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Water Quality Monitoring of the Cambrian-Ordovician Aquifer System in Iowa and Illinois

U.S. Department of the Interior
U.S. Geological Survey
National Water Quality Assessment Program

NAWQA Cycle I

LONG-TERM GOALS:

- Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers

- Describe how water quality is changing over time

- Improve understanding of the primary natural and human factors that affect water-quality conditions

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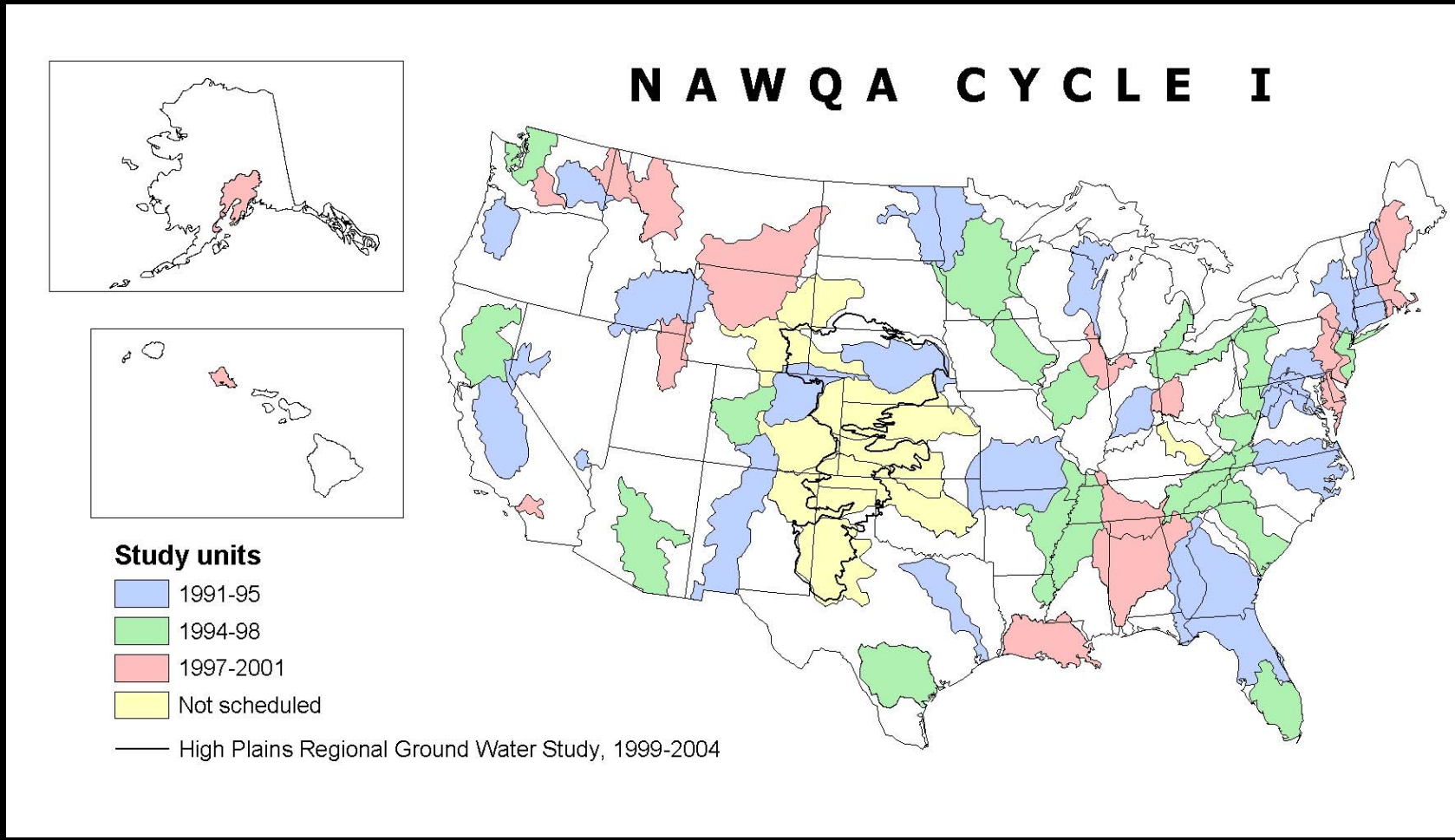
NAWQA Cycle I



