NAWQA CYCLE 3 GROUNDWATER: NETWORK DESIGN

Kenneth Belitz
Chief, NAWQA Groundwater Studies

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NAWQA CYCLE 3 GROUNDWATER OBJECTIVES

- Assess the quality of groundwater used for domestic and public supply
- Assess the impact of legacy contamination on the quality of surface water
- Assess changes in groundwater quality

NAWQA CYCLE 3 GROUNDWATER APPROACH

- **Synoptic monitoring of groundwater in new and existing NAWQA networks**

  monitoring wells, domestic wells, public supply wells

- **Time series sampling in selected networks**

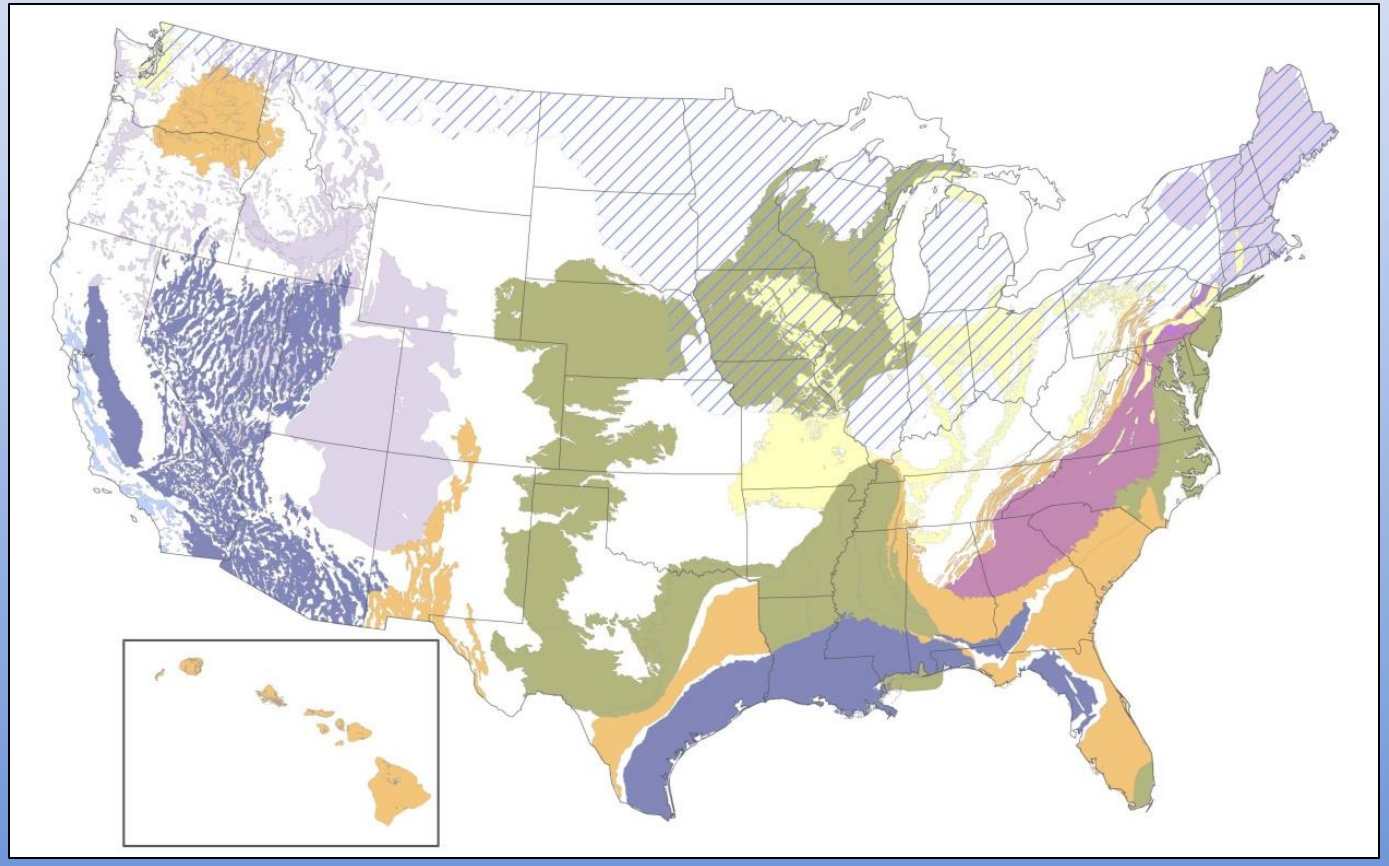
  continuous monitoring and periodic sampling

- **Modeling – multiple types & multiple scales**

  flow & transport, statistical, hybrid

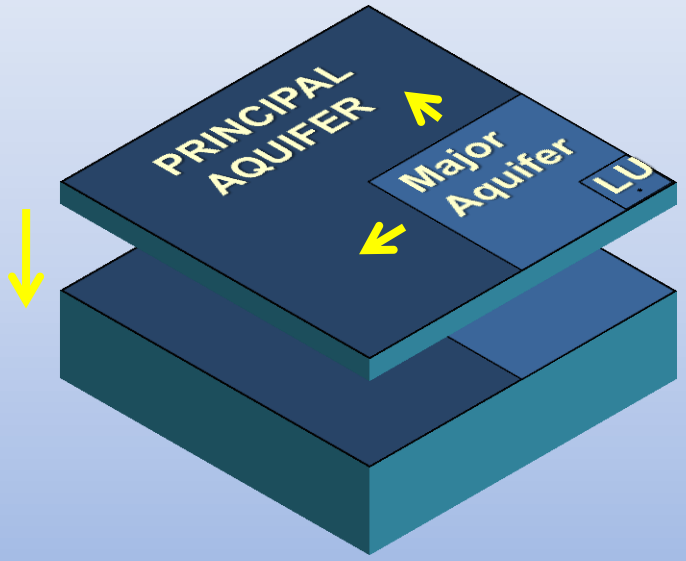
  National, Principal Aquifers, Regional, Local

