Idaho Nitrate Symposium

Nitrate in Idaho's Ground Water
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Tonia S. Mitchell, P.G.
Sr. Hydrogeologist
Idaho DEQ

Idaho's Ground Water

- Important resource for Idaho, beneficial uses include
  - Drinking Water
  - Industrial
  - Agriculture
  - Aquaculture
- Ground Water supplies 95% of Idahoans with their drinking water

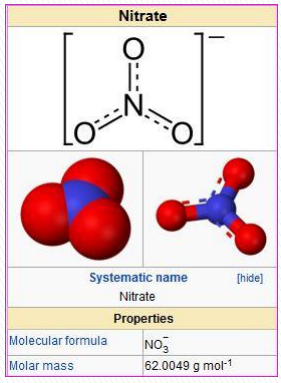
Recognition of the importance of ground water in Idaho

- Called for protecting the resource
  - Several statutes and rules have been enacted to prevent degradation including:
    - Ground Water Quality Protection Act
    - Idaho Ground Water Quality Rule

Ground Water Quality Monitoring

- Agencies include USGS, IDWR, DEQ, ISDA
- Indicates areas and constituents of concern

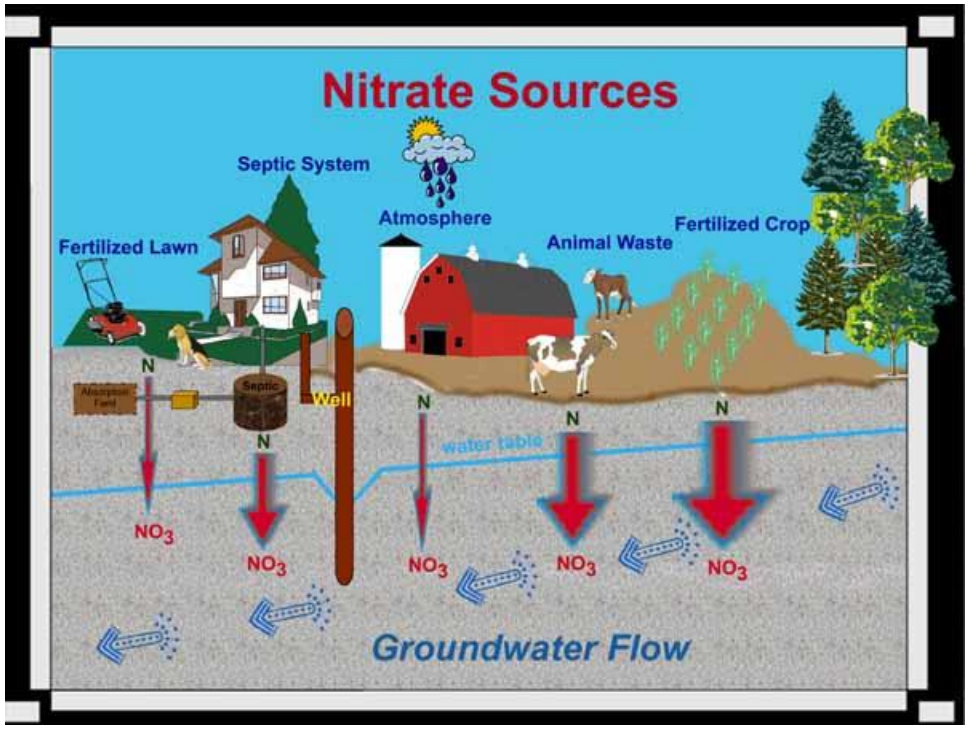
What is Nitrate?