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NAWQA Cycle II

- Same long-term goals as Cycle I
- Build upon initial assessments of water-quality conditions
- Increase investigations of long-term trends and the factors that affect water quality

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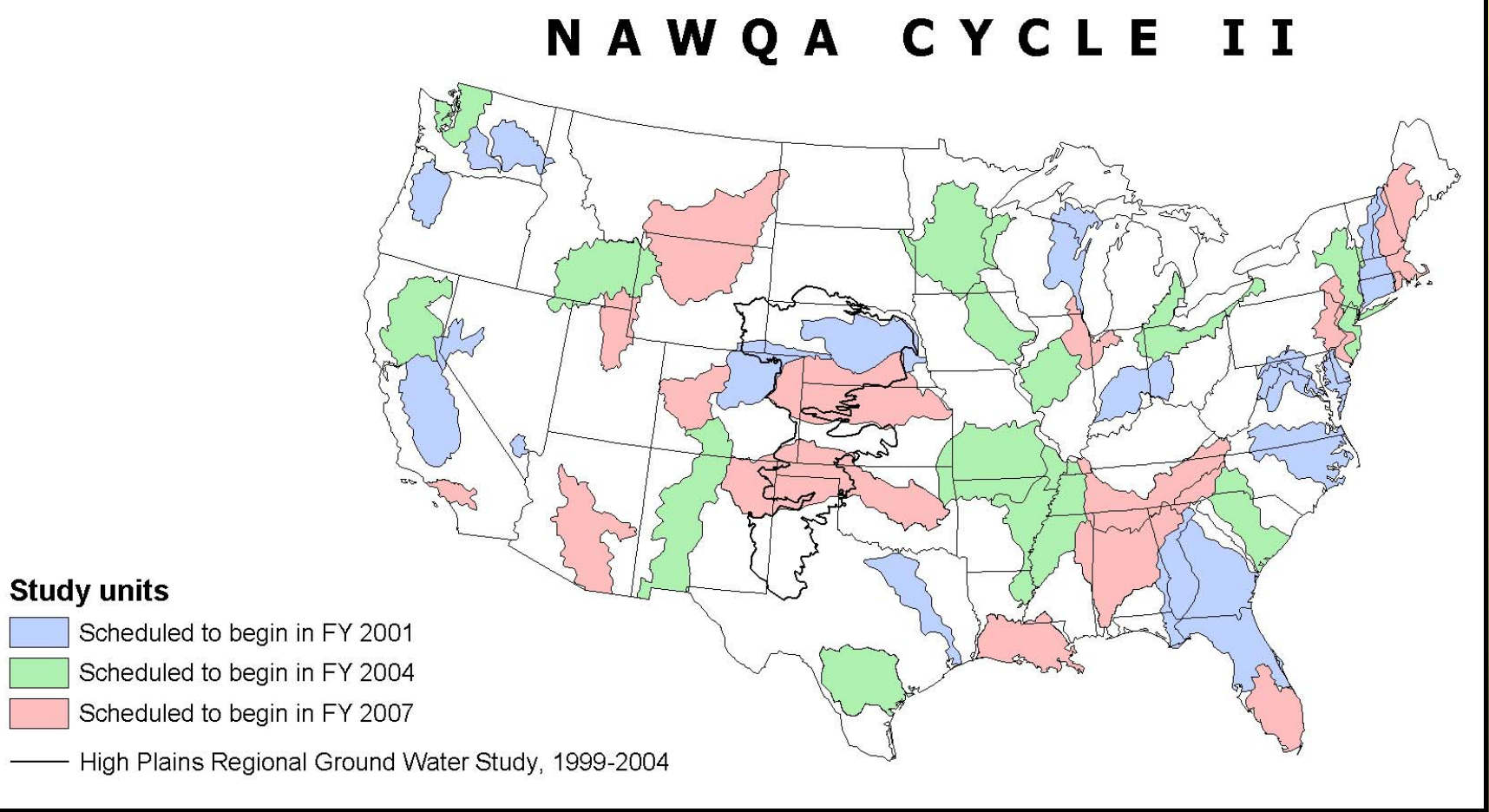
NAWQA Cycle II



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NAWQA Ground Water Synthesis

Source: Modified from USGS, 2003

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Cambrian-Ordovician Aquifer System

- Covers approximately 177,000 square miles in the upper Midwest

- Is comprised of multiple aquifer units interbedded with leaky confining units

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Cambrian-Ordovician Aquifer System