THE NATION AND PRINICIPAL AQUIFERS ARE THE PRIMARY ORGANIZATIONAL UNITS



20 PRINICIPAL AQUIFERS ACCOUNT FOR 90% OF PUMPING FOR PUBLIC SUPPLY

- **6 account for 50%, and 13 account for 75%**
- **These PAs also account for 85% of pumping for domestic supply**



NETWORK DESIGN

- **Multiple scales**
- **Relative to Cycles 1 & 2:**
  - **expanded depth & spatial coverage**
  - **evaluate short-term variation along with long-term trends**
  - **continue to collaborate with partners**

Network Type	Scale km^2	Typical depth, m	Number networks	Wells per network	Total wells (samples)	Primary purpose
Principal Aquifer Survey	10K-100K	50-200	16	90	1400	Assess
Major Aquifer Survey	1K-10K	20-50	30	30	900	Trends
Land-Use Survey	100-1000	10	50	30	1500	Trends
Model Support Studies	1K-10K	10-200	6	30	240	Loading
Flow Path Studies	1K-10K	10-200	12	20	--	Various
Enhanced Trends	--	--	8	3 (30)	(720)	Trends
Totals	--	--		**- -**	**4800**	

GROUND WATER RESOURCE: 82% PUBLIC SUPPLY, 18% DOMESTIC

ANALYTES

- **Water Quality Constituents (those with HHBs)**

  Trace elements, Radchem, Nutrients, Organics,

  Microbiological indicators (e.coli, coliform, enteroccocci)