- One nitrogen atom (N)
- Three oxygen atoms
- Strong oxidizing agent
- Water soluble
- A form of nitrogen
- Federal Drinking Water Standard is 10 mg/L

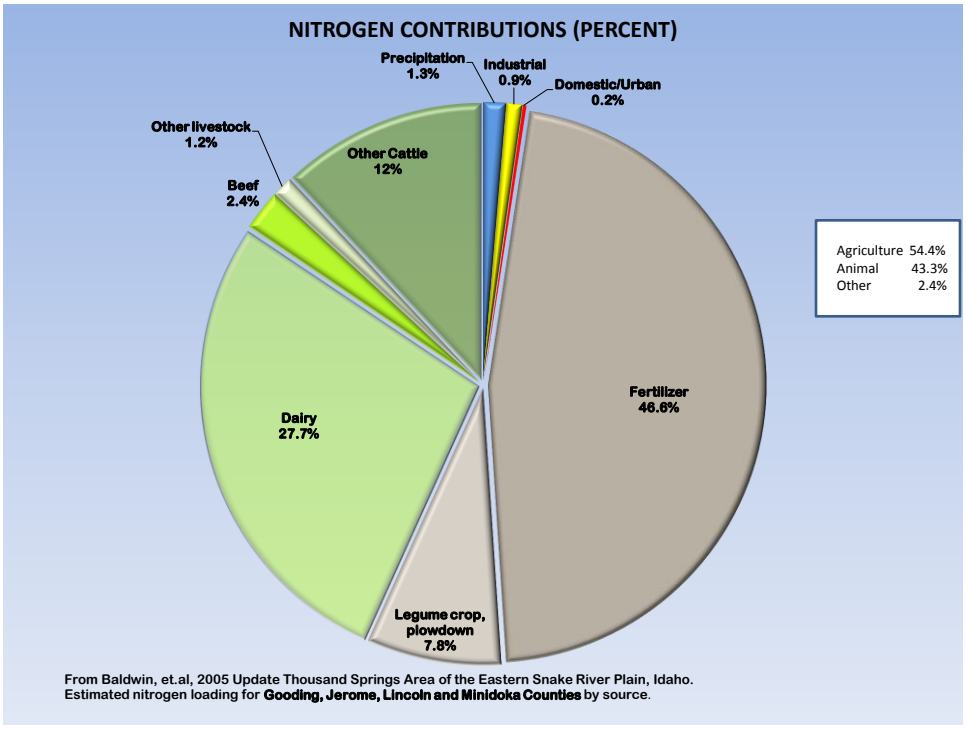
Simple English WIKIPEDIA

The earth's atmosphere is 78% nitrogen



Ground Water Monitoring Technical Committee (GWMTC), Chaired by DEQ

- **Agencies that implement ground water quality protection, coordinate projects**
  - USGS
  - IDWR
  - ISDA
  - DEQ
  - IDL
  - Health & Welfare
  - Public Health Districts
  - NRCS
  - Soil and Water Conservation Commission
  - Universities



PM-004, DEQ Policy for Addressing Degraded Ground Water Quality Areas

- **Identify & Designate**
- **Prioritize Areas Based on:**
  - Severity of problem
  - Potential to impact drinking water sources defined by delineated source water protection areas*
  - Potential to exceed standards or impair beneficial uses
  - Ground water quality trends
- **Ground Water Quality Management Strategies**
- **Evaluate Effectiveness**
- **Recategorization of Aquifers**
- **Remove Degraded Areas from Priority List**

GWMTC – Advises DEQ in developing criteria to define and prioritize areas with degraded ground water quality