Bedrock geology - Iowa

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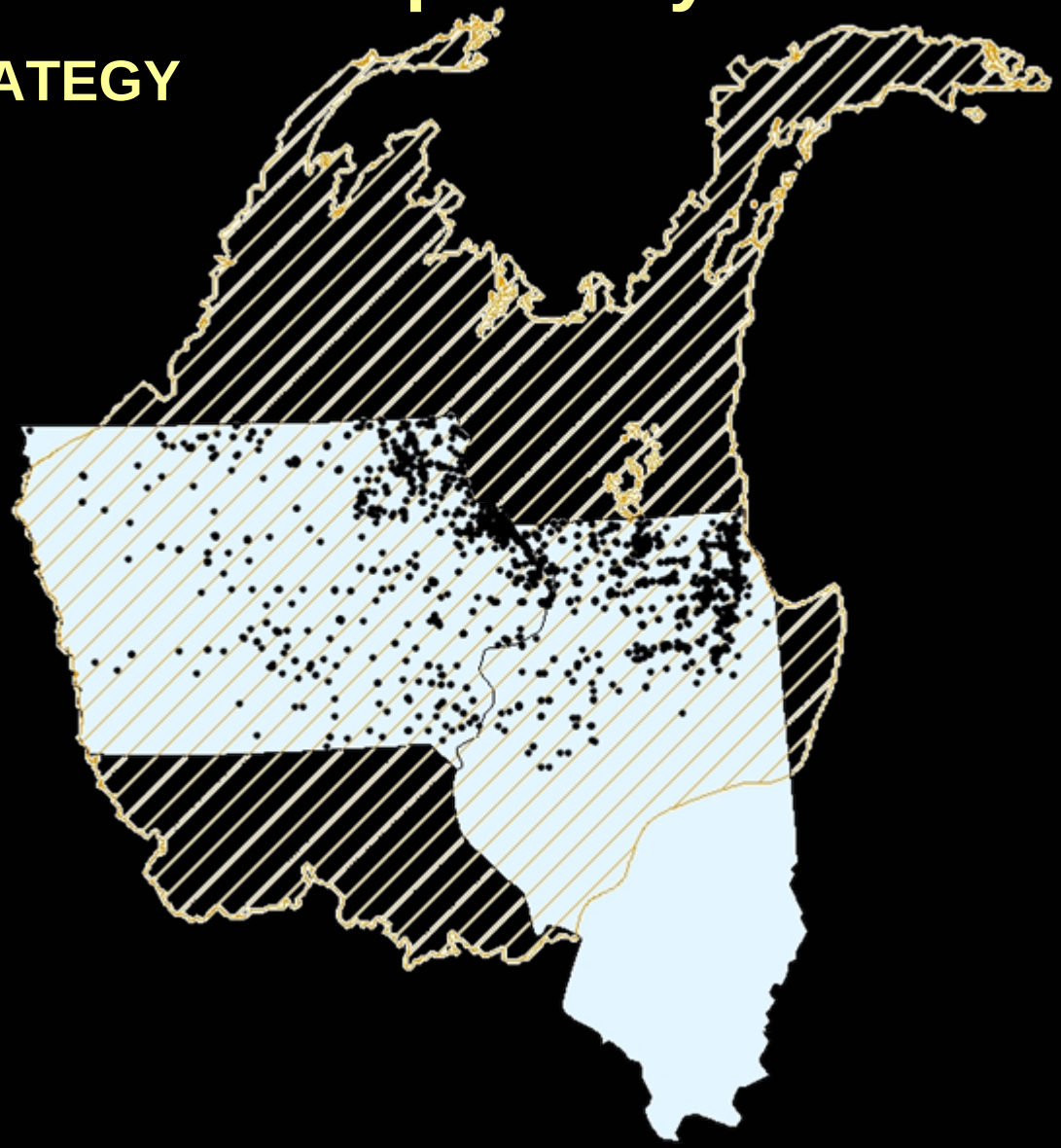
Cambrian-Ordovician Aquifer System

SITE SELECTION STRATEGY
Iowa and Illinois



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Cambrian-Ordovician Aquifer System

