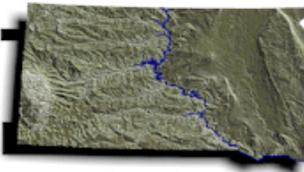


South Dakota's Ground Water Monitoring Networks

Water Levels and Water Quality

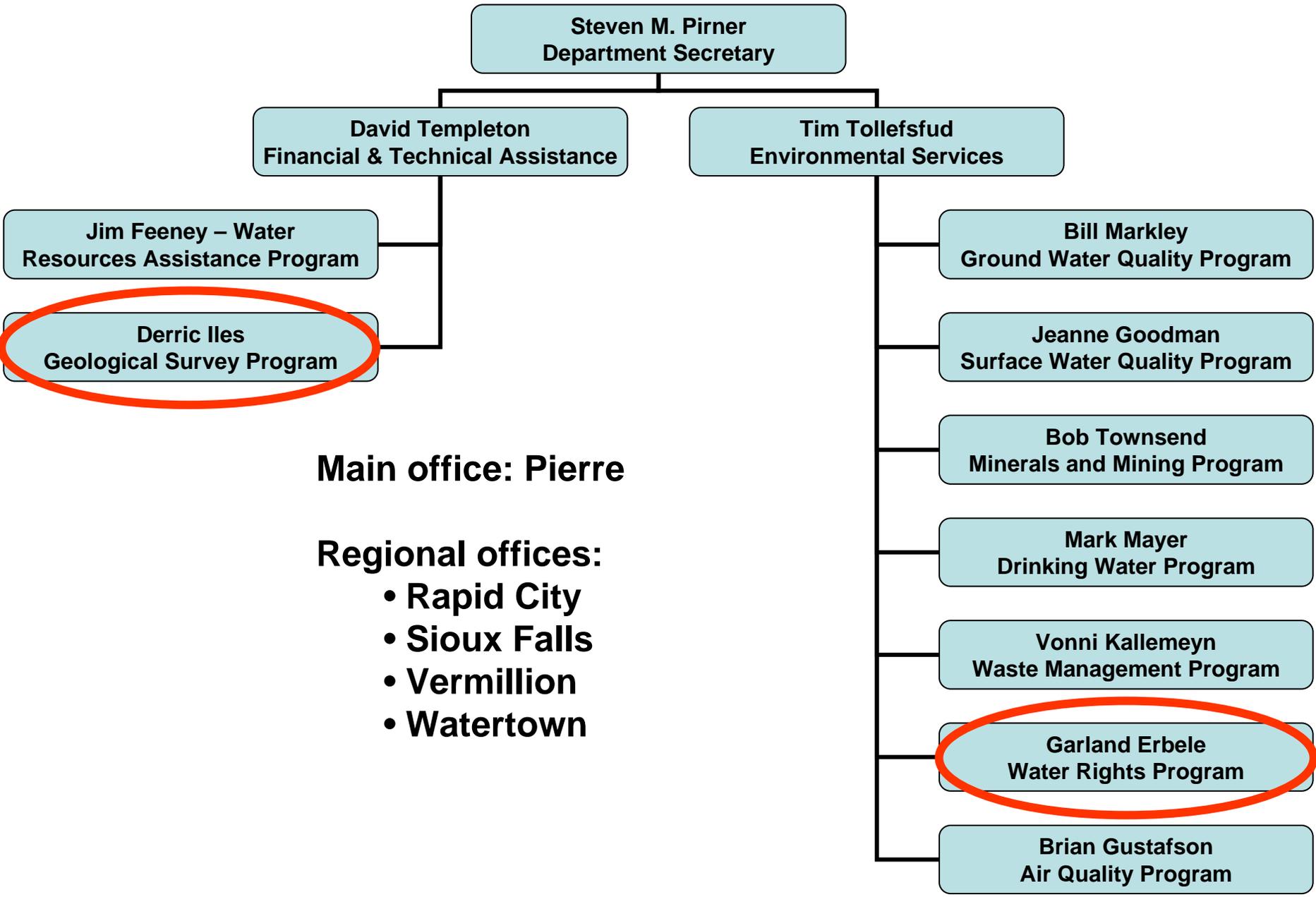


South Dakota