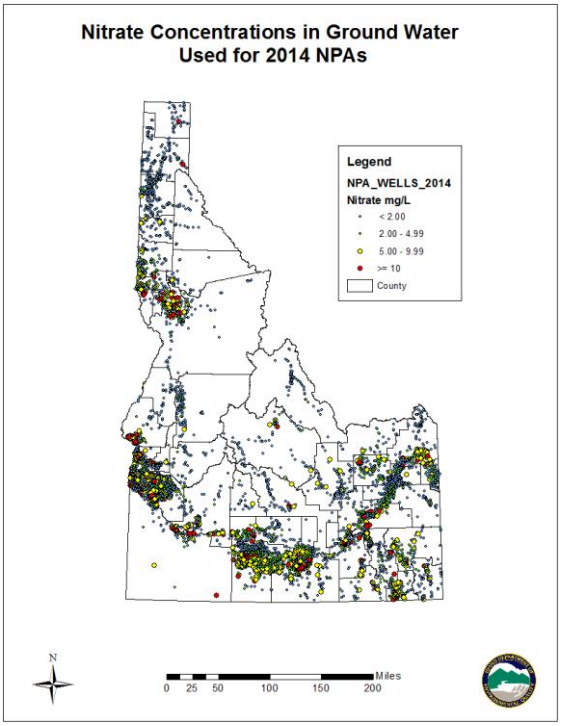
- 25% samples in an area greater than or equal (≥) to ½ MCL
- Nitrate Selected as Constituent of Concern – Nitrate Priority Areas (NPA)
  - Widespread, common
  - Directly related to land use activities
  - Preventable
- Developed a method to prioritize (PM-004)
  - Population
  - Number of Public Water Systems/Source Water Delineations
  - Number of sites exceeding drinking water standard
  - Water quality percentages
  - Water quality trends
  - Beneficial uses other than drinking water

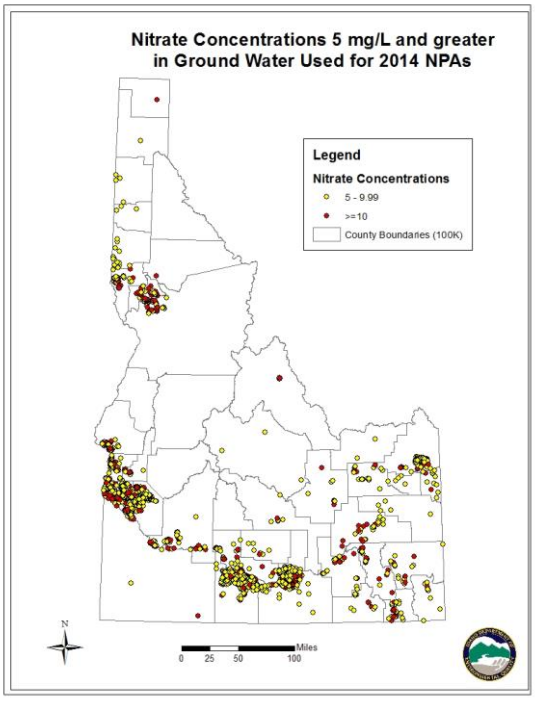
Step 1

- Compile Data
- Spatially locate the data
- Query the most recent sample for sites with multiple samples

There are over 160,000 Water Wells in Idaho, of those

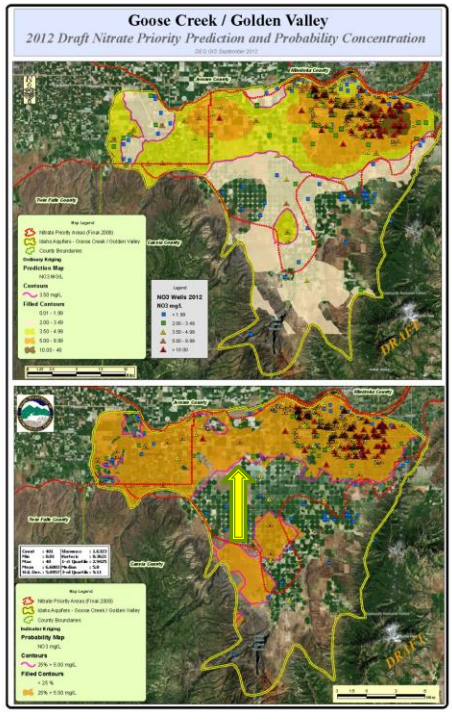
- Over 10,000 ground water monitoring sites (wells and springs) used to define NPAs
- Over 4,000 of the sites are within NPAs
- Over 400,000 people live within an NPA
- Ground Water Monitoring Data Sources
  - DEQ Ground Water Projects
  - DEQ Public Water Systems Regulated Reporting*
  - ISDA (Ground Water & Dairy Programs)
  - IDWR Statewide Monitoring Network
  - USGS