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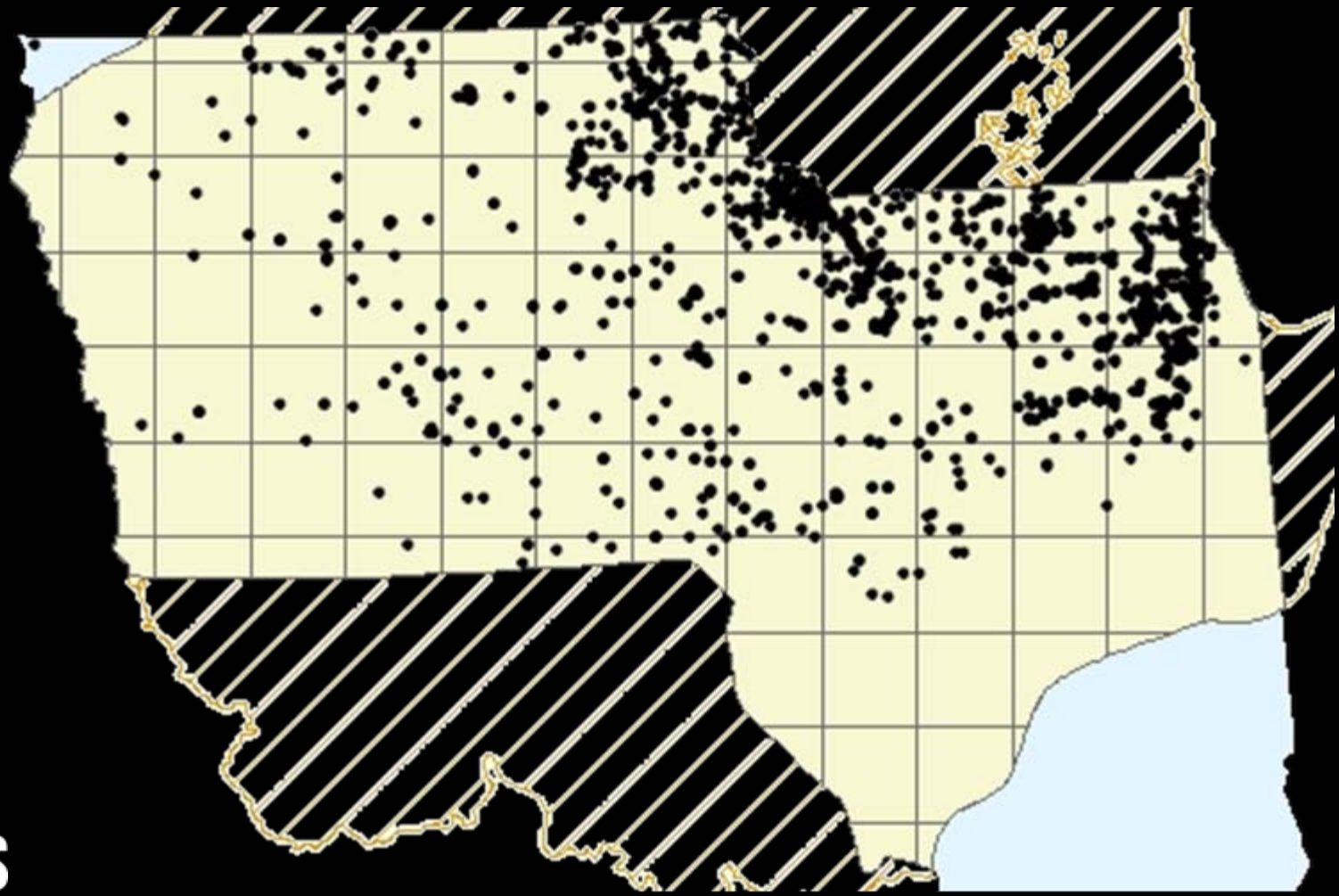

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Cambrian-Ordovician Aquifer System