*Department of Environment
& Natural Resources*

*Geological Survey Program
Water Rights Program*

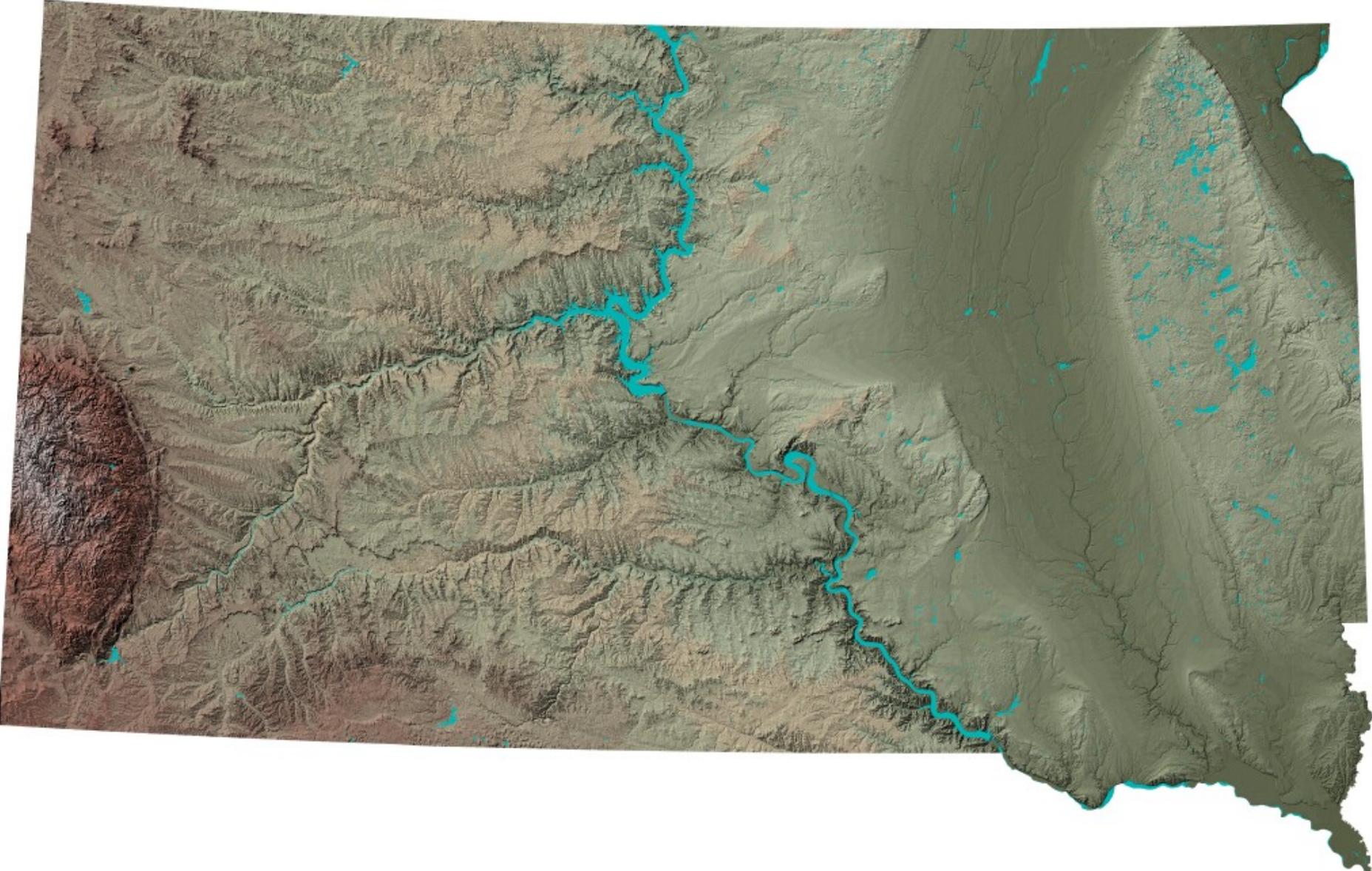
Department of Environment and Natural Resources – Organization