Nitrate Concentrations in Ground Water
Used for 2014 NPAs
Legend
NPA_WELLS_2014
Nitrate mg/L
< 2.00
2.00 - 4.99
5.00 - 9.99
>= 10
County
N
0 25 50 100 150 200
Miles


Nitrate Concentrations 5 mg/L and greater
in Ground Water Used for 2014 NPAs
Legend
Nitrate Concentrations
5 - 9.99
>=10
County Boundaries (100K)
N
0 25 50 100
Miles

Step 2

- Delineate the areas
- Professional judgment
  - GIS coverages
  - Local knowledge
- Geostatistical Kriging
  - Increases defensibility

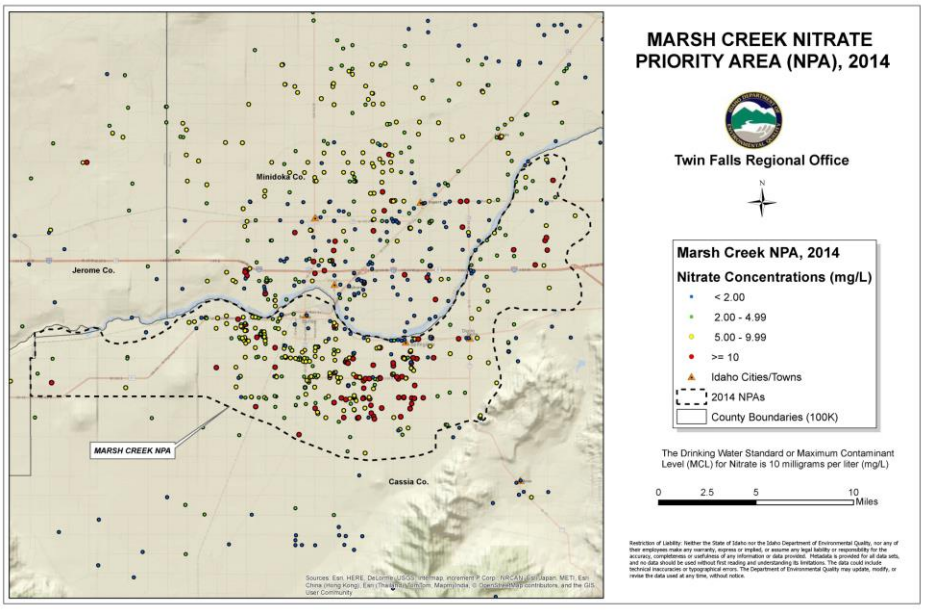


Ordinary Kriging

Predicts or interpolates values between locations of data

Indicator Kriging

Probability of exceeding a concentration

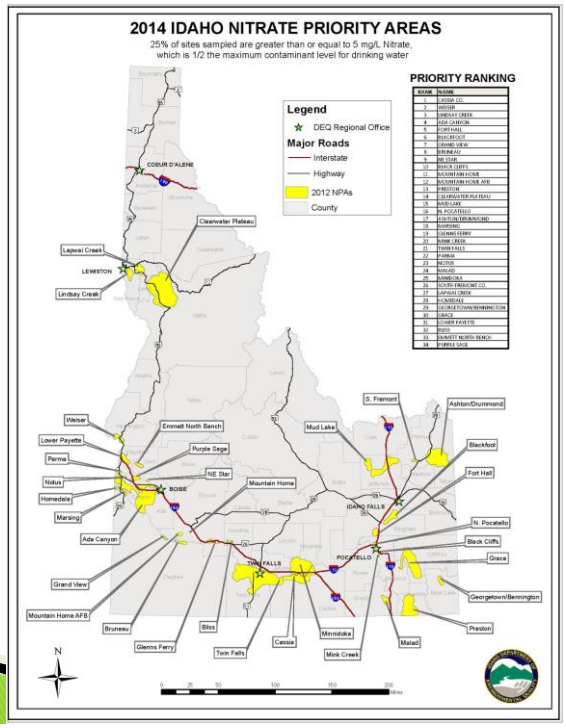


Step 3 – Prioritize

- Components from GWMTC
- Add points to determine score

Example score sheet

Priority Area Number: 1		Priority Area Name: Marsh Creek		
Ranking Criteria			**Score**	**Comments**
1) POPULATION				
	Points	**Select One**		
a) Within Degraded Area				
<1000	1			
1000 to 10,000	2			
>10,001	3	x	3	17,977
		Subtotal	**3**	
b) Source Water Protection Areas or Public Water System wells in Priority Area				
0	0			
1 to 20	1			
21 to 40	2			
>40	3	x	3	43
		Subtotal	**3**	
c) Number of Wells with $NO_3 \geq 10$ mg/l				
0	0			
1 to 5	1			
6 to 20	2			
21 to 40	3			
>40	4	x	4	91
		Subtotal	**4**	
		Population Score Total	**10**	
		Max Possible Score = 10		
2) WATER QUALITY				
	% wells	**Nitrate Concentration**		
		Criteria		
Percent of wells with $NO_3 \geq 2$ mg/l	0.89	2	1.78	
Percent of wells with $NO_3 \geq 5$ mg/l	0.64	5	3.20	
Percent of wells with $NO_3 \geq 10$ mg/l	0.23	10	2.30	