- **Emerging Constituents**

  Pharmaceuticals, Hormones/Endocrine Disruptors, Polonium, …

- **Geochemical Indicators**

  Major ions, redox, pH, DO, T

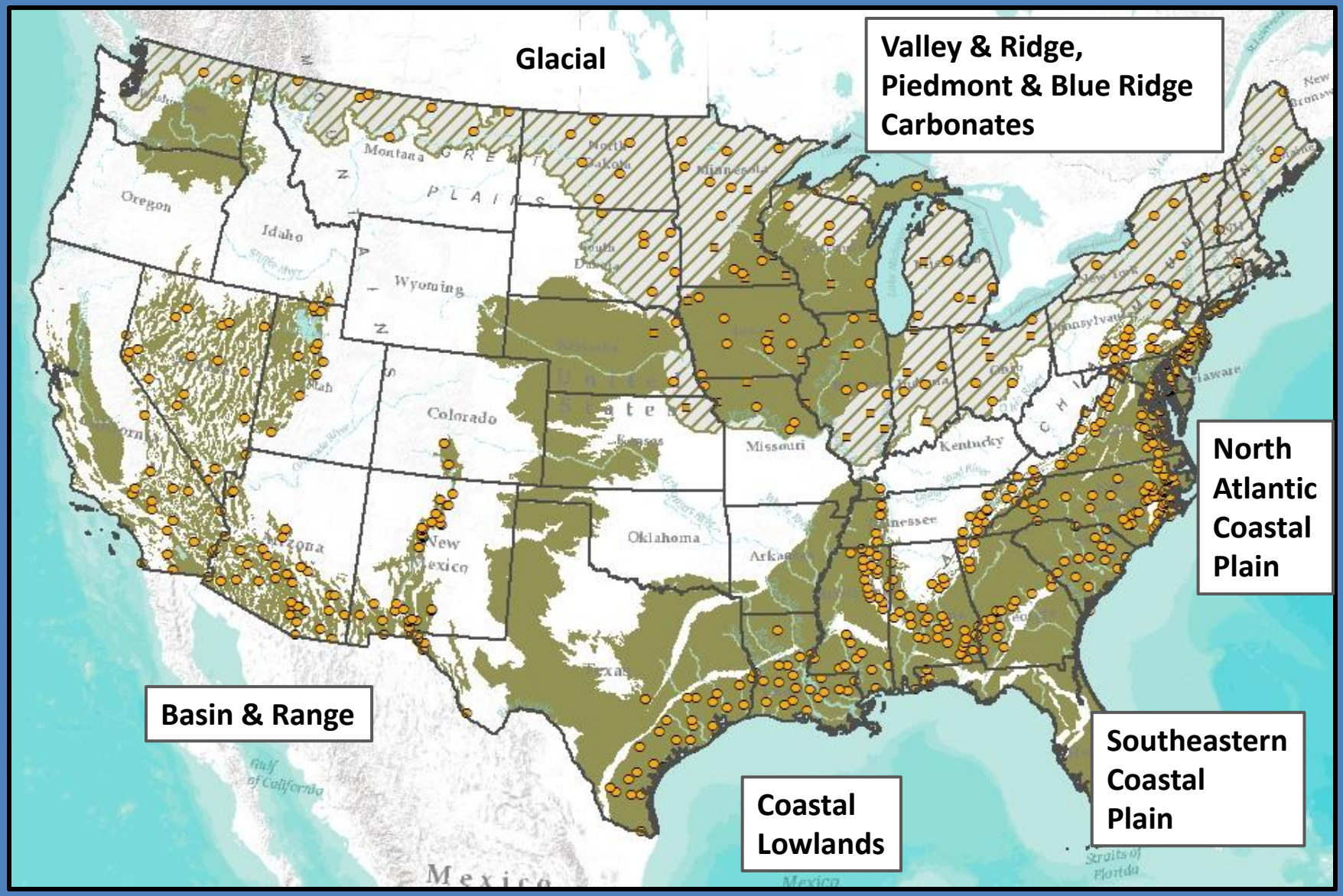
- **Age Tracers**

  3H, noble gases, CFCs, SF6, 14C, …

ANALYTES

- New networks (PAS)
  - Full analytical suite
- Trend networks
  - Basic inorganic suite
  - Reduced number of wells (8) sampled for pesticides & VOCs with exceptions made on a case-by-case basis, subject to funding
  - MAS wells sampled for radchem and emerging constituents with selected LUS networks (domestic wells)
- MSS, FPS, ETN
  - Full analytical suite, but …

PAS WELLS – FY 13 (~400)



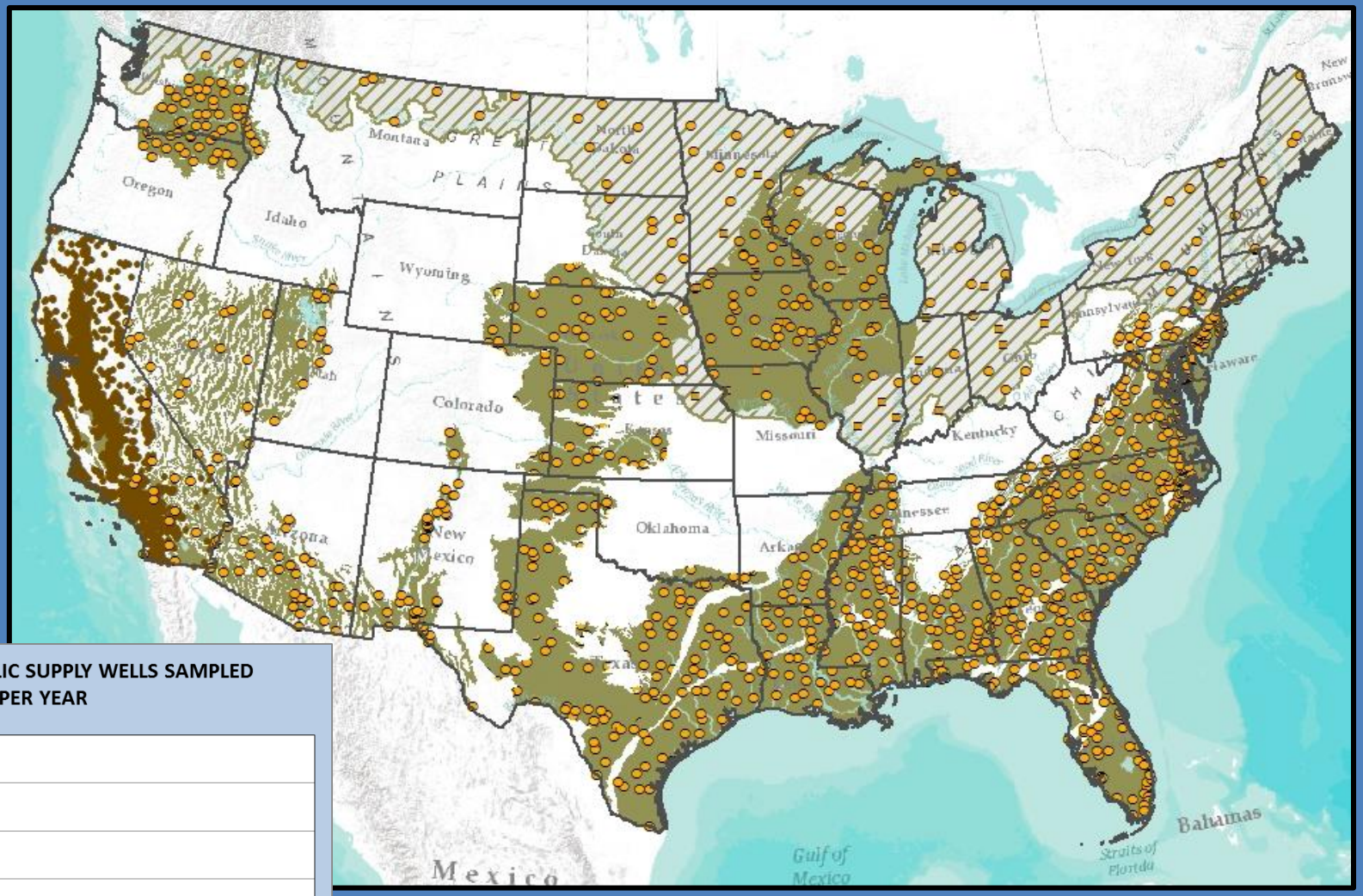
PRELIMINARY FINDINGS (*subject to change*) FOR 5 PRINCIPAL AQUIFERS SAMPLED IN FY13