SITE SELECTION STRATEGY
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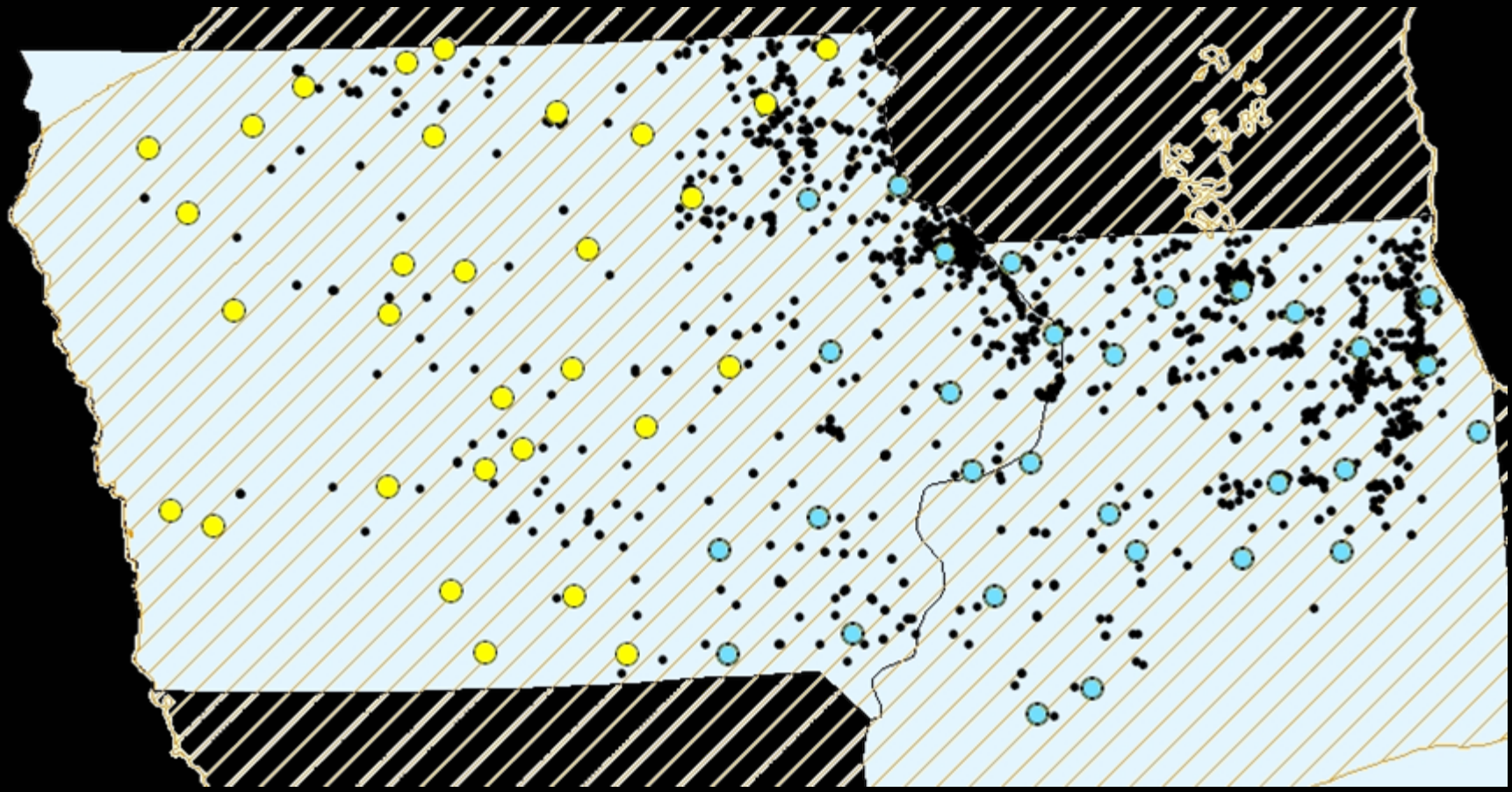