		Water Quality Total	**7.28**	
3) WATER QUALITY TRENDS				
		Select One		
Increasing Trend	10.0	x	10	
Increasing Tendency	7.5			
No Discernable Trend	5.0			
Decreasing Tendency	2.5			
Decreasing Trend	0			
		Trend Score	**10**	
4) OTHER BENEFICIAL USES				
Other beneficial uses are impaired	1	Yes=1 No = 0	0	
		Beneficial use score	**0**	
		Max Possible Score = 1		
		Total Score	**27.28**	



2014 Trend Analysis

- **Most recent** analyses used

- Time Period 1: 2002 – 2006
- Time Period 2: 2007 – 2011

2014 methodology

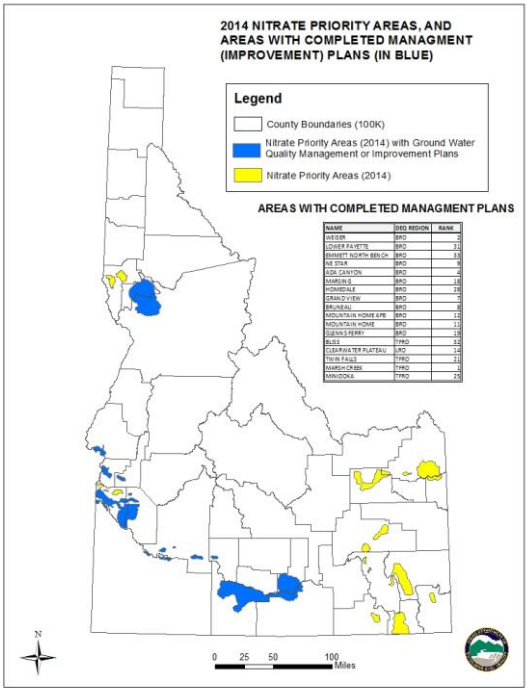
- Significant changes in several areas were noted from previous ranking periods
  - Changes in size
  - Changes in water quality
  - Changes in trend

Significant Change in Rank Example

- **Marsh Creek** (formerly Cassia Co.)
  - Ranked #1 in 2014, Ranked #9 in 2008
    - Reduced aerial extent by 94,492 acres in 2014
    - Average nitrate concentration increased
      - 6.34 mg/L in 2008
      - 7.16 mg/L in 2014
    - Number of sites equal to or greater than 10 mg/L
      - 65 in 2008
      - 91 in 2014
    - Trend changes
      - No trend in 2008
      - Increased trend in 2014

Significant Change in Rank Example

- **Twin Falls – Management plan developed, 2001**
  - Ranked #1 in 2008, ranked #21 in 2014
    - Reduced aerial extent by 20,684 acres in 2014
    - Average nitrate concentration decreased
      - 5.20 mg/L in 2008
      - 5.14 mg/L in 2014
    - Number of sites equal to or greater than 10 mg/L
      - 34 sites in 2008
      - 35 sites in 2014
    - Trend changes
      - Increasing trend in 2008
      - Decreasing trend in 2014