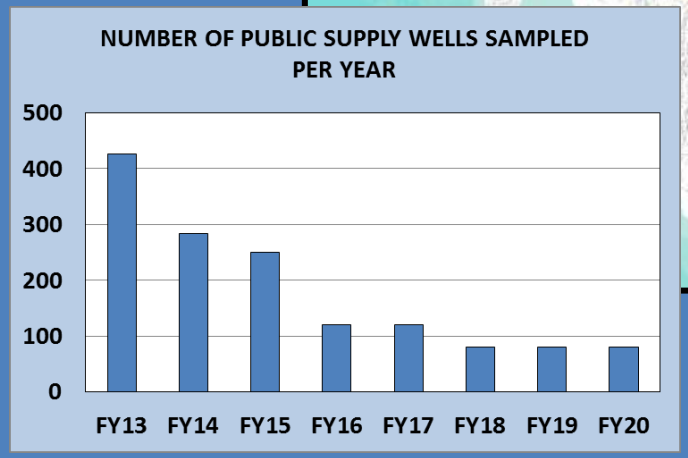
FOR A GIVEN CONSTITUENT CLASS: COUNT THE NUMBER OF PAs WITH HIGH CONCENTRATIONS EXCEEDING THE GIVEN PROPORTION

	>=2%	>=5%	>=10%	>=20%
Organics	0	0	0	0
Nitrate	2	0	0	0
Trace & minor inorganics	5	4	3	1

- Arsenic, Uranium, Fluoride (MCLs)
- Manganese (HHBs)
- Basin&Range>Glacial>NACP/SECP>Valley&Ridge/Piedmont&Blue Ridge CO3

PAS WELLS – CYCLE 3 (~1400)





Assessments will be based on NAWQA collected data + additional data [e.g. compliance data for PSWs; CA GAMA]

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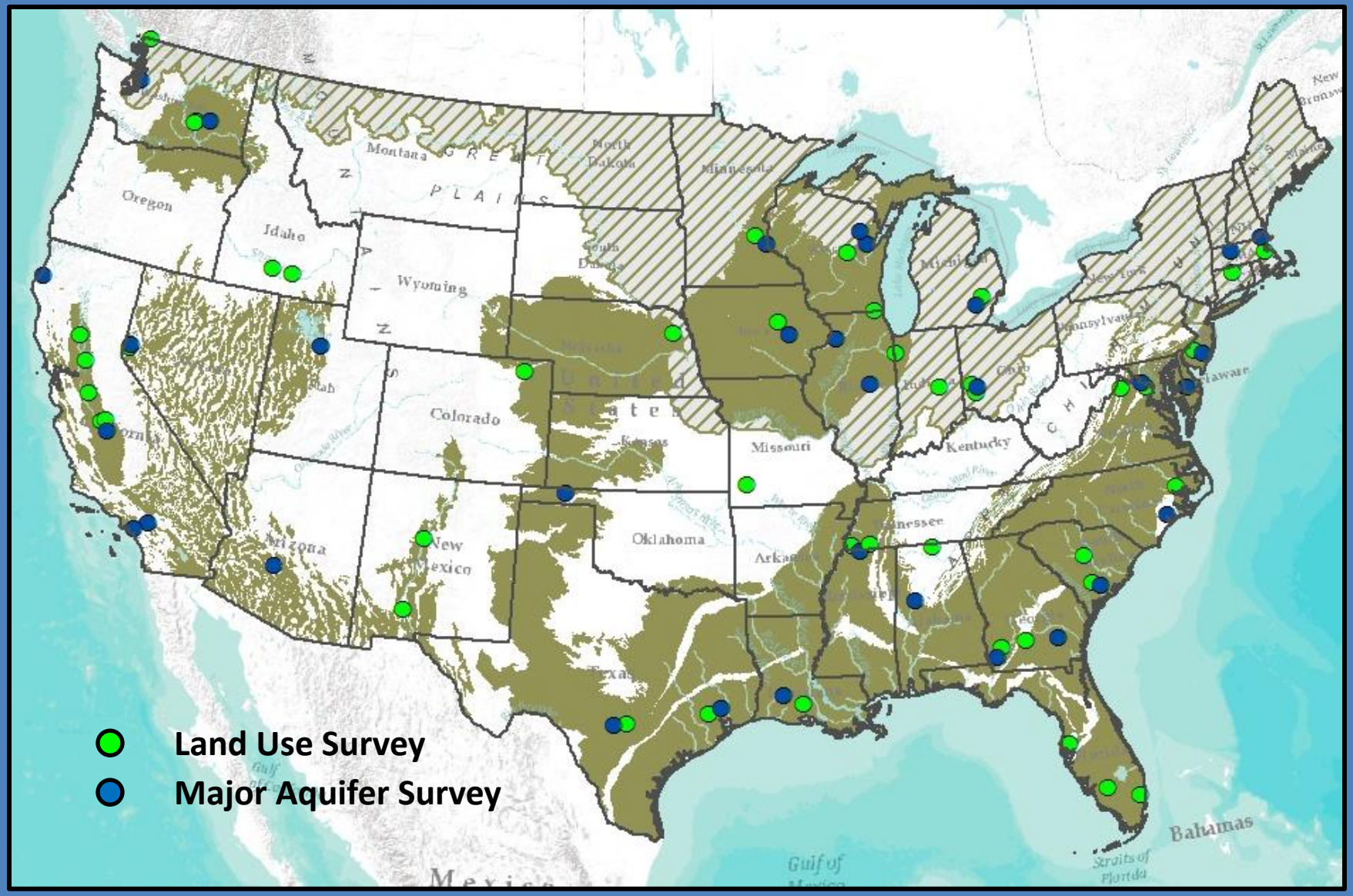
DECADAL (MAS & LUS) NETWORKS



Is groundwater quality getting better or worse?

