	3,920	unknown	30	117,600
Potatoes	2003	8,800	463 Cwt[e]/ac	180	1,584,000
Sugar Beets	2003	14,200	32.2 tons/ac	120	1,704,000
Wheat	2002	22,812	103.9 bushels/ac	140	3,193,680
Mint	2002	6,750	101.4 lbs/ac	130	877,500
Wine Grapes[a]	1999	492	unknown	230	113,160
Subtotal		146,154			11,182,985
Crop	Crop Year	Plants[c]	Estimated Acreage[c]	Applied per Plant	N- Total Required
			(ac)	(lbs/plant)	(lbs)
Apples[b]	1999	509,563	2,740	0.16	81,500
Peaches	1999	149,969	914	0.16	24,900
Sweet Cherries	1999	62,800	532	0.16	10,000
Prunes & Plums	1999	19,488	132	0.16	3,120
Pears	1999	13,318	99	0.16	2,130
Apricots	1999	11,609	91	0.16	1,860
Nectarines	1999	7,179	48	0.16	1,150
Subtotal			4,556		124,660
Total					11,307,645

Notes:

a Nitrogen application rate from Davenport et al, 2003.

b Nitrogen application rate for young trees but applied to all trees; average value recommended by Tindall (1991) for various types of nitrogen sources.

c Acreages obtained from Idaho Agricultural Statistics Service, Idaho County Estimates 2003; U.S. Department of Agriculture, National Agricultural Statistics Service, 2002 Census of Agriculture - County Data; U.S. Department of Agriculture, Idaho Agricultural Statistics Service, Idaho Fruit Tree Census 1999.

d USDA Farm Services Agency, March 2005, Caldwell, Idaho, personal communication from Jeff Bohr

e Cwt = hundred-weight.

f Corn raised for silage and oats raised for non-grain uses is assumed to be used locally for feed for livestock; nitrogen applied as fertilizer is not counted in this table because nitrogen also is accumulated in livestock waste in a later table.

Nitrogen Loading from Plowing Down Legume Crops

Nitrogen is released to the soil when legume crops are plowed down. This estimated nitrogen load is based on the plowing down of alfalfa, pea, and bean acreages and is shown in Table 2.

Values shown in Table 2 were estimated by multiplying the acreage for each crop by a factor of 60 pounds per acre for alfalfa and 40 pounds per acre for peas and beans (Tindall, 1991, Information Series 373). It is further assumed that one quarter of the alfalfa acreage is rotated out of production each year, so the potential nitrogen loading is based on one quarter of the potential total nitrogen load of alfalfa. Beans, in contrast, are an annual crop, so the total acreage is assumed to be plowed down each year. Total nitrogen loading is then as follows:

- Of the 52,100 acres of alfalfa in Canyon County, about 13,000 acres are assumed to be plowed down each year. The estimated release of nitrogen is therefore 780,000 pounds, based on the 60 pounds per acre noted above.
- About 3,920 acres of peas and 12,900 acres of beans are raised in Canyon County; if the entire acreage is assumed to be plowed down, the estimated release of nitrogen is, therefore, about 673,000 pounds (156,800 + 516,000).

Table 2. Nitrogen loading from plowing down legume crops.

Crop	Acres[a]	N contribution (lbs/acre)[b]	Total Nitrogen (lbs)
Alfalfa	13,000	60	780,000
Peas	3,920	40	156,800
Beans	12,900	40	516,000
Total			1,452,800
Notes:	a Acreage reported in Idaho Agricultural Statistics Service, Idaho County Estimates 2003 and USDA Farm Service Agency, Caldwell (personal communication from Jeff Bohr)		
	b Nitrogen contribution is based on estimated provided in Tillman, 1991, Current Information Series No. 373.		

Nitrogen Loading from Domestic and Urban Sources

Domestic wastewater also contributes to nitrogen loading as shown in Table 3. Notes regarding the data used in the estimate include the following:

- The 2002 census shows the population of Canyon County at 152,770; 29,120 from that figure are attributed to rural areas. The estimated population in 2005 will total 164,000 with 29,690 people living in rural areas. This reflects an estimated increase of 7% in the overall population and 2% in the rural population.
- The U.S. Environmental Protection Agency (2002) compiled data from various studies of residential wastewater flows and found the average flow rate is 68.6 gal/person/day. The estimated rate of nitrogen loading that can occur to ground water has been updated to reflect studies of wastewater systems that include Total Kjeldahl Nitrogen (TKN) and nitrate as effluent from the septic tank and soil water at 1.97 ft (0.6 meters) and 3.94 ft (1.2 meters) depths. The TKN concentration decreases with depth, and the nitrate concentration increases with depth, due to conversion processes that occur in situ. The nitrate concentration at 3.94 ft depth averaged 13.0 mg/L in the studies, and this value is assumed to percolate to ground water in the aquifer with minimal changes.
- It should be noted that nitrogen from domestic waste is applied through drainfields below the crop root zone; little or no nitrogen is removed by plants, and it is assumed to be available to migrate to ground water.

Table 3. Nitrogen loading from domestic and urban sources

	Area Population	Human Nitrogen Contribution (lb/gal)[a]	Individual Nitrogen Contribution (lb/day)[c]	Total Human N Contribution (lbs/day)[d]	Total Human N Contribution (lbs/yr)
Rural Canyon Co.	29,120	0.0001085	0.007	217	79,111
	(68.6 gallons per day per person)	(13 mg/L)			
Urban Canyon County[b]	2 schools	0.000025	--	0.384	140
	(15,345 gallons per day)	(3 mg/L limit)			
Total					79,251
Notes:	a Human nitrogen contribution is 13.0 mg/L (EPA 2002) for residences, 3 mg/L for schools				
	b Wastewater package treatment systems; Nampa Charter School (6088-02) and Purple Sage Elementary School (6197-02)				
	c For the rural population, multiply the Human Nitrogen Contribution by 68.6 gallons per day; for the schools, there is no individual value.				
	d For the urban schools, multiply the daily flow by the 3mg/L limit.				

In addition, the Southwest District Board of Health (SWDH, 2005) has permitted the large soil absorption systems listed in Table 4; these systems contribute an additional 76,900 pounds per year.

Table 4. Large Soil Absorption Systems in SWDH Service Area; Canyon County.

