Nitrate Symposium: Abstracts

Overview of Idaho's Aquifer Systems and Southern Idaho's Unique Hydrogeology (Michael McVay, IDWR)

Abstract: The hydrology section at IDWR is responsible for characterizing and monitoring Idaho's water resources, which includes identifying and modeling both the physical characteristics and water use in aquifers around the state. An aquifer's vulnerability to non-point source contamination is a combination of physical setting and anthropogenic activities. Therefore, information gathered for water-resource modeling can be used to assess nitrate vulnerability, and an overview of southern Idaho's unique hydrogeology will include a comparison of assessment criteria and nitrate priority areas.

Water Quality Concerns: Nitrate Priority Areas and Source Water in Idaho (Toni Mitchell, IDEQ)

Abstract: Nitrate is the most common, widespread contaminant in Idaho. The presentation will provide a brief introduction what nitrate is, the sources of and estimated nitrogen loading amounts from fertilizer, animal operations, plow-down residuals, industrial, precipitation and domestic land uses within the Snake River Aquifer of Idaho.

A brief overview of Ground Water Quality Rules and Statues in Idaho and a discussion of Idaho's DEQ Policy for Addressing Areas with Degraded Ground Water Quality will be provided. The policy provides the agency with a procedure to follow that has been used to establish Nitrate Priority Areas in Idaho. Topics include how degraded areas are identified, the sources of data used to identify, tools used to spatially analyze with geostatistical software, geology and hydrogeology; 2) the criteria used to determine how areas are prioritized including population, water quality percentages, number of public water systems/source water assessments, nitrate concentration trends over time and beneficial uses; 3) management or improvement strategies development; 4) implementation of strategies; 5) an evaluation of strategies; and 6) priority re-designation. Changes in priority within some specific areas over three ranking cycles in 2002, 2008, and 2014 have been observed and will be discussed. In order to improve defensibility of the process several how changes in the identification and prioritization methodology have been implemented. A majority of the Nitrate Priority Areas are located within the Snake River Aquifer.

Sole Source Aquifers will be introduced with the designations established by the EPA in Idaho with the spatial relationships to the nitrate priority areas. Currently 2 of the 3 sole source aquifers in Idaho intersect with the 2014 Nitrate Priority Areas, including the Snake River Aquifer.

Public water systems will be described along with the regulatory difference from private water systems. In 1996, amendments to the Safe Drinking Water Act required states to delineate drinking water sources of a public water system, inventory potential contaminant sources within the delineated area and to assess the system by determining the susceptibility to contamination based on

system construction, soil types, land uses and contaminant sources. Protection plans are developed on a volunteer basis by communities within delineated areas to implement protective measures to drinking water.

Health Effects of Nitrate in Drinking Water: Human and Livestock Concerns from Nitrate. (Jeff Fromm, IDEQ)

Abstract: Adverse health effects associated with nitrate exposure will be discussed, focusing on methemoglobinemia (blue baby syndrome), but also other potential effects that have been investigated. Nitrate effects on livestock health will be covered, as well. Nitrate as an indicator of other potential water quality problems will also be addressed.

Nitrogen in the Soil: Current Studies (David L. Bjorneberg Ph.D., USDA ARS, Amber Moore Ph.D., University of Idaho)

Abstract: This session will include information about nitrogen losses from agricultural production and data from several research studies to determine nitrogen uptake by crops and changes in the soil with different fertilizer rates, manure applications, or previous crop history. The nitrogen cycle will also be discussed in terms of what we know and don't know about managing nitrogen in agricultural soils.

Nitrogen Movement Below Root Zone: Post-harvest nitrate tests in Yakima, Washington (Eric Winiecki, EPA)

In March 2013, EPA signed an Administrative Order on Consent ("Consent Order") with several dairies in the Lower Yakima Valley, Washington, to address sources of nitrate contamination in groundwater near and downgradient of the dairies' facilities. The dairies have begun work to control nitrate sources, collect soil and groundwater data, and monitor the quality of the groundwater to assess the effectiveness of the source control actions. This presentation will summarize the data that the dairies have collected so far, with a focus on the soil data.

Irrigation Management: How Irrigation Effects Nitrogen Movement (Howard Neibling Ph.D. University of Idaho)

This presentation will cover the following:

- How much water can root zones with different soil textures hold before drainage?
- How much water is typically applied per irrigation with pivot and set systems?
- What is the resulting potential for deep percolation (and soluble N movement)?
- How can we better schedule irrigation timing and amount to minimize deep percolation?
    - Web-based water budget tool
    - Web-access soil moisture sensor tools

Sustainable Source Water Protection through Habitat Restoration at Remsen, Iowa (Becky Ohrtman, Iowa Department of Natural Resources)