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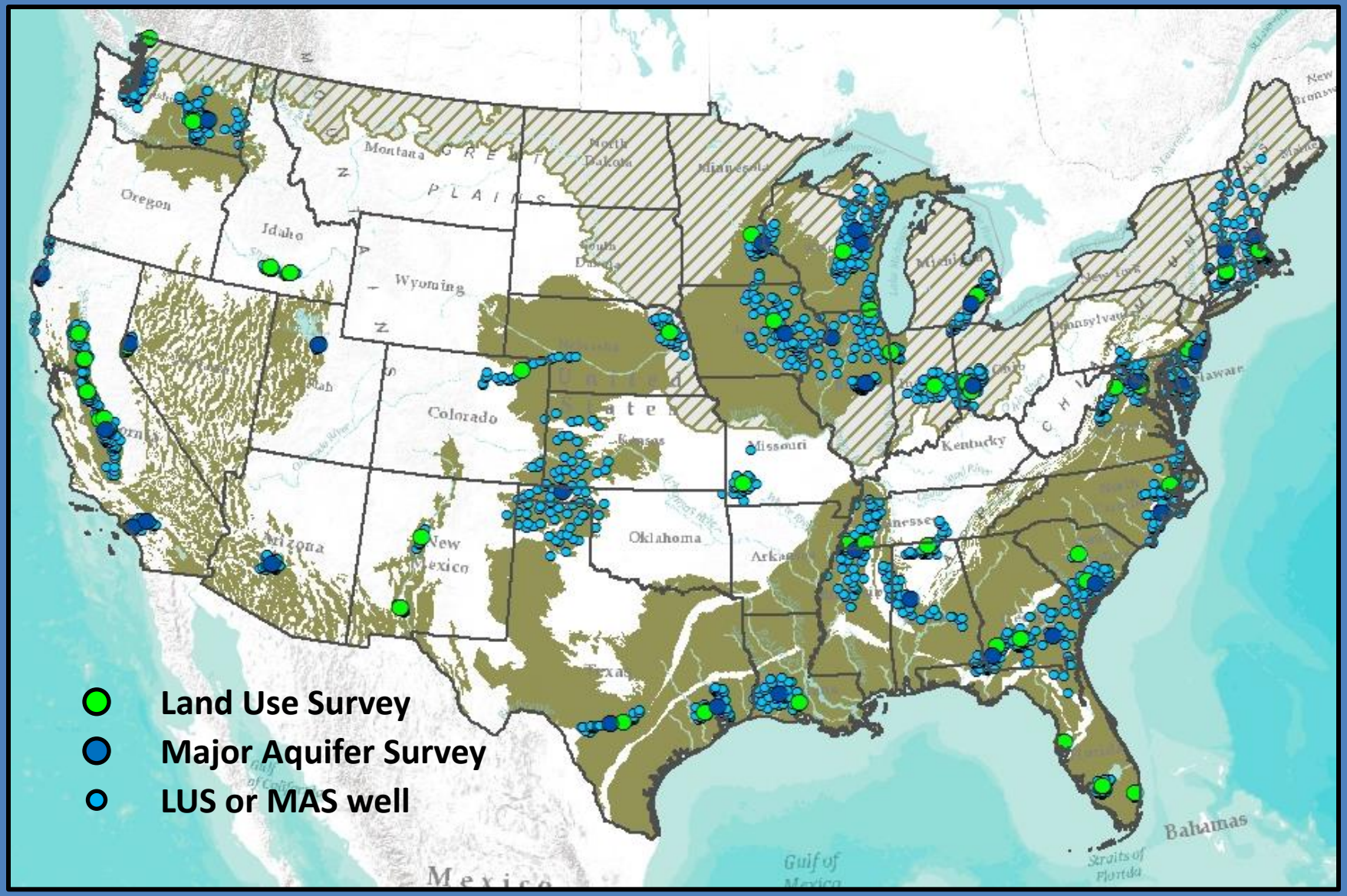
DECADAL (MAS & LUS) NETWORKS & WELLS



Is groundwater quality getting better or worse?