Name	Location	Flow (gal/day)	Nitrogen Load (lbs/day)[a]	Nitrogen Load (lbs/yr)
Russell Ward[b]	17671 Oasis Road	13,500	1.5	535
Deer Flat Free	17703 Beet Road	5,600	0.6	222
Dr. E.G. Johnson	1142 Hwy 20/26	2,500	0.3	99
City of Caldwell	Purple Sage Road	2,500	0.3	99
East Canyon Elementary	18408 Northside	14,500	1.6	574
Central Canyon Elementary	16437 South Florida	10,800	1.2	428
Vallivue Middle School	16412 S. 10th	1,950	0.2	77
West Canyon Elementary	Ustick Road	Unknown. Not listed on permit.	NA	
Middleton Elementary	El Paso Road	9,000	1.0	356
Sunnyridge School	506 Fletcher Road	4,200	0.5	166
Shalimar Terrace[c]	2815 Greenval	15,000	1.6	594
Sorrento Lactalis	4912 Franklin	8,000	0.9	317
Liberty Charter	1063 E Lewis Lane	6,345	0.7	251
Leisure Heights Subdivision[d]	534 Lakeridge	17,050	1.8	675
Roswell Cooperative	Howard Street	9,000	1.0	356
SSI Corporation	Hwy 95	4,000	0.4	158
Subtotal				4,909
Notes:	Revised 3/9/05; modified by DEQ 3/14/05			
	a Nitrogen contribution of from domestic waste is based on U.S. Environmental Protection Agency (EPA 2002) value of 13mg/L (0.0001085 lb/gal).			
	b 27,000 gal septic tank; expected flow 13,500 gal/day			
	c 30,000 gal. septic tank; expected flow 15,000 gal/day			
	d 34,100 gal. septic tank; expected flow 17,050 gal/day			

The total nitrogen loading from domestic and urban sources is the sum of the 79,251 pounds shown in Table 3 and the 4,910 pounds shown in Table 4—or 84,160 pounds.

Nitrogen Loading from Livestock/Animal Waste

The nitrogen contribution from livestock in Canyon County (Table 5) is based on U.S. Department of Agriculture census data for 2002 and guidelines for estimating the production of nitrogen from animal wastes:

- The estimates for nitrogen in the waste generated by the livestock are assumed to be applied directly to the land, except where the livestock would normally be confined and the wastes stored before application.
- In the case where wastes are stored before application to the land, the residual nitrogen is estimated using guidelines developed by the university extension services. These guidelines account for losses of nitrogen during storage (30%) and losses that occur during handling and spreading (20%).
- In some cases, the estimated amount of nitrogen generated by a species was not available, so the value for an animal of the nearest weight was used for this estimation (such as beef for elk, and turkeys for geese).

Table 5. Nitrogen loading from livestock/animal waste.

Livestock Type	# of Animals[a]	Estimated Nitrogen (lbs/animal/yr)	Total Nitrogen (lbs/yr)
Dairy[b]	29,384	129	3,790,536
Beef[b]	17,934	55	986,370
Other cattle[b,f]	74,400	55	4,092,000
Subtotal			8,868,906
Horses & Ponies[c]	6,999	110	769,890
Sheep	23,769	9.2	218,675
Hogs & Pigs[b]	1,805	14	25,270
Goats	1,373	23	31,579
Bison	270	99	26,730
Llamas[d]	214	23	4,922
Layers, Pullets, Meat[b]	7,141	0.56	3,999
Elk	24	99	2,376
Ducks	285	1.6	456
Geese[e]	131	3.4	445
Subtotal			1,084,342
Total			9,953,248

Notes:

a Source is U.S. Department of Agriculture, National Agricultural Statistics Service, 2002 Census of Agriculture – County Data.

b Animals are assumed to be confined and waste collected and stored before application.

c Numbers of horses and ponies summed without regard to weight difference.

d Value assigned to llamas is from data for goats.

e Value assigned to geese is from data for turkeys.

f 2002 census combines heifers and heifer calves, steers, steer calves, bulls, and bull calves into "Other Cattle."

Nitrogen Loading from Industrial Sources

Nitrogen is applied to the ground at two Wastewater Land Application sites in Canyon County (Table 6). These two sites are Simplot at the Caldwell complex and SSI Food Services, Inc. near Wilder, and the data are based on performance reports provided by the facilities to the Idaho Department of Environmental Quality. The total nitrogen applied was summed for the acreages under application, using the amount of nitrogen stated as being applied to those acreages. (It should be noted that these facilities routinely report the amount of wastewater and nutrients applied to their land application sites and the amount of nutrients removed by cropping the acreage. The net balance for nitrogen is negative in that the crops remove more nitrogen than is applied to the land.)

Table 6. Nitrogen loading from industrial sources.

	Acreage (ac)	Total Nitrogen Applied (lbs/year)
Simplot Caldwell[a]	1,793.50	510,000
SSI Food Services[b]	372.1	61,180
Total		571,180
Notes:	a Data submitted for 2004 (April 1, 2003 – March 31, 2004); The J.R. Simplot Company; Permit LA-000008-03	
	b Data submitted for 2003 (November 2002 – October 2003); SSI Food Services Inc., February 2004; Permit LA-000095-02	

Nitrogen Loading from Precipitation

Total nitrogen deposited by precipitation can be estimated for Canyon County using the same methods employed by Rupert (1996) for the upper Snake River Basin. Equation 1 defines the approach for developing this estimate:

$$B = (E \times Q \times I) \times D,$$

Equation 1. Nitrogen as a function of precipitation and dry deposition.

Where:

B = total nitrogen input from precipitation (kg),
E = total nitrogen concentration in precipitation (mg/L),
Q = annual rainfall (m),
I = land area within the county (m^2), and
D = dry deposition constant (unitless).

Values used for this evaluation are as follows:

- Maupin (1995) estimated the total nitrogen in precipitation (E) for the upper Snake River Basin to range from 0.18 to 0.27 mg/L. The midrange concentration (0.23 mg/L) total nitrogen is used to calculate the nitrogen contribution from precipitation for this evaluation.

- Average annual precipitation (Q) is 11.16 inches (0.283 m) at the Nampa Sugar Factory, based on records from 1976 to 2004 (Western Regional Climate Center).
- Canyon County covers (I) 603 square miles (1.56 E+09 m^2) (State of Idaho, 2005).
- Rupert (1996) used a dry deposition constant (D) of 1.444 to convert the wet deposition value to total nitrogen supplied by wet and dry deposition.