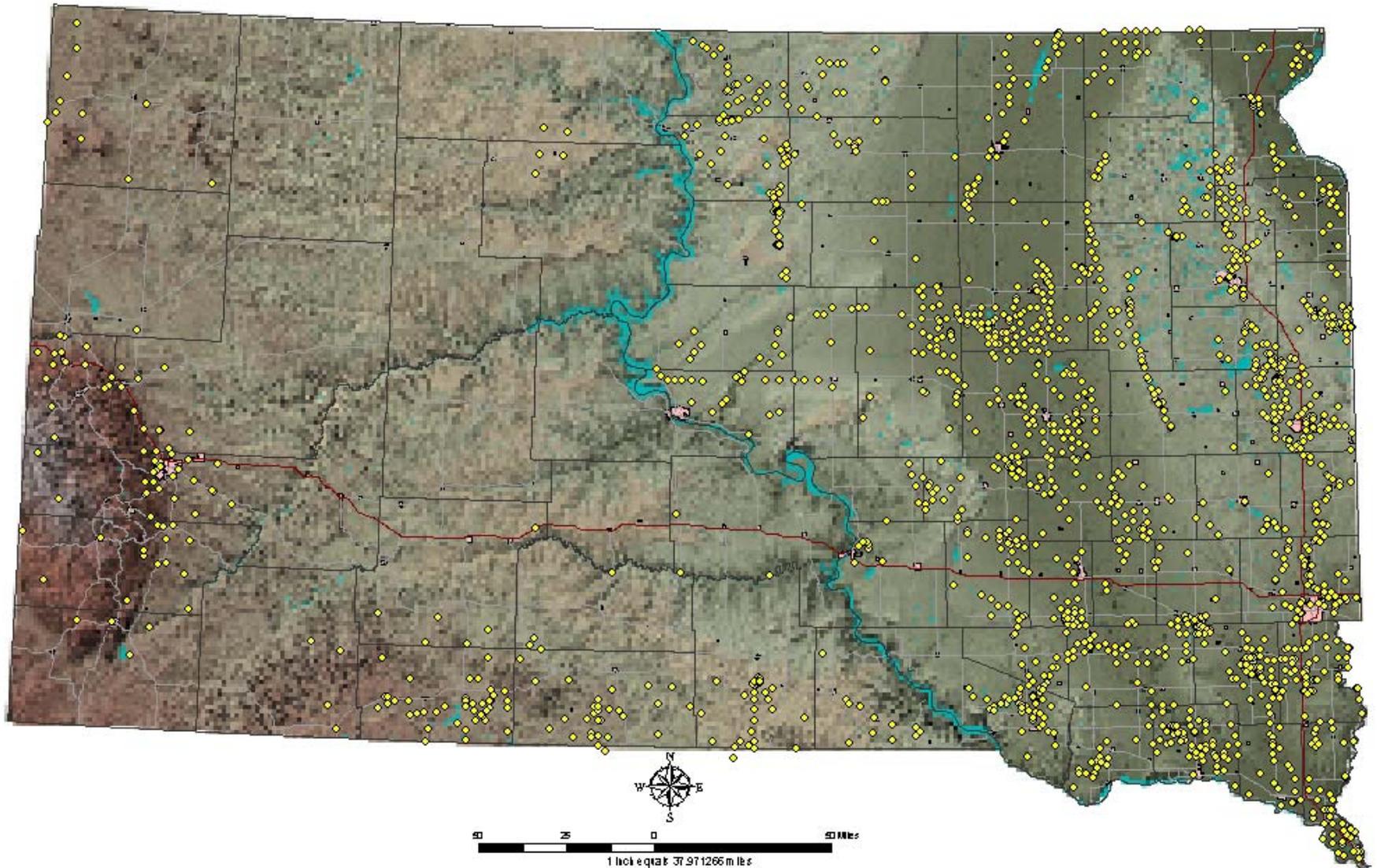
Main office: Pierre

Regional offices:

- **Rapid City**
- **Sioux Falls**
- **Vermillion**
- **Watertown**



South Dakota's Water Rights Observation Well Network



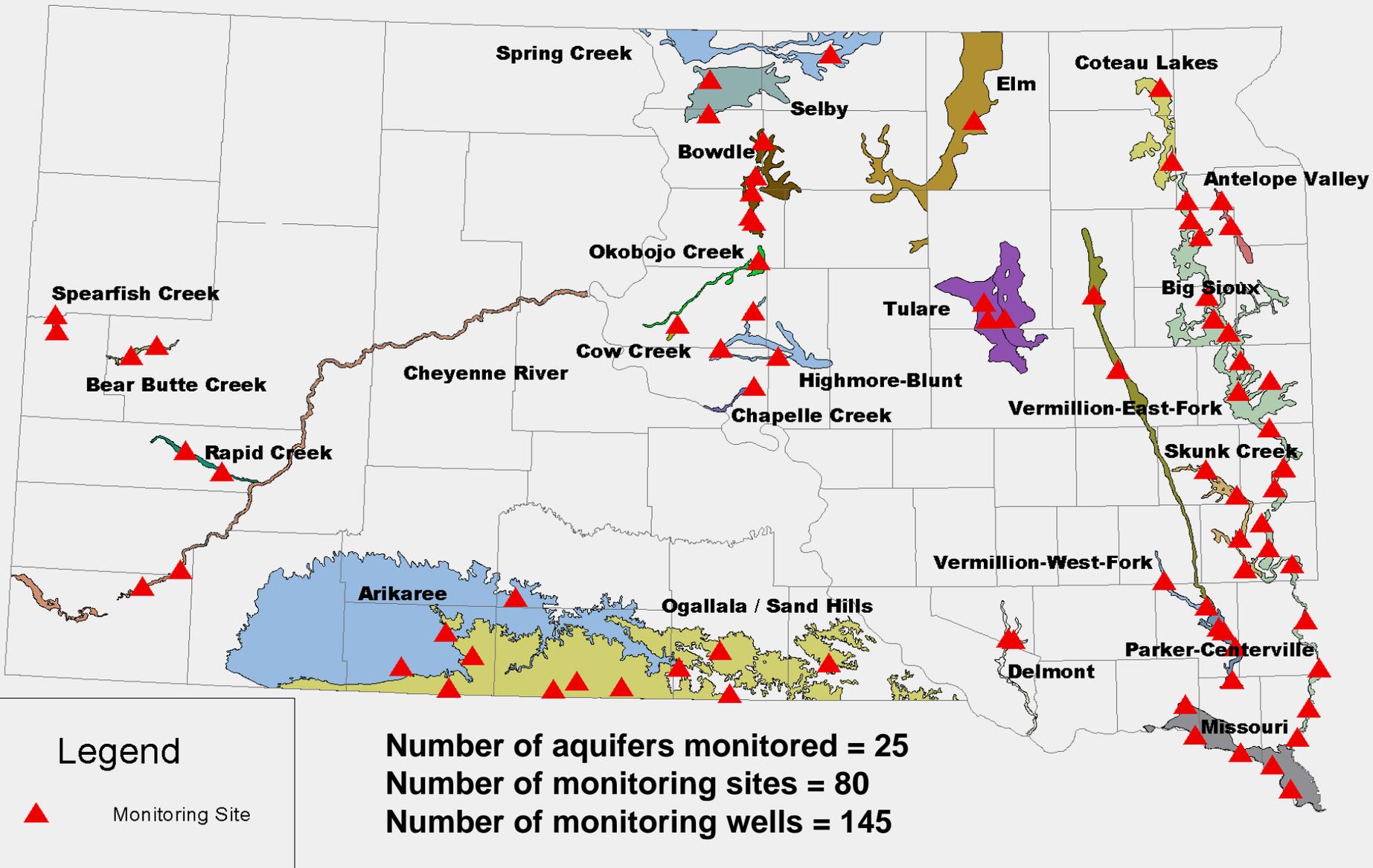
Water Rights' Observation Well Network

- **~1,649 wells**
- **16 bedrock aquifers**
- **89 glacial aquifers**
- **Goals of monitoring**
 - To adequately monitor significant bedrock and glacial aquifers
 - To have areal coverage within each monitored aquifer
- **Frequency of measurement**
 - Every 2 weeks from Spring through Fall using seasonal labor
 - Water Rights staff may collect additional measurements
 - Typically 8-12 measurements in each well every year
 - Approximately 16,000 measurements in 2006

Water Rights' Observation Well Network

- **Methods of data collection**
 - Most data are collected using a steel tape
 - Measurements taken to the nearest 0.1 foot
 - Automatic recorders on approximately 80 to 90 wells
- **Data management**
 - Water levels entered into laptop computers in the field
 - Data commonly downloaded each week into a central data system
- **Data use**
 - Generation and comparison of hydrographs
 - Analyses of trends and temporal influence of pumping
 - Recharge; examination of ground-water use versus recharge
 - Direction of ground-water movement

South Dakota's Statewide Ground Water Quality Monitoring Network



Statewide Ground Water Quality Monitoring Network

- **Site selection criteria**

- Aquifer is at land surface or very near surface, and is unconfined
- Not near known or suspected point-source pollution
- Representative of typical land use
- Aquifer is thick enough to accommodate nested wells, if possible
- Accessible to the drilling equipment of the Geological Survey

- **Drilling and well/pump installation**

- Well casing and screen steam cleaned and wrapped at factory
- Back of drilling rig and down-hole tools steam cleaned prior to drilling of each hole
- No fluid added to hole during drilling; hollowstem auger method
- Pumps, well seals, and tubing steam cleaned and wrapped at factory; manufactured to fit well depth
- Down-hole tools and materials handled with clean gloves