Safe Drinking Water Act – (SDWA) Applies To Public Drinking Water Systems

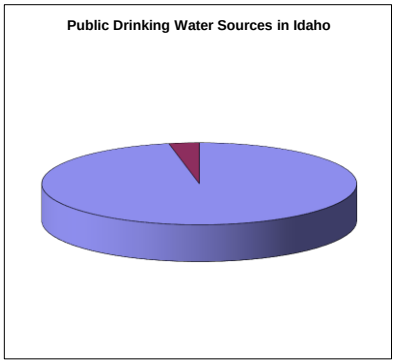
SDWA

- 1974 **focused on treating water** to provide safe drinking water at the tap
- National Primary Drinking Water Regulations
  - Legally *enforceable* standards (MCLs) that apply to public water systems
- National Secondary Drinking Water Regulations
  - Non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects (e.g., iron)
- 1996 amendments **added other components** considered important for safe drinking water:
  - source water protection
  - operator training
  - funding for water system improvements
  - public information

Public Water Systems

- 15 service connections or serve at least 25 people per day for 60 days of the year.
- Drinking water standards apply to water systems differently based on their type and size
  - Community – 15 connections year round
  - Non-transient non-community (schools, factories)
  - Transient non-community (rest areas, campgrounds)
- 903 Systems within 2014 NPAs
- Safe Drinking Water Act **does not apply to thousands of private drinking water wells in Idaho**

Idaho's Public Drinking Water Sources



Ground Water Source (Wells and Springs)	3183
(903 Public GW Sources in NPAs)	
Surface Water Source	102
Total Sources	3285

DEQ Source Water Program

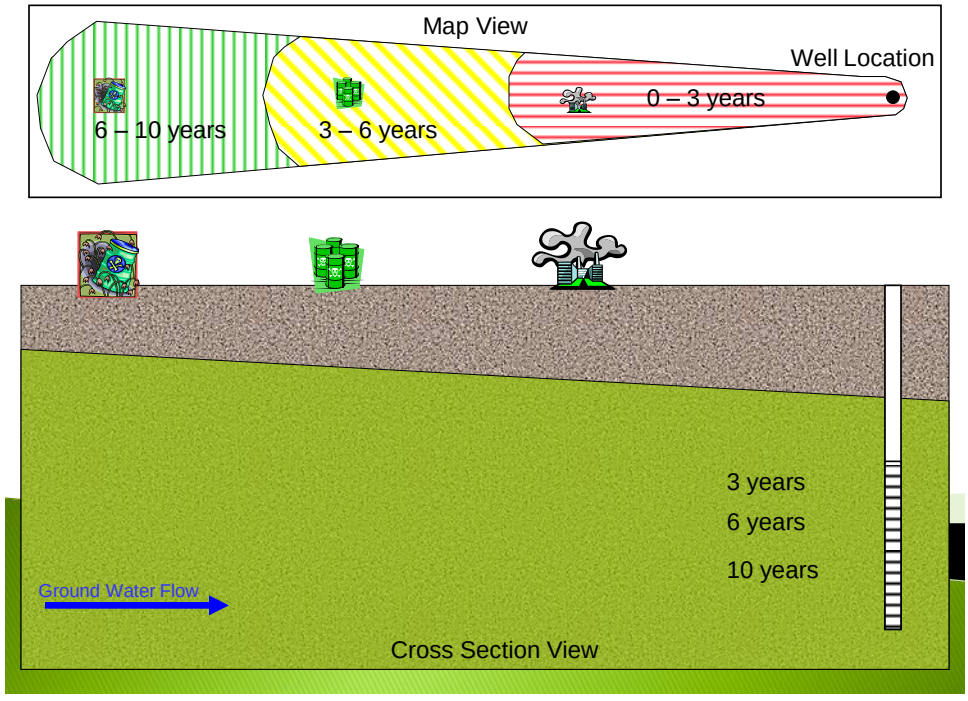
- **Assessment** → **Protection**
  - Delineation
  - PCI
  - Susceptibility Analysis
  - Report
  - Planning
  - Implementation