Applying these values to Equation 1 yields the following:

$$B = \{(0.23 \text{ mg/L})\ (0.283 \text{ m})\ (1.56E{+}09 \text{m}^2)\ (1.444)\ (1{,}000 \text{ L/m}^3)\} \div (1E{+}06 \text{ mg/kg})$$

$$B = 147{,}000 \text{ kg}$$

$$B = 324{,}000 \text{ lbs}$$

Total Estimated Nitrogen Loading

The total nitrogen loading that potentially is applied to the land surface in Canyon County (Table 7) can be estimated by combining the subtotals of the six[1] categories of sources described above. Figure 1 presents the same information graphically.

Table 7. Total estimated nitrogen loading for Canyon County.

Source	Nitrogen Contribution (lbs)	Percent Contribution
Fertilizer	11,307,645	47.7
Legume crop plowdown	1,452,800	6.1
Domestic/urban	84,160	0.4
Dairy	3,790,536	16.0
Beef	986,370	4.2
Other cattle	4,092,000	17.3
Other livestock	1,080,000	4.6
Industrial	571,180	2.4
Precipitation	324,000	1.4
Total	23,688,691	100

[1] Because of the relative magnitude of the nitrogen loading contributed by animal waste, this category is presented using data from four subcategories: dairy, beef, other cattle, and other livestock.

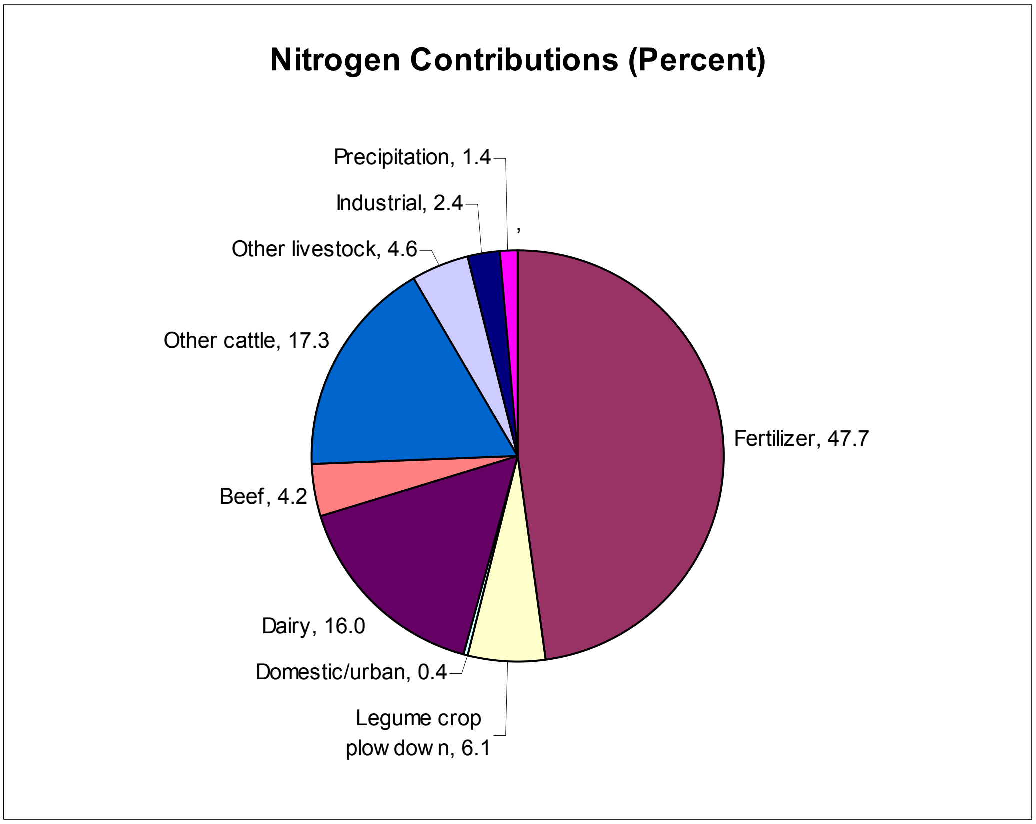

Figure 1. Estimated nitrogen loading for Canyon County, by source.

Summary and Conclusions

It is apparent that the largest potential source of nitrogen that could impact ground water in Canyon County is nitrogen from fertilizer applications (47.7%). The second largest potential source of nitrogen is from dairy and cattle operations (37.5% overall). The remaining 14.8% of the potential nitrogen sources can be attributed to domestic/urban waste (0.4%), other livestock (4.6%), legume crops plowed down (6.1%), industrial sources (2.4%), and precipitation sources (1.4%).

This does not mean the results of this evaluation should be interpreted to indicate that localized problems cannot occur from the smaller sources of nitrogen. What it does mean is that the bulk of the potential nitrogen loading that can occur to ground water in Canyon County can be expected to come from farming and livestock operations within the county.

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Western Regional Climate Center; wrcc@dri.edu, http://www.wrcc.dri.edu/

Appendix D. Glossary

Glossary

Animal Feeding Operation (AFO) – The holding of any number of animals in buildings, pens, or lots.

Agricultural activity/Agriculture – Any activity conducted on land or water for the purpose of producing an agricultural commodity, including crops, livestock, trees, and fish.

Ambient – The best-assumed level of water quality prior to human land use activities.

Anti-backflow (anti-back siphoning) device – A check valve or other mechanical device to prevent the unwanted reverse flow of liquids back down a water supply pipe into a well.

Aquifer – A geological formation of permeable saturated material, such as rock, sand, gravel, etc., capable of yielding economically significant quantities of water to wells and springs.

Background concentration – is defined in two different ways:

Natural background ground water quality – The ground water quality unaffected by man.

Site background ground water quality – The ground water quality directly up gradient of a site.

Beneficial uses – Various uses of ground water in Idaho include, but are not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, aquacultural water supplies, and mining. A beneficial use is defined as an actual current or projected future use of ground water.

Best management practice (BMP) – A practice or combination of practices determined to be the most effective and practical means of preventing or reducing contamination to ground water and/or surface water from nonpoint and point sources in order to achieve water quality goals and protect the beneficial uses of the water.

Coliform – A type of bacteria found in water that, when present in drinking water, carries the risk of spreading a water-borne illness.

Compost – A biologically stable material derived from the biological decomposition of organic matter.

Constituent – an element or component.

Contaminant – Any chemical, ion, radionuclide, synthetic organic compound, microorganism, waste or other substance that does not occur naturally in ground water, or a constituent that occurs naturally that may cause health concerns.

Crops needs – Factors required by a crop in order to grow, such as water, nutrients, and sunlight.

Crop root zone – The zone that extends from the surface of the soil to the depth of the deepest crop root and is specific to a species of plant, group of plants or crop.