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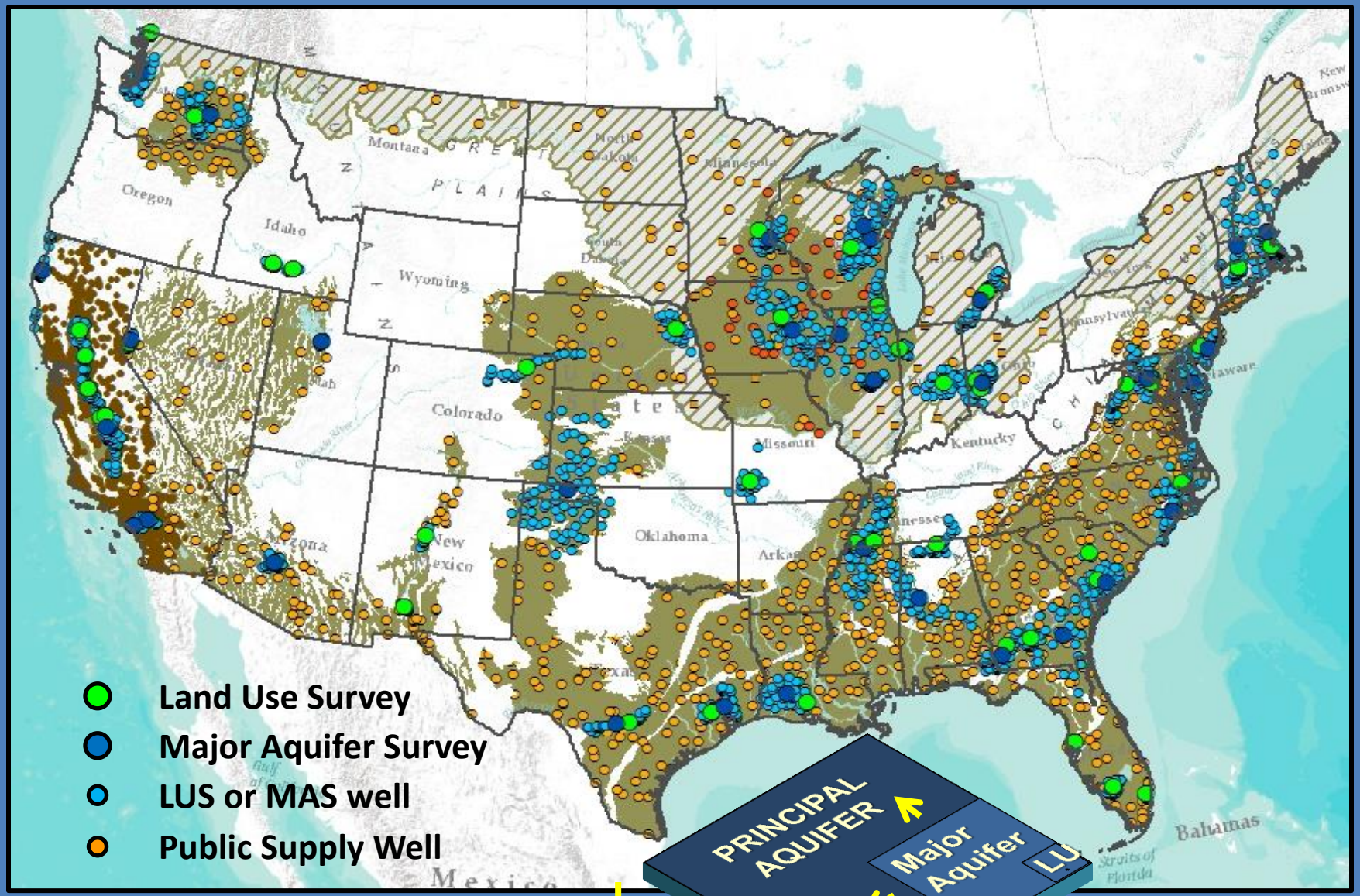
TOWARD A THREE DIMENSIONAL PERSPECTIVE ON GW QUALITY



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FLOW PATH NETWORK

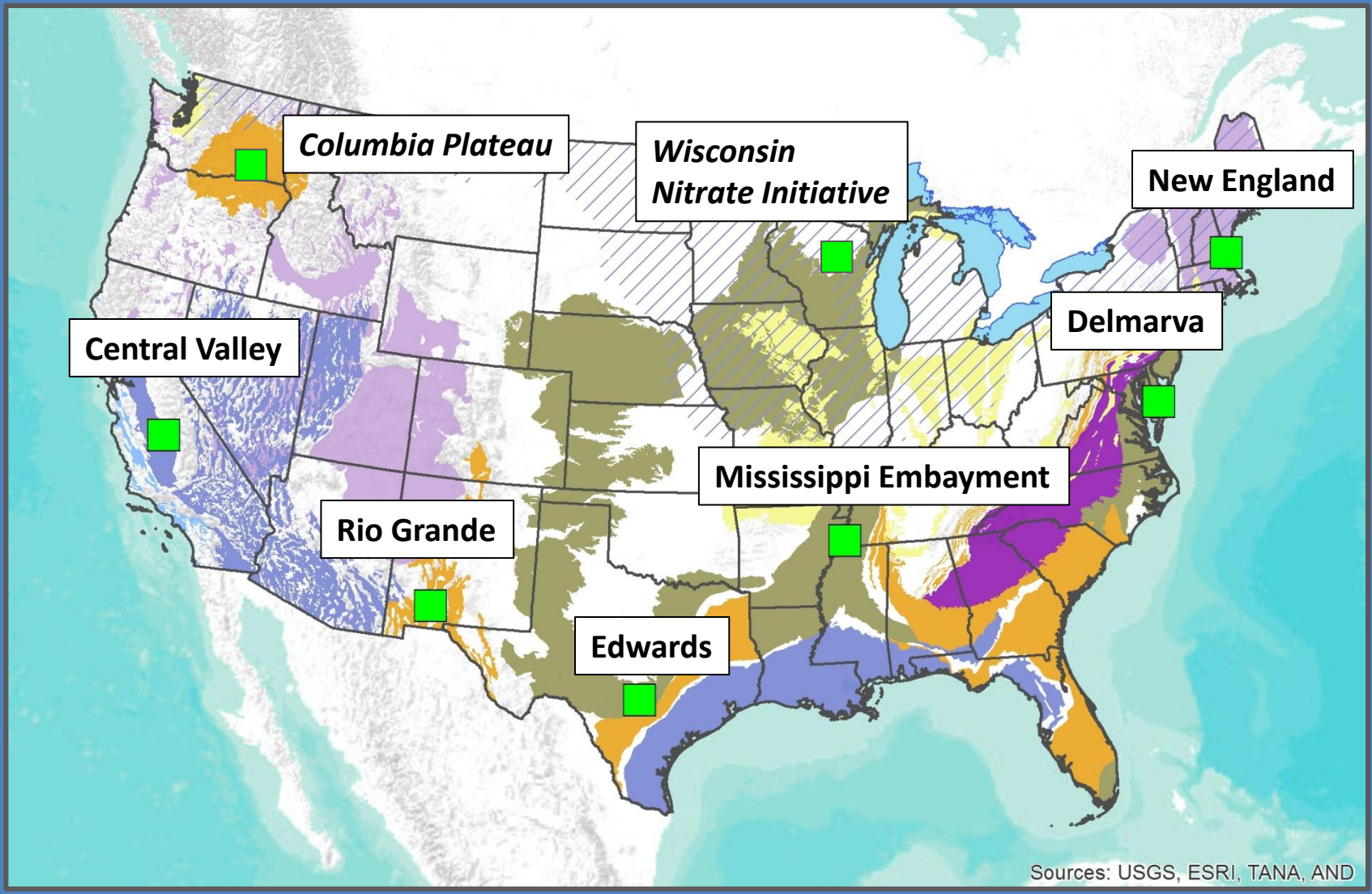
- Flow path studies trade "space for time"
  - Synoptic sampling and age dating of those samples
  - GW quality can be related to age