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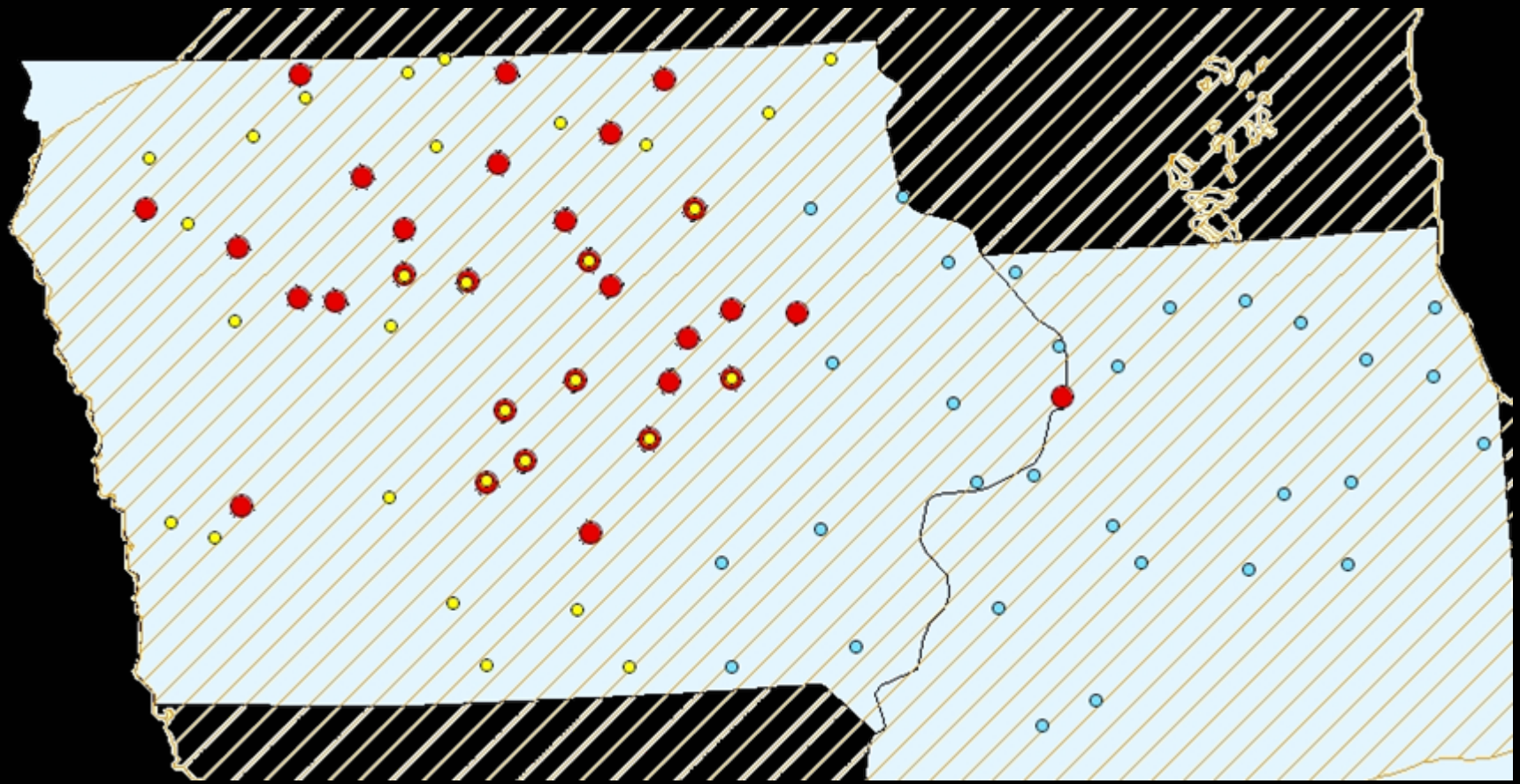
Cambrian-Ordovician Aquifer System

FINAL SAMPLING SITE LOCATIONS

Iowa



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Cambrian-Ordovician Aquifer System

CONSTITUENTS SAMPLED
Iowa

- **Major inorganics**
  - Bromide
  - Calcium
  - Chloride
  - Fluoride
  - Iron
  - Magnesium
  - Manganese
  - Potassium
  - Silica
  - Sodium
  - Sulfate
- **Trace elements**
  - Aluminum
  - Antimony
  - Arsenic
  - Barium
  - Beryllium
  - Boron
  - Cadmium
  - Chromium
  - Cobalt
  - Copper
  - Lead
  - Lithium
  - Manganese
  - Molybdenum
  - Nickel
  - Selenium
  - Silver
  - Strontium
  - Thallium
  - Uranium
  - Vanadium
  - Zinc
- **Nutrients**
  - Nitrogen, ammonia
  - Nitrogen, nitrite
  - Nitrogen, nitrite + nitrate
  - Total nitrogen (NH_3+NO_2+NO_3+organic)
  - Phosphorus, orthophosphate
- **Dissolved organic carbon**
- **Pesticides**
- **Volatile organic carbons**
- **Radium isotopes**
  - Ra-226
  - Ra-228
- **Radon**
- **Tritium**

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Cambrian-Ordovician Aquifer System

PRELIMINARY RESULTS

Iowa

- **Major inorganics**
  - 70% (21 of 30) of wells sampled > 300 μg/L of iron (drinking water alert)
  - half of wells sampled > 250 mg/L of sulfate (drinking water alert)
- **Pesticides**
  - rarely detected (5 pesticides detected at least once); measured concentrations low
- **Volatile organic carbons**
  - rarely detected (5 VOCs detected at least once); measured concentrations low
- **Radon**
  - values ranged from 40 – 460 pCi/L, with a median of 110 pCi/L
- **Radium isotopes**
  - 5 of 30 wells exceeded the drinking water alert of 5 pCi/L for Ra-226