Crop uptake – Water and nutrients actually used by the crop.

Degradation – When a numerical ground water quality standard has been exceeded.

Denitrification – The volatilization of nitrate into nitrogen gas, which dissipates into the air.

Effluent, solid or liquid – Any waste material moving away from its point of origin.

Fertilizer – Any substance containing one or more plant nutrients utilized to enhance plant nutrient content and/or for promoting plant growth.

Ground water – Any water that occurs beneath the surface of the earth in a saturated geological formation of rock or soil.

Ground Water Quality Standards – Values, either numeric or narrative, assigned to any contaminant for the purpose of establishing maximum levels or protection, a portion of the Idaho Ground Water Quality Rule, IDAPA 58.01.11.

Infiltration rate – The rate at which water infiltrates or seeps into the soil.

Injection well – The subsurface emplacement of fluids. The purpose of injection by Class V wells is the temporary or permanent disposal or storage of fluids into subsurface geologic formations.

Irrigation water management – Determining and controlling the rate, amount and timing of irrigation water in a planned and efficient manner.

Leach – To dissolve nitrogen (or other constituents) in water, potentially enabling these constituents to reach the ground water.

Legume – Crops having nodules on the roots containing bacteria that are able to convert nitrogen in the air into a usable form for the plant.

Liquid manure – A mixture of water and manure that can be pumped, generally less than 10 percent solids.

Livestock wastes – A term sometimes applied to manure that may also contain bedding, spilled feed, water or soil. It also includes wastes not particularly associated with manure, such as milking center or washing wastes, milk, hair, feathers or other debris.

Local government – Cities, counties and other political entities of the state.
Manure – The fecal and urinary excretions of livestock and poultry.

MCL (Maximum Contaminant Level) - The maximum level a contaminant is considered safe for human health as determined by the U.S. Environmental Protection Agency.

Mg/L (Milligrams per liter) – The weight of a substance measured in milligrams contained in one liter.

Mineralization – Increases in concentration of one or more inorganic constituents resulting from contact of ground water with geologic formations.

Nitrate – A common contaminant identified in ground water that is a component in fertilizer, is found in wastes at the soil surface, and occurs naturally in the soil, through a process such as mineralization of organic nitrogen. The MCL for nitrate is 10 mg/L.

Nitrification – Microbial oxidation of ammonia to nitrate.

Nitrogen-fixing crop – A crop that is able to take nitrogen from the air and convey it to microorganisms in soil for consumption.

Nonpoint source – A contaminant or pollutant released in a diffuse manner of entry into a water body so there is no identifiable or specific point of entry.

Nutrient – Any substance applied to the land surface or to plants that is intended to improve germination, growth, yield, product quality, reproduction, or other desirable characteristics of plants.

Nutrient management – Managing the amount, form, placement and timing of the plant nutrient applications.

Nutrient management plan – A plan for managing the amount, placement, form and timing of the land application of nutrients and soil amendments.

Nutrient-pathogen Evaluation – A scientifically based comprehensive site evaluation of soils, geologic conditions and hydrology in an area to evaluate potential impacts to ground and surface waters from effluent of on-site wastewater treatment systems.

Organic matter – Substances of biological origin that contain carbon-decaying cells of plants, microorganisms, or small animals.

Organic nitrogen – A form unavailable to plants until the mineralization process takes place. Most of this type of nitrogen is bonded to carbon in living and decaying cells of plants, microorganisms, or small animals.

Point source – A contaminant or pollutant, often released in concentrated form, from a conveyance system or discrete source, such as from a pipe, into a body of water.

Pond – A water impoundment made by constructing a dam or an embankment or by excavating a pit or dugout.

Process water – Water used in a facility or an AFO that cleans equipment, the facility, or animals.

Public Water Systems – Serves at least 15 service connections used by year-round residents or regularly serves a population of at least 25 year-round residents.

Recharge area – An area in which water infiltrates the soil or geological formation through precipitation, irrigation practices, and/or seepage from creeks, streams, lakes, etc., and percolates into one or more aquifers.

Residual nitrogen/nutrients – Residual or unused nitrogen remaining in the soil after a crop is harvested.

Root zone – The zone within a soil profile where the roots predominate, normally at 0 – 9 inches of soil depth.

Soil characteristics – Parameters, often generated from lab tests, used to describe or quantify the basic characteristics of a soil.

Soil profile – A vertical section of soil delineating the distinct horizontal layers of various soils and geologic formations in a given area.

Solid manure storage – A storage facility in which accumulations of bedded manure or solid manure are stacked before subsequent handling and field spreading.

Total maximum daily load (TMDL) – Determination of water bodies capacity to support beneficial uses.

Volatilization – The dissipation of gaseous components, such as ammonium nitrogen, from animal manure or other substances.

Waste storage pond – An impoundment made by excavation or earthfill for temporary storage of industrial or agricultural waste.

Waste treatment lagoon – An impoundment made by excavation or earthfill to biologically treat industrial or agricultural waste.

Wastewater – Process water after use within a facility or AFO; the water is usually treated prior to disposal.

Water quality – The excellence of water in comparison with its intended use or uses.

Well bore – The actual hole dug by a well drilling rig.

Well cap – A manufactured device installed at the top of a well casing that creates an airtight and watertight sanitary seal to prevent surface water and contaminants from infiltrating the ground water supply.

Wellhead – The physical structure, facility, or device at the land surface from or through which ground water flows or is pumped from subsurface water-bearing formations.

Appendix E. Acronyms

Acronyms

AFO	Animal Feeding Operation
BMP	Best Management Practice
Committee	Lower Boise/Canyon County Nitrate Management Advisory Committee
EPA	United States Environmental Protection Agency
FSA	Farm Service Agency
IASCD	Idaho Association of Soil Conservation Districts
DEQ	Idaho Department of Environmental Quality
IDOC	Idaho Department of Commerce
IDWR	Idaho Department of Water Resources
ISCC	Idaho Soil Conservation Commission
ISDA	Idaho State Department of Agriculture
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
SCD	Soil Conservation District
SWCD	Soil and Water Conservation District
SWDH	Southwest District Health
TMDL	Total maximum daily load
USDA	United States Department of Agriculture
U of I	University of Idaho

Appendix F. Agency Roles, Programs and Responsibilities

Agency Roles, Programs and Activities

The following is a brief description of the roles and activities of the participating agencies and organizations.