South Dakota Geological Survey's Mobile B-61 Drilling Rig

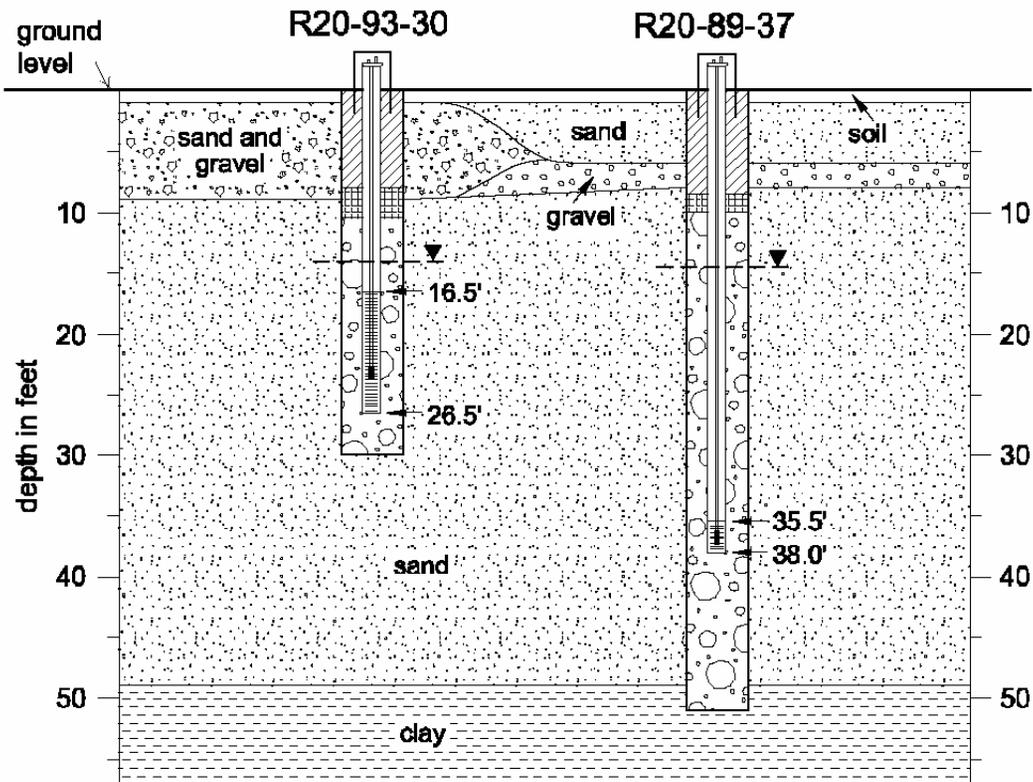




**A typical monitoring site
in eastern South Dakota**

**Big Sioux aquifer
NE SE SE SE sec. 9, T. 120 N., R. 52 W.
(near Lonesome Lake, Grant County)**

S ← → N



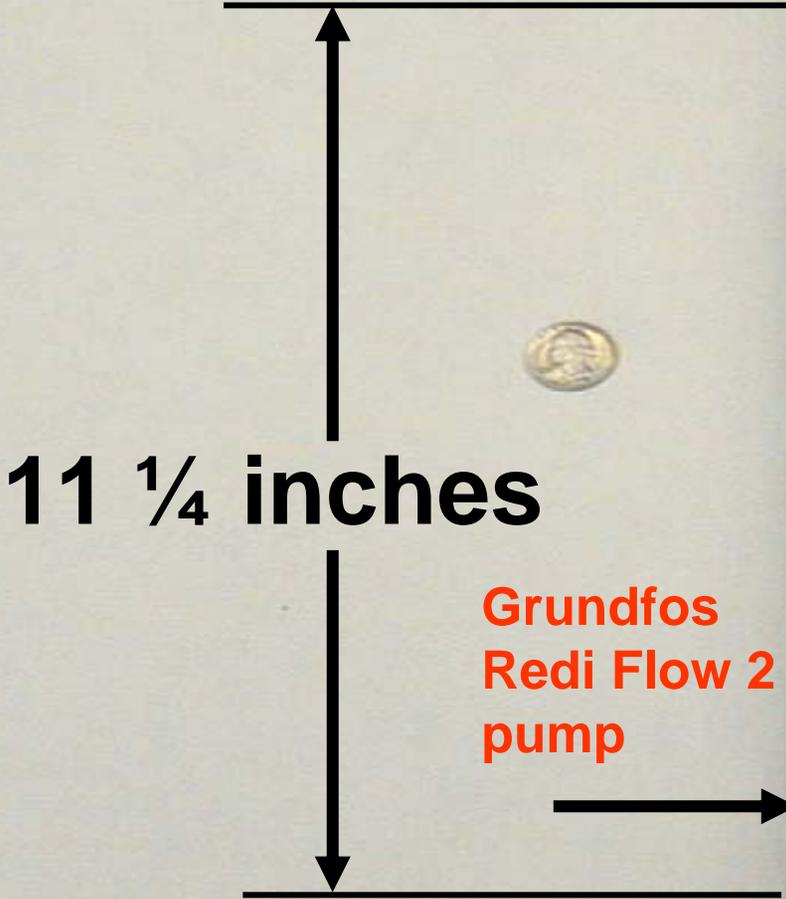
**Cross section of a
nested monitoring site**

-  Neat cement
-  Granular bentonite
-  Native sediment (sand/gravel) and/or graded sand filter pack
-  Water level on August 2, 1994



**A typical well.
Most are 4" dia.
Some are 2" dia.**

Pumps are dedicated to each well thereby eliminating most concerns of cross contamination and decontamination.