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Cambrian-Ordovician Aquifer System

SUMMARY

- 30 additional sites to be sampled in Illinois, 2009
- consistent sampling techniques and same analytical schedules
- combine data sets for further analysis

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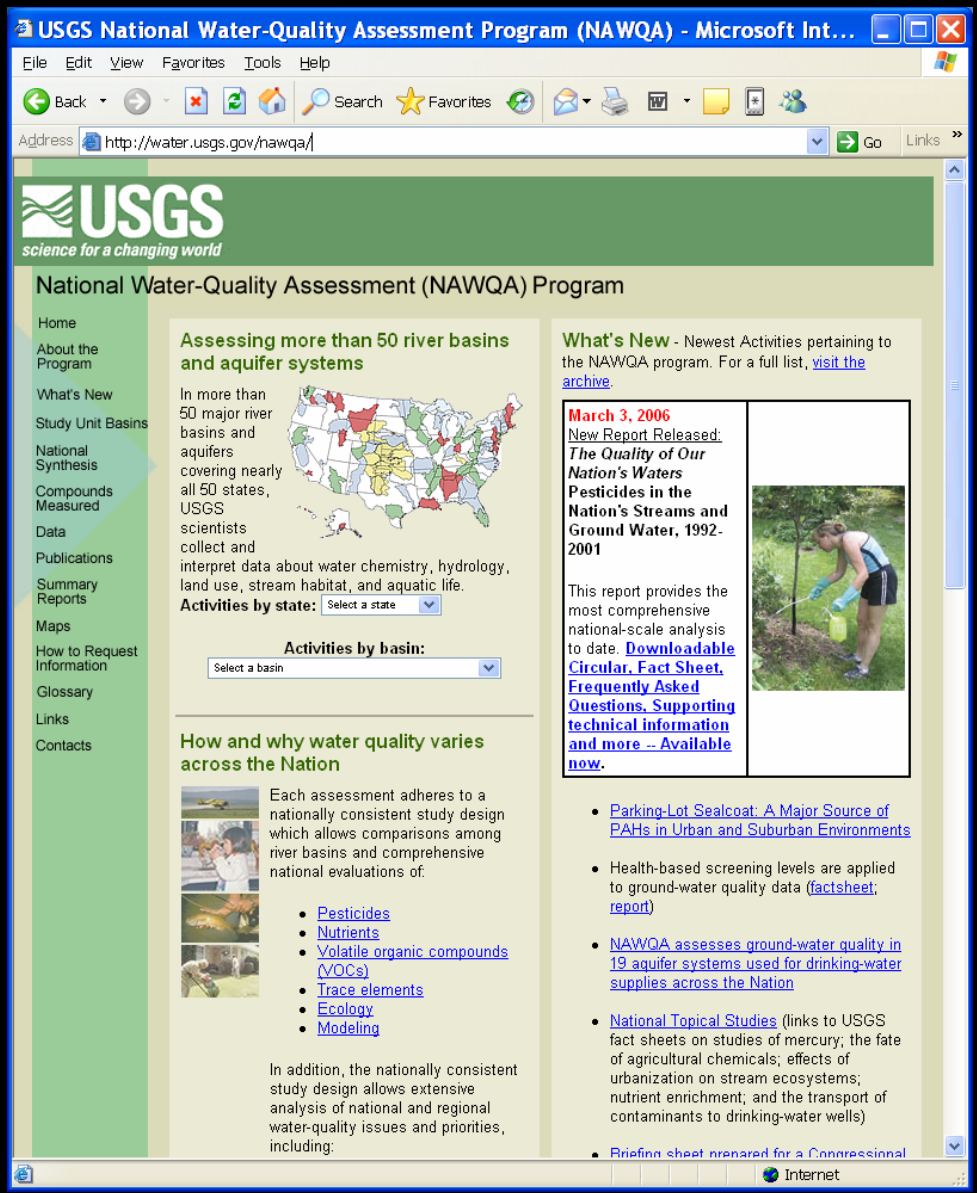
The NAWQA Program:
http://water.usgs.gov/nawqa/



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