Lower Boise/Canyon County Nitrate Management Advisory Committee (Committee)

The Lower Boise/Canyon County Ground Water Quality Management Planning Committee was formed as a pro-active measure to address local ground water quality degradation. The Committee is composed of local area residents and government agencies that represent the broad range of interests within the area. DEQ is the lead agency assisting the Committee in development and implementation of this management plan to address the ground water degradation in the area from nitrate.

United States Department of Agriculture – Natural Resources Conservation Service (NRCS)

The NRCS coordinates and implements the Agricultural Conservation Program, which is administered to restore and protect land and water resources and preserve the environment. Activities include working with the local Soil Conservation Districts to implement technical and financial assistance programs related to soil and water resources. The NRCS, in cooperation with the Farm Services Administration, DEQ, and ISDA, can perform public, group, and individual demonstration projects to ensure the acceptance of the established BMPs by industry and the community. Land operators will benefit from this assistance in the planning and implementation of nutrient, pest control, and irrigation management plans designed to protect ground water and surface water quality with “best management systems.”

Soil Conservation Districts

Primary activities of the Soil Conservation Districts include soil erosion control; conservation and development of water resources; control of water pollution from agricultural nonpoint sources; and protection, conservation, development, and enhancement of the quality and productive potentials of land and water resources in Idaho. The Soil Conservation Districts are administered and coordinated by the Idaho State Department of Agriculture (ISDA).

Southwest District Health

The Southwest District Health Department (SWDH) is responsible for permitting subsurface sewage disposal systems and for the administration of sanitary restrictions for subdivisions. SWDH Environmental Health Services regulates subsurface sewage disposal systems along with the DEQ through and application/permitting process for a subsurface sewage disposal system, a pre-requisite to obtaining a building permit from the county. SWDH is also vested with the responsibility of releasing sanitary restrictions or maintaining sanitary restrictions in force on all platted subdivisions under Idaho Code, Title 50, Chapter 13. SWDH works in cooperation with the Idaho Department of Environmental Quality (DEQ), by releasing sanitary restrictions on platted subdivisions having city water and city sewer only after DEQ has conducted the necessary reviews of the specifications.

Subdivisions utilizing individual wells and individual subsurface sewage disposal systems must meet the Subdivision Engineering Report (SER), through SWDH prior to releasing sanitary restrictions. Additionally, SWDH may require a Nutrient Pathogen Study; depending on the location of the subdivision, size of the lots, and density of dwellings. Subdivisions utilizing a combination of public and individual systems must work with both SWDH and DEQ in order to satisfy the requirements necessary to release sanitary restrictions

University of Idaho Cooperative Extension System

The University of Idaho and its Cooperative Extension Service provide research information and educational programs. Extension has responsibility to prepare news items, bulletins, publications and educational material to inform and educate the general public about water quality issues. Extension provides agri-chemical application and rate recommendations, based on research, and consistent with water quality goals.

Idaho Department of Water Resources (IDWR)

The IDWR administers surface and ground water programs and activities predominately related to water supply issues. IDWR also has responsibilities for ground water quality in areas such as Statewide Ambient Ground Water monitoring, managed recharge, injection wells, well drilling permits and water rights.

IDWR can assist with this ground water management plan in the following ways:

- Continue to conduct hydrogeologic characterization studies.
- Continue to enforce well construction standards and determine if stricter standards are needed.
- Ensure proper regulation and distribution of water in accordance with water rights and allocation.
- Recommend solutions where ground water quality problems exist or may be emerging.

IDWR cooperates with and assists other agencies involved in the planning and implementation of measures designed to protect the ground water quality and improve the efficiency of water use.

Idaho State Department of Environmental Quality (DEQ)

The Idaho Department of Environmental Quality is designated as the primary agency to coordinate and administer ground water quality protection programs for the state (Ground Water Quality Protection Act of 1989, Idaho Code 39-120). Various state and local agencies have responsibilities for and are involved in implementing the Ground Water Quality Plan (adopted in 1992 and amended in 1996). The Ground Water Quality Rule (IDAPA 58.01.11.400.02 and IDAPA 58.01.11.400.03) sets forth a number of alternative actions that the DEQ may follow when a numerical ground water quality standard has been exceeded, or when a standard has not been exceeded, but significant degradation of the ground water has been detected.

The DEQ has the following responsibilities:

- Assist in developing a regional ground water monitoring network and performing periodic water quality assessments to evaluate the performance of the management action plan in reducing the ground water contamination resulting from the identified sources of contamination.
- Establish monitoring requirements to determine water quality conditions; establish and coordinate local monitoring efforts to obtain information on ground water quality.
- Work in conjunction with the Committee, ISDA and other state and local agencies to periodically evaluate and assess the implementation of the action plan and to determine whether the plan is effective in reducing nitrate loading to the ground water. Also to assist the Committee as requested.
- Administer rules and regulations for the permitting of land application of wastewater.
- Carry out the provisions of the federal Safe Drinking Water Act by establishing drinking water standards, certifying water and treatment systems, and operators. DEQ is responsible for identifying health hazards and issuing public notification on such hazards.
- Perform risk assessments concerning ground water quality and provide for the regulation and protection of all public water supplies within the management area.

Idaho State Department of Agriculture (ISDA)

The ISDA is the lead state water quality agency to implement agricultural laws and rules, water quality management and planning, engineering and technical services, monitoring, permits, and education and licensing efforts related to agriculture. The ISDA implements the Agricultural Ground Water Quality

Protection Program for Idaho and the Agricultural TMDL Implementation Monitoring Program. The ISDA is also responsible for the regulation of fertilizers, soil and plant amendments, and dairy and feedlot facilities. Disposal of on-site animal waste (manure) from concentrated animal facilities is regulated through a Memorandum of Agreement between EPA, DEQ, and ISDA.

The ISDA is involved with the identification of existing agricultural management practice problems and in the development and implementation of alternative practices. The ISDA networks with the Soil Conservation Commission and Soil Conservation Districts to provide technical and financial assistance to farmers for conservation projects, research and demonstration projects, and public education and information.

Idaho Soil Conservation Commission (ISCC)

The ISCC provides administrative, financial, and technical support to all of the Soil and Water Conservation Districts in the state. The ISCC and Soil Conservation Districts develop annual work plans, review and evaluate district projects, practices, budgets, and contracts, and assist districts in meeting their obligations.

City and County Governments

The Ada and Canyon County Planning and Zoning (P & Z) Commissioners and the Boards of Commissioners are involved in rural residential and agricultural land use. County P & Z administrators and building inspectors issue building permits to build on land and enforce code provisions. The P & Z Commissions review land partitions, subdivision proposals, requests to rezone properties, and special use permits, and makes recommendations to the County Boards, as well as make suggestions for amendments to the county comprehensive plan. The role of local government is to educate the public about ground water quality concerns and planning for development compatible with the protection of ground water.