- Flow path studies
  - provide insight into reaction rates
  - provide link between shallower and deeper wells
  - are complementary to decadal resampling of LUS and MAS networks
  - are supportive of modeling studies
  - address the question: "is groundwater quality getting better or worse?

ENHANCED TRENDS NETWORK

- Over what time scales does groundwater quality change?
- Continuous monitoring of water level, specific conductance, temperature, +/- other probes (DO, NO3)
- Direct measures of water quality and surrogates
- Bimonthly sampling for 4 years & biennial for 6 years

ETN SITES



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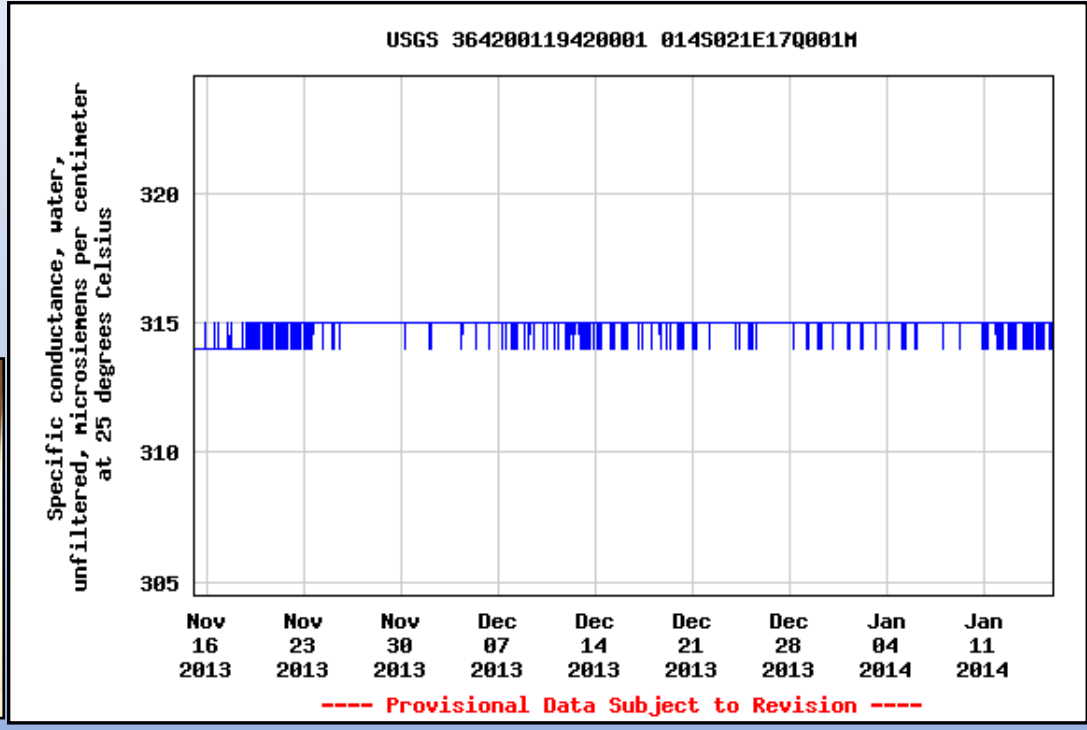
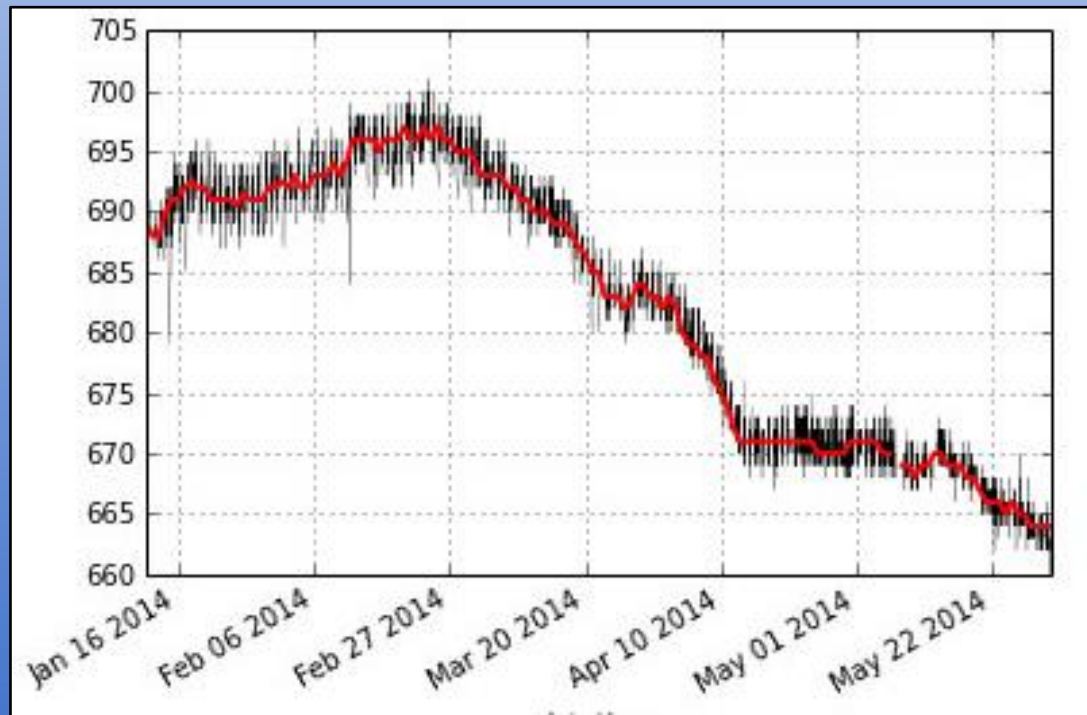
Public Supply Well in CA