Source Water Delineations

- For Ground Water
  - Calculated fixed radius
  - Refined Analytical Element Model
- For Surface Water
  - Rivers and streams in small watersheds: Watershed boundary
  - Rivers/streams in large watersheds: 25 miles upstream or 4 hour stream flow (based on 10 year flood) and a 500 foot buffer on each side of the river/stream
  - Lakes/reservoirs – 500 foot buffers around perimeter

Contaminant Source Identification

- Identify past practices and discharges
- Look for the major sources of potential contaminants
- Primary and Enhanced Inventories



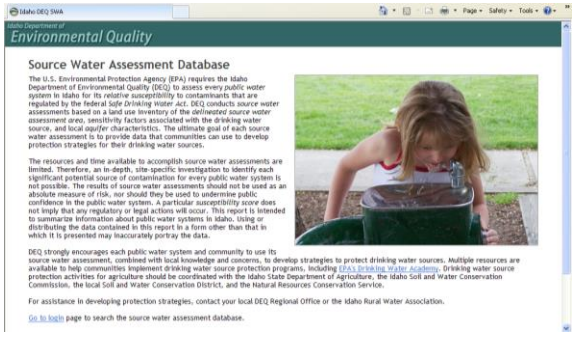
Susceptibility Analysis

Evaluate the conditions in the delineated area to determine the potential for contaminants to impact water quality at the wellhead.

- Hydrologic Sensitivity
- Potential Contaminant Source/Land Use
- System Construction

Source Water Assessment Reports

- Reports online
- GIS information online and through Public Records Request
- Online SWA website



http://www.deq.idaho.gov/water/swaOnline/

Source Water Protection Plans

Develop a Public Water System Source Water Protection Plan, or Regional Protection Plan.

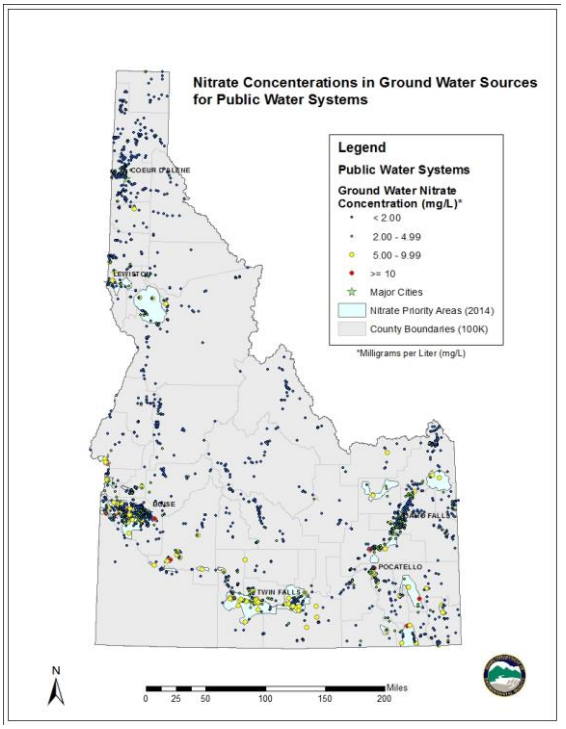
- Voluntary plans
- Provides a variety of tools, both regulatory and non-regulatory