Table E-1. Existing Programs and Activities

Program/Activity	Purpose/Objective	Contact
Idaho Dept. of Agriculture		
Agricultural Ground Water Quality Monitoring and Protection Program	Technical Assessment & Assistance Protection Plans Education and Outreach Implementation of BMPs Regulation Monitoring	Rick Carlson 332-8599
IDAPA 02.03.03 Pesticide and Chemigation Use and Application	Regulation of irrigation systems for application of pesticides and fertilizers	Fred Rios 442-2816
USEPA, DEQ, ISDA Idaho Dairy Pollution Prevention Initiative, Memorandum of Understanding Idaho Dairy Industry (Idaho Code, Title 37, Chapter 3, 4, 5, and 7) IDAPA 02.04.14 Rules Governing Dairy Waste IDAPA 02.04.15 Rules Governing Beef Cattle animal Feeding Operations	Regulates management of nutrients of on-site animal waste from all licensed dairy farm and beef operations. Rules for dairy operations Dairy waste inspections for compliance with Clean Water Act and ISDA regulations	Marv Patten 332-8551 John Chatburn 332-8540
Idaho Dept. of Environmental Quality		
Regional and local ground water quality monitoring	Investigations of ground water contamination	Tom Neace 373-0183
IDAPA 58.01.03 Individual/Subsurface Sewage Disposal	Review of subdivision engineering report and nutrient pathogen evaluation	

Land application of wastewater: IDAPA 58.01.02.600 Idaho Regulations, Water Quality Standards and Wastewater Treatment Requirements IDAPA 58.01.17 Wastewater-Land Application Permit Regulations	Permitting of wastewater land treatment systems	Paul Wakagawa 373-0550
Idaho Source Water Assessment and Protection Program	Assessments Drinking Water Protection Plans	Pam Smolczynski 373-0461
Lower Boise River Total Maximum Daily Load (TMDL)	Subbasin Assessment (SBA), an assessment of surface water quality conditions Implementation Plan	Julia Achabal 373-0550
Idaho Dept. of Water Resources		
Statewide Ambient Ground Water Quality Monitoring Program	Statewide monitoring network with USGS assistance to characterize ground water quality, identify trends and changes, and identify potential problem areas Data analysis and report preparation	Ken Neely 287-4852
IDAPA 37.03.09 Well Construction Standards Rules IDAPA 39.03.10 Well Driller Licensing Rules	Well driller licensing Well construction and operating permitting Well abandonment	Mark Slifka 287-4935
Health Districts		
Land Development Program/Sanitary restrictions IDAPA 58.04.02 community Subsurface Sewage Disposal Systems IDAPA 58.01.03 Rules for Individual/Subsurface Sewage Disposal Systems IDAPA 58.01.15 Regulations governing the Cleaning of Septic Tanks)	Conduct site evaluations Issue system permits Issue septic tank pumper licenses Conduct inspections Establish design standards and accepted waste management practices for private septic system Establish criteria for permit issuance Establish soil site evaluation standards for placement of septic systems	Brian Crawford Dave Loper 465-8402
USDA Natural Resources Conservation Service		
Environmental Quality Incentives Program (EQIP)	Provides financial and technical help with structural and management conservation practices on agricultural land	Jeff Bohr x 130 454-8695

Wildlife Habitat Incentives Program	Voluntary program for people who want to develop and improve wildlife habitat	
Wetlands Reserve Program	Voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands	
Soil and Water Conservation Assistance (SWCA)	Cost share and incentive payments to farmers and ranchers to voluntarily address threats to soil, water, and related natural resources, including grazing land, wetlands, and wildlife habitat.	
U.S. Geological Survey		
Ground water monitoring	Regional and site-specific monitoring studies	Deb Parliman 387-1326
Ada County Development Services		
Comprehensive Plan		Diana Sanders 287-7900
Development Review:	Land partitions Subdivision proposals Rezoning requests Special use permits	
Canyon County Development Services		
Comprehensive Plan		Donna West 454-7458
Development Review	Land partitions Subdivision proposals Rezoning requests Special use permits	
Idaho Soil Conservation Commission **Idaho Association of Soil Conservation Districts** **Ada and Canyon County Soil Conservation Districts**		
Idaho Home*A*Syst Project	Education	Scott Koberg 338-5900
State Agricultural Pollution Abatement Plan	Agricultural BMP implementation	

IDAPA 02.05.02 Rules for Antidegradation Plan for Agriculture Water Quality Program for Agriculture IDAPA 02.05.03 Rules for Administration of Agriculture Water Quality Cost-Share Program		
Resource Conservation and Rangeland Development Loan Program (RCRDP)	Loans up to $100,000 and Grants up to $10,000	
University of Idaho, Cooperative Extension Service		
	Information and education Agricultural research	Jerry Neufeld 459/6003

Appendix G. Resources

Resources

Agency Web Sites

Idaho Department of Environmental Quality Programs
http://www.deq.state.id.us/water/prog_issues.cfm

Idaho Department of Water Resources
http://www.idwr.state.id.us/

Idaho Soil Conservation Commission
http://www.scc.state.id.us/waq.htm

University of Idaho Extension Service
http://www.uidaho.edu/extension/

Environmental Protection Agency
http://www.epa.gov/OGWDW/

Southwest Health District Department
http://www.publichealthidaho.com/

Canyon County Development Services
http://www.canyoncounty.org/dsd/

Idaho Department of Agriculture, Water Quality Program
http://www.agri.state.id.us/

Water Quality Information

Canyon County Ground Water Study along the Boise River Corridor, Canyon County, Idaho, Dec. 2000
http://www.deq.state.id.us/water/data_reports/ground_water/boise_river_canyonco_study.pdf

Western Country Estates Report, 2003
http://www.deq.state.id.us/water/data_reports/ground_water/western_country_estates_nampa.pdf

Lower Boise/Canyon County Nitrate Degraded Ground Water Quality Summary Report, Dec 2001
http://www.deq.state.id.us/water/data_reports/ground_water/lower_boise_canyono_nitrate_degraded.pdf

Health Effects of Nitrate

Bureau of Community and Environmental Health, Idaho Division of Health, Nitrates in Drinking Water
http://www.healthandwelfare.idaho.gov/portal/alias__Rainbow/lang__en-US/tabID__3393/DesktopDefault.aspx