Abstract: The community of Remsen relies on a number of shallow alluvium municipal wells as a part of its water supply. These wells had shown significant nitrate contamination since 2005. On the basis of the increasing nitrate concentration trend, Remsen will most likely need to install expensive denitrification treatment to maintain their water supply in the near future. With assistance from the Iowa Department of Natural Resources (DNR) Contaminated Sites Section, potential areas of concerns were identified and investigated using ground water flow models and ground water sampling in 2008 and 2009. A specific plot of land where over-application of manure had been practiced was identified to a major source of nitrate to the shallow alluvium wells. Through a partnership effort with the Remsen Source Water Protection Community Planning Team, the Remsen Utilities Board and City Council, Plymouth County U.S. Department of Agriculture - Natural Resources Conservation Service, Sioux River Resource Conservation and Development Council, Iowa DNR Source Water Protection Program and Contaminated Sites Section staff, Iowa DNR Clean Water State Revolving Fund, State Watershed Improvement Review Board, USDA Agricultural Research Service, and Plymouth County Pheasants Forever Chapter, a combination of loan and grant were used to purchase land of the well field where Pheasants Forever prepared seedbed and plant most of the acquired areas for restoration to prairie in the Spring of 2009. Additional ground water modeling and ground water sampling have shown that the prairie habitat restoration has gradually and continuously lowering the nitrate concentration in the shallow aquifer. The collaborative source water protection program through land use management and habitat restoration, with partnership with the agriculture community, has been demonstrated to be an effective and sustainable approach to improve the quality of water supply sources.

Best Management Practices to Improve Ground Water Quality: Implementation Efforts in Idaho and Beyond (Carolyn Firth, Idaho Soil and Water Conservation Commission)

Abstract: Agricultural Best Management Practices (BMPs) have been implemented within Nitrate Priority Areas (NPAs) all across Idaho, and the results appear promising. Soil testing prior to applying fertilizer and using soil test results in conjunction with University of Idaho Fertilizer guides to determine application rates are simple, but important practices as initial efforts in the implementation of nutrient management. Additionally, irrigation water management using soil moisture monitoring, planting cover crops, and residue and tillage management are effective practices in reducing leaching of nitrogen compounds into ground water. Real life examples of producers using these practices from 1999-2014 include those within almost half of Idaho's designated NPAs, ranging from Ashton to Weiser and other communities located along the Snake River, and as far north as the Clearwater Plateau near Lewiston. The USDA-NRCS has been aggressively promoting soil health BMPs nationwide, such as cover crops and tillage management as ways to not only increase organic matter in soils, but also to decrease the amount of fertilizer required to produce crops with optimal yields. Farmers from Montana to Florida are successfully implementing soil health BMPs. Nutrient management is being refined by precision agriculture using GPS guided variable rate application of fertilizer and other soil amendments, including lime

to increase pH. Outreach and education are also important components of strategies to improve ground water quality. Some of these activities include free water testing of private wells, grower workshops, and working with schools to integrate water quality awareness activities into science curricula.

Deep Nitrate Tests in Columbia Basin: How to get the community engaged? (Paul Stoker, Columbia Basin Ground Water Management Area)

In 1997, EPA issued the "*Support Documentation for Consideration of the Eastern Columbia Plateau Aquifer System as a Sole Source Aquifer (SSA)*" based on 1) the aquifer is the sole or principal source of drinking water, and 2) contamination of the aquifer would create a significant hazard to public health.

As an attractive alternative to the SSA designation, the Boards of County Commissioners passed resolutions to Washington State Department of Ecology to designate Adams, Franklin, and Grant Counties as a Ground Water Management Area (GWMA). The GWMA calls for the appointment of local ground water advisory committees to provide for effective and coordinated local management of the ground water resource. Over 100 citizens formed committees representing suspected sources of nitrate in ground water. Six local Conservation Districts and three health districts lead the planning, research and implementation of the plan. Six state and federal agencies signed an agreement to support the GWMA efforts with funding and technical assistance.

One component in the Plan was to encourage agricultural producers to implement activities that reduce nitrate movement downward through the soil to the ground water in the aquifer. Such activities included irrigation water management and deep soil testing, well below the crop root zone. A first phase of this educational program was conducted in the spring of 2000. Seventy-three growers provided 373 fields that were sampled in this program. By 2004, 195 growers participated in this program covering 59,280 acres for irrigation water management. This presentation will discuss how the community became engaged in the program which led to increased participation and successful implementation.

Panel Discussion (Chi Ho Sham, Ph.D., The Cadmus Group, Inc.)

This session will include a facilitated discussion with a panel of speakers who provided presentations earlier on case studies examples of nitrate reduction strategies and best management practices. Each speaker will provide information on lessons learned from their case studies and participants will be able to ask questions of the panel.

Collaborative Learning Session (Chi Ho Sham, Ph.D., The Cadmus Group, Inc.)

Collaborative learning is a process that engages various experts and stakeholders involved in an issue to share ideas in order to identify the most promising ideas to explore and identify actions for success. Participants at the symposium represent a wide variety of expertise including university

researchers, federal and state regulators, technical assistance providers, planners, crop advisors, policy makers, and others. This facilitated process will draw on this expertise by dividing the participants into small groups (for 15 minutes) to discuss nutrient reduction strategies, outcomes of each strategy, actions needed to implement each strategy, partners needed, and existing assumptions. The most promising ideas identified by the small groups will be brought to the larger group. The facilitator will lead the group through a discussion to identify action items and measures of success. The goal will be to identify next steps to develop strategies to reduce nutrients in ground water through partnerships and the promotion of best management practices that encourage sustainable agriculture.