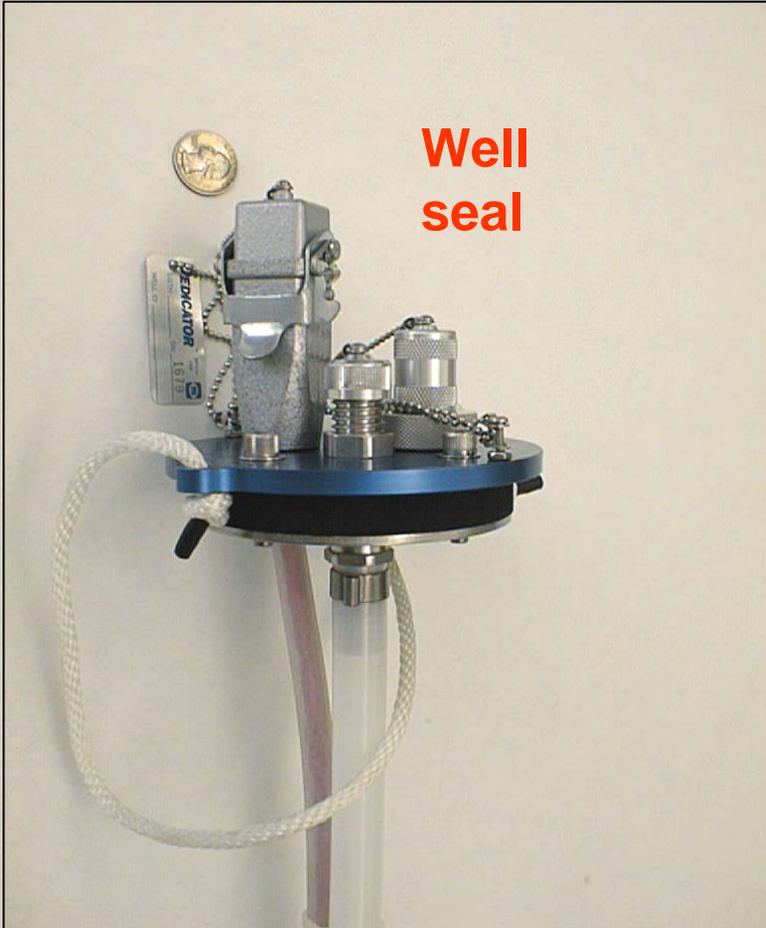


11 1/4 inches

**Grundfos
Redi Flow 2
pump**



1 3/4 inches



**Well
seal**



“Clean” work space in modified van



Gasoline powered generator – 220v, 110v, 12v



Grundfos Redi Flow 2 controller

Each site is sampled about the same time every year to eliminate concerns of seasonal variability.

Pesticides and/or nitrate:

- 3 additional times during the growing season
- 15-20 sites

The network is monitored for:

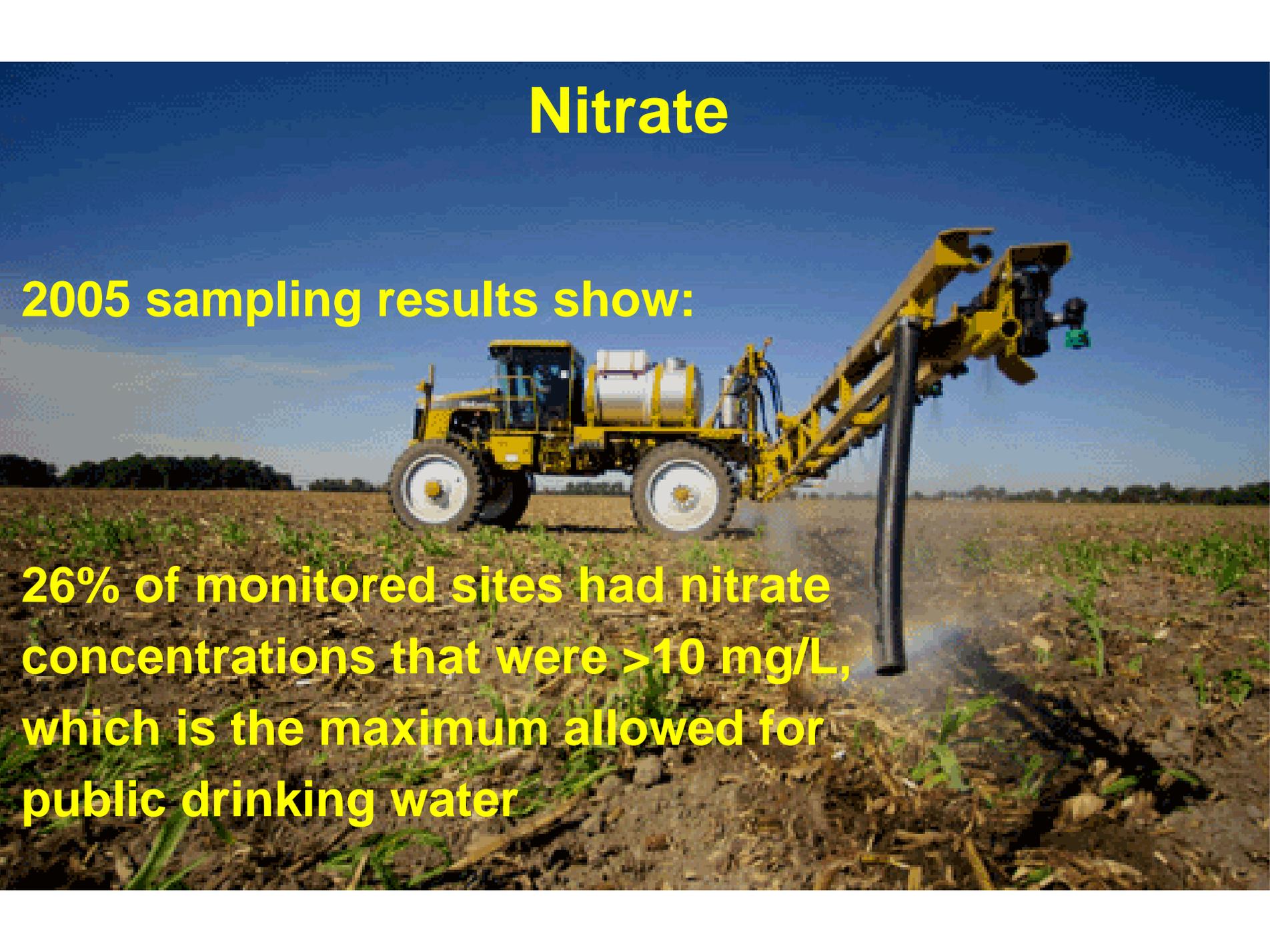
Common Inorganics (includes nitrate)	Once per year
Trace Metals	Once every 5 years
Radionuclides	Once every 5 years
Volatile Organic Compounds	25% of an aquifer's wells every 5 years
Pesticides	Once per year

Water quality results available online

Nitrate

2005 sampling results show:

26% of monitored sites had nitrate concentrations that were >10 mg/L, which is the maximum allowed for public drinking water



Pesticides

2005 sampling results show:

- **Pesticides were detected at 10% of the monitoring sites**
- **No pesticides were detected above a drinking water or health advisory standard**

Questions?



South Dakota
Department of Environment
& Natural Resources
Geological Survey

www.sdgs.usd.edu

Extra Slides



Pesticides detected in 2004

- **Atrazine**
 - **Desethyl Atrazine**
 - **Desisopropyl Atrazine**
- **Dicamba**
- **Glyphosate**
- **Metolachlor**

Pesticides detected during ~10 years of monitoring

Atrazine

Desethyl Atrazine

Desisopropyl Atrazine

Dicamba

Glyphosate

Metolachlor

Metolachlor esa

Alachlor

Alachlor esa

Acetochlor oa

Propachlor esa

2,4-D

Bentazon

Carbofuran

Cyanazine

DCPA

MCPA

Picloram

Metribuzin

Simazine

Trifluralin