Agency for Toxic Substances and Disease Registry, Case Studies in Environmental Medicine: Nitrate/Nitrite Toxicity
www.atsdr.cdc.gov/HEC/CSEM/nitrate/exposure_pathways.html

Environmental Protection Agency, Consumer Fact Sheet on Nitrates
www.epa.gov/safewater/contaminants/dw_contamfs/nitrates.html

Department of Environmental Quality, "Nitrates in Ground water"
http://www.deq.state.id.us/water/gw/nitrates_in_gw.pdf

General Information

Treasure Valley Hydrology
http://www.idwr.state.id.us/water/tvalley/default.htm

Well Construction Standards
http://www2.state.id.us/adm/adminrules/rules/idapa37/0309.pdf

Health District Brochures
http://www.publichealthidaho.com/brochures.asp

Best Management Practices Information

Agriculture

Sources of additional information for this category include the Idaho One Plan, a catalog of best management practices at http://www.oneplan.org; the USEPA Office of Water *Management Measures to Control Nonpoint Sources Pollution from Agriculture at* http://www.epa.gov/owow/nps/agmm/ ; the Idaho Department of Agriculture, Agricultural Water Quality Program web site at http://www.agri.idaho.gov/Categories/Environment/water/indexwater.php The USDA Natural Resources Conservation Service (NRCS), *Comprehensive Nutrient Management Planning – Technical Guidance* at http://www.nrcs.usda.gov/technical/nutrient.html; and the NRCS *National Handbook of Conservation Practices,* at http://www.nrcs.usda.gov/technical/Standards/nhcp.html

Septic Systems

An excellent reference for the most complete and current information on management options for septic systems is the **National Small Flows Clearinghouse (NSFC)**. Established by the USEPA under the 1977 CWA, the NSFC gathers and distributes information about small community wastewater systems through a catalog of publications and other products, free newsletters, a computer bulletin board, computer databases, telephone consultation and referral service, and related programs. The Clearinghouse can be contacted at 1-800-624-8301, or at National Small Flows Clearinghouse, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064.

Other materials used for this category are the DEQ A Homeowner's Guide to Septic Systems at
http://www.deq.state.id.us/water/assist_citizen_comm/septic/septic_homeowners_guide.pdf,
Technical Guidance Manual for Individual and Subsurface Sewage Disposal Systems at
http://www.deq.state.id.us/water/assist_business/septic/tech_manual_updates.cfm,

Technical Guidance Manual for Individual and Subsurface Sewage Disposal Systems
This document provides guidance on the design, construction, alteration, repair, operation and maintenance of standard individual and subsurface sewage systems, their components, and alternatives.

The University of Idaho College of Agriculture, Cooperative Extension System, Care *and Maintenance of Your Home Septic System* at http://info.ag.uidaho.edu/

The septic Information ion Website *Inspecting, Designing, & Maintaining Residential Septic Systems* at http://www.inspect-ny.com/septbook.htm,
and EPA's *Design Manual for Onsite Wastewater Treatment and Disposal Systems* (1980), currently under revision.
Information distributed by the Southwest District Health Department can be found at http://www.publichealthidaho.com/septic-systems.asp

Appendix H. Draft Plan Comments and Responses

Lower Boise/Canyon County Ground Water Quality Management Plan
Response to Comments
September 2005

The comments received on the Lower Boise/Canyon County Ground Water Quality Management Plan (Plan) were organized into three categories. Editing comments and comments asking for clarification have been addressed in the final Plan but are not listed below. Changes made to the Plan in response to these comments do not change the intent of the Plan. All other comments are included below and responses are provided, where appropriate.

1. (Henry Hamanishi, Simplot) General Comment: Baseline nitrate information and trend tracking.
There was a general lack of information in the draft plan that gave specific information on what was to be used for the baseline nitrates in monitored wells and how these wells would be reviewed to determine if there is an upward (or downward) trend in nitrate concentrations. It should be one of the responsibilities of the local nitrate management planning committee to establish the baseline and to be the responsible party for tracking the trends for each monitoring well that will be part of the trend analysis.

Response: It is the responsibility of the agencies to collect and evaluate ground water quality data and identify trends in nitrate concentrations. This information will be provided to the Committee as it becomes available, for consideration in evaluating the success of implementation activities.

2. (Henry Hamanishi, Simplot) General Comment: Land use in Canyon County
Though a snapshot was given in the draft plan for land use in Canyon County, what was not considered is how the land use has changed in the last decade since the first monitoring wells were surveyed for nitrates. Has the change in land use (e.g. increased urbanization, possibly more feedlots) caused the upward trend in nitrates?

Response: Land use activities are responsible for the upward trend in nitrate concentrations in ground water but studies have not been designed to link the increases to specific land use activities. Plan implementation, which includes monitoring, will focus some effort on source area identification.

3. (Henry Hamanishi, Simplot) Page 14 – Animal feeding Operations (AFO) and Dairies, third paragraph, last sentence “The practice of exporting waste off-site is currently not regulated by ISDA and was identified as a significant potential source of nitrate contamination.”
The cattle manure exported off-site is like other commercial fertilizer, it has a cost and benefit to the off-site, 3rd party, recipient that will dictate reasonable

application rates and use. Nutrient management plans for commercial fertilizer application is not required, neither should cattle manure.

Response: Comment noted. The practice of exporting waste off-site is currently not regulated by ISDA and was identified as a significant potential source of nitrate contamination when best management practices for field spreading of animal wastes are not followed.

4. (Henry Hamanishi, Simplot) Page 22 – Table 5. Animal Feeding Operation Strategies, for ISDA, SCDs, NRCS, "Large CAFOs should be regulated as industrial facilities."
There are adequate regulations in place through ISDA and agreements with Idaho DEQ and EPA that are sufficient to regulate large CAFOs, additional regulations associated with industrial facilities would be redundant.

Response: Comment noted. Large CAFOs may impact ground water in a similar manner as industrial facilities. While there exist regulations, additional requirements may be needed in the future if nitrate concentrations in ground water continue to increase as a result of large CAFO operations.

5. (Joe Canning, B&A Engineers) Page 15, first bullet item under "other residential activities is "excessive fertilization related to landscaping, lawns and gardens". It is interesting to note that testing being performed for the Ada County Highway District tends to refute this as a source. The next bullet item covering "over-watering related to landscaping, lawns and gardens" in and of itself would probably have little impact to nitrate in ground water, unless very excessive amounts of fertilizers were used. I am not proposing deleting these items, but we may want to note that we suspect these are very small or insignificant contributors.