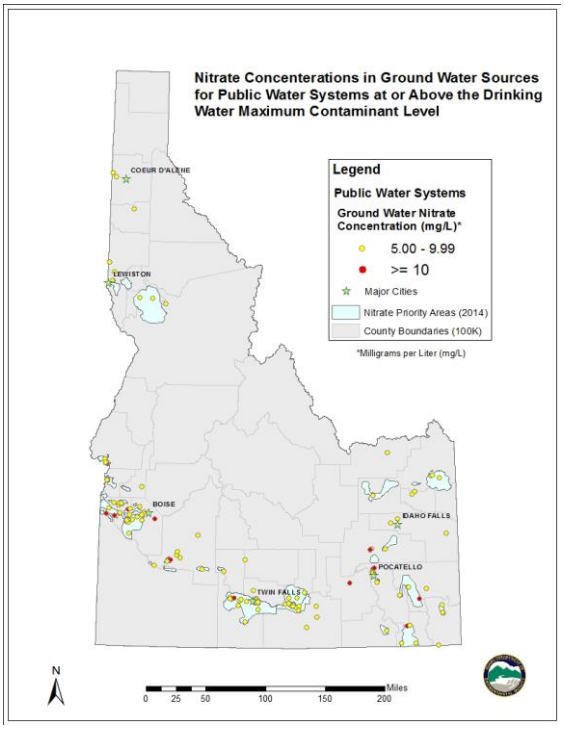
Implementation: Non-Regulatory Protection Measures

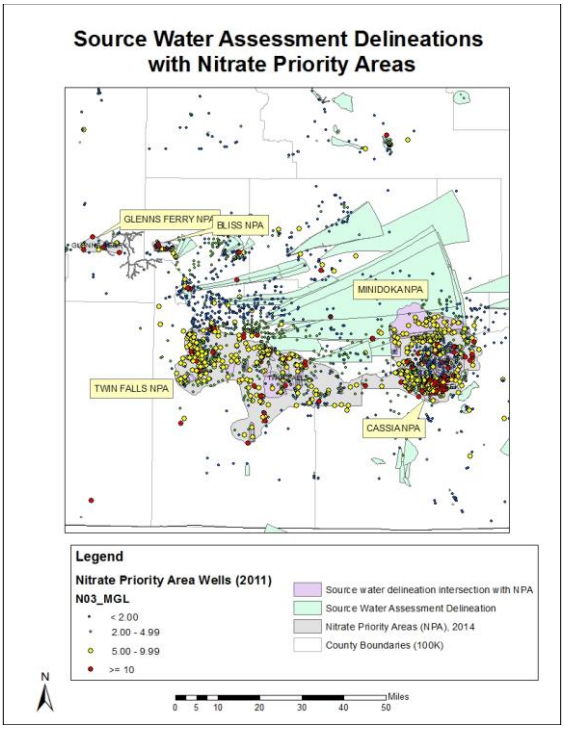
Education on Proper Use of Fertilizers and other Potential Contaminants

Storm drain marking

Agricultural BMPs




Nitrate Concenterations in Ground Water Sources for Public Water Systems at or Above the Drinking Water Maximum Contaminant Level
Legend
Public Water Systems
Ground Water Nitrate Concentration (mg/L)*
5.00 - 9.99
>= 10
Major Cities
Nitrate Priority Areas (2014)
County Boundaries (100K)
*Milligrams per Liter (mg/L)
COEUR D'ALENE
LEWISTON
BOISE
IDAHO FALLS
POCATELLO
TWIN FALLS
N
0 25 50 100 150 200
Miles


Source Water Assessment Delineations with Nitrate Priority Areas
GLENNS FERRY NPA
BLISS NPA
MINIDOKA NPA
TWIN FALLS NPA
CASSIA NPA
Legend
Nitrate Priority Area Wells (2011)
N03_MGL
< 2.00
2.00 - 4.99
5.00 - 9.99
>= 10
Source water delineation intersection with NPA
Source Water Assessment Delineation
Nitrate Priority Areas (NPA), 2014
County Boundaries (100K)
N
0 5 10 20 30 40 50
Miles

Thank You!

- For more information
  - http://www.deq.idaho.gov/water-quality/ground-water/nitrate.aspx
  - http://www.idwr.idaho.gov/WaterInformation/Publications/wib/wib50p8_Nitrate_Trend_analyses_Report_2013.pdf
  - http://www.deq.idaho.gov/water-quality/source-water.aspx
  - Tonia.Mitchell@deq.idaho.gov, 208-373-0250