Response: Comment noted. The Plan says only that fertilization is a "potential" source of nitrate.

6. (Joe Canning, B&A Engineers) Page 9. It is just interesting to note that agricultural land uses account for approximately 79.3percent of the area of Canyon County. On page 18 of the report the amount of nitrogen contributed due to agriculture is approximately 95.9percent. Only 2.8percent comes from industrial/residential/urban land uses. The amount contributed by natural precipitation is 1.4percent. It is obvious where the biggest bang for the buck should be spent to mitigate nitrogen in our ground water.

I roughly calculated some loading per acre from some numbers presented to the committee. If you use a rural home on a one-acre lot, it would contribute approximately 8.4 pounds of nitrogen per year per acre. Ag fertilizer applications would contribute approximately 74 pounds per year per acre. Industrial sources would contribute approximately 264 pounds per year per acre. Livestock would contribute approximately 61 pounds per year per animal. Precipitation would contribute approximately 0.8 pounds per year per acre.

It appears that one solution to nitrogen contribution would be to increase the number of homes in the county by replacing ag land. For each one-acre lot with a home on it, the contributed nitrogen load would decrease by a factor of approximately 9.

Response: Comment noted.

7. (Joe Canning, B&A Engineers) Page 16. Storm water disposal is noted as a possible source. Again the Ada County Highway District testing seems to refute or minimize this risk. And the paragraph begins with the statement “land development”, I would suggest that land development has a net decrease in potential impact of nitrogen to ground water if the land use lost was agriculture.

Response: Comment noted.

9. (Joe Canning, B&A Engineers) Page 20, table 2, under Health Districts – a strategy listed is to provide information to homeowners about septic system alternatives when applying for a septic permit. I would suggest that this is nearly impossible since not many new homeowners even apply for permits. However this is a very good goal, some way just needs to be figured out how to get this done.

Response: This strategy has been changed to read as follows:
“Provide information to developer about septic system alternatives when applying for a septic permit and to homeowner when replacement systems are needed.”

10. (Joe Canning, B&A Engineers) Page 21, table 3, under DEQ – I applaud the inclusion of following up on NP studies!

Response: Comment noted.

11. (Joe Canning, B&A Engineers) Page 23, table 6, under DEQ and health districts – I would encourage the continuation of NP studies only be required if the item immediately above provides evidence they are worth the effort. What is the cost/benefit of these studies?

Response: The DEQ is currently evaluating NP studies but it is too soon for the results of that evaluation. A cost/benefit analysis of these studies has not been done.

12. (Joe Canning, B&A Engineers) Page 24, table 9, under Committee – I applaud setting priorities to best spend any resources where they will provide the most benefit.

Response: Comment noted.

13. (Claudia Haynes, Citizen) Page 10 map--this really needs to be enlarged. It has a lot of great info on it but it is too hard to read. Can it be doubled in size and folded to get in the report?

Response: The plan will be available on the DEQ Web site in a pdf format. The map can be enlarged electronically on the computer. Large printed copies will be available upon request.

14. (Claudia Haynes, Citizen) Page 13 Last paragraph 2nd line - *Pest* Management Program----is this right or is it Best? Is the University study on the Pest?

Response: This is a University Program that provides information about fertilizer application and pest management.

15. (Claudia Haynes, Citizen) Page 14 Industrial Wastewater land Application Areas-- You said DEQ regulatory waste discharge permit system requires land application to get a permit. Does this apply to CAFO or not? If CAFOs were called industrial because of there size would this apply?

Response: The permit for land application of wastewater does not apply to confined animal feeding operations (CAFOs). A change in the regulations would be necessary for this requirement to apply to CAFOs.

16. (Johanna Bell, Boise City Public Works Department) General Comment: We recommend the addition of an annual assessment of the number and percent of CAFO facilities in compliance with nutrient management plan requirements (i.e., this would be another strategy listed in Table 5).

Response: This recommendation was presented to the Committee for consideration at the September 28, 2005 meeting. The Committee decided not to include this as a strategy because they have no authority to act on this information.

17. (Johanna Bell, Boise City Public Works Department) General Comment: The Lower Boise Sediment and Bacteria Total Maximum Daily Load (TMDL) Implementation Plan lists urban and agricultural practices that will likely have a similar beneficial impact to both ground water and surface water nutrient concentrations. And, it is likely that the Lower Boise Nutrient TMDL and Implementation Plan (pending 2006) will also rely on similar practices for surface water target attainment. We suggest that the nutrient management plan include a reference to these other water quality planning documents and implementation

plans and promote the idea of coordinated implementation efforts in order to help reduce overall water quality management costs within our region.

Response: The following text has been added to the sixth paragraph in the introduction to Section 5.0:
"DEQ will coordinate the implementation of this plan with other water quality planning document and implementation plans, including the *Lower Boise Sediment and Bacteria Total Maximum Daily Load Implementation Plan* and source water protection plans developed for public drinking water systems."

18. (Johanna Bell, Boise City Public Works Department) General Comment: In addition to the Pitt report (1994) cited in the current draft, local event mean concentration data are available and can be reviewed by the Committee. These locally collected data show that stormwater infiltration typically acts to dilute the current ground water nitrate concentrations (i.e., median nitrate = 0.59 mg/L with a 0.47 mg/L standard deviation). This suggests that as a BMP, the infiltration of stormwater should be characterized more as a benefit to ground water (i.e., for clean water recharge) vs. an additional source of nitrate. You can contact either the City of Boise Stormwater Program or ACHD Drainage staff for a complete monitoring data report.

Response: Comment noted.

19. (Johanna Bell, Boise City Public Works Department) General Comment: While the local stormwater quality data from rain events show that urban sources of nitrate ground water contamination is not typically due to stormwater infiltration, common urban practices such as material handling and illicit spills or disposal are potential sources of nitrate contamination. We suggest that strategies that address landscape watering, fertilizer and pesticide application management and material handling practices for non-agricultural land uses be included in the management plan under development.

Response: The Committee has recommended strategies that address residential activities. They are contained in Table 2.

20. (Johanna Bell, Boise City Public Works Department) General Comment: The 2000 International Fire Code specifies secondary spill containment requirements for facilities where large quantities of hazardous materials are stored or handled. These secondary spill containment requirements should be reviewed by the Committee and possibly identified in the draft as additional structural control strategies for urban pollutant sources.

Response: Activities related to the control of hazardous materials are beyond the scope of this plan.