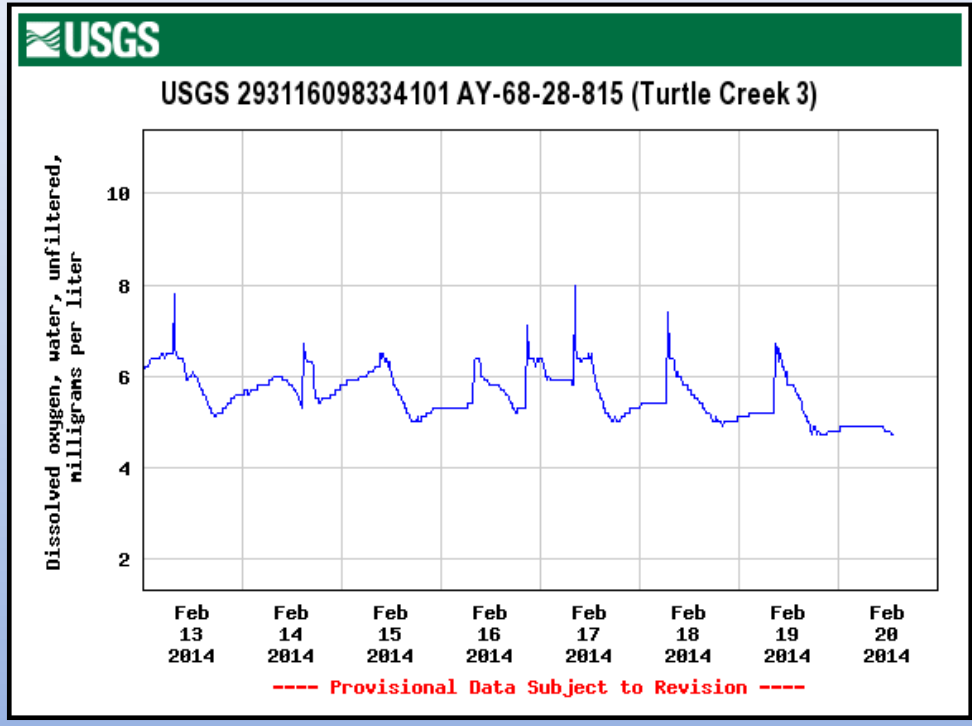


Public Supply Well in NH

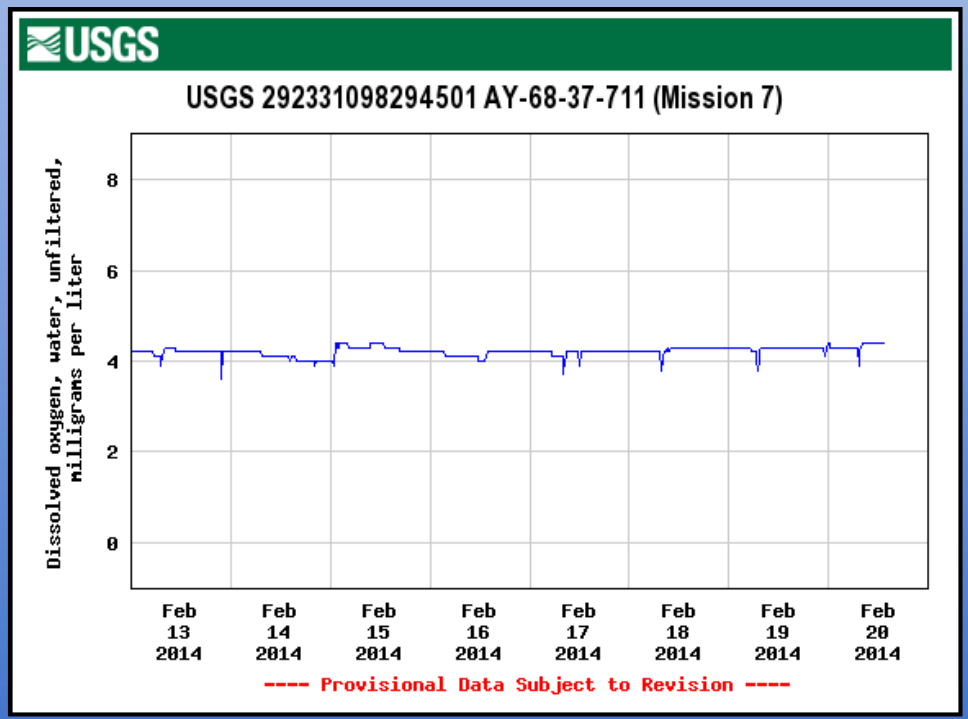


Public Supply Wells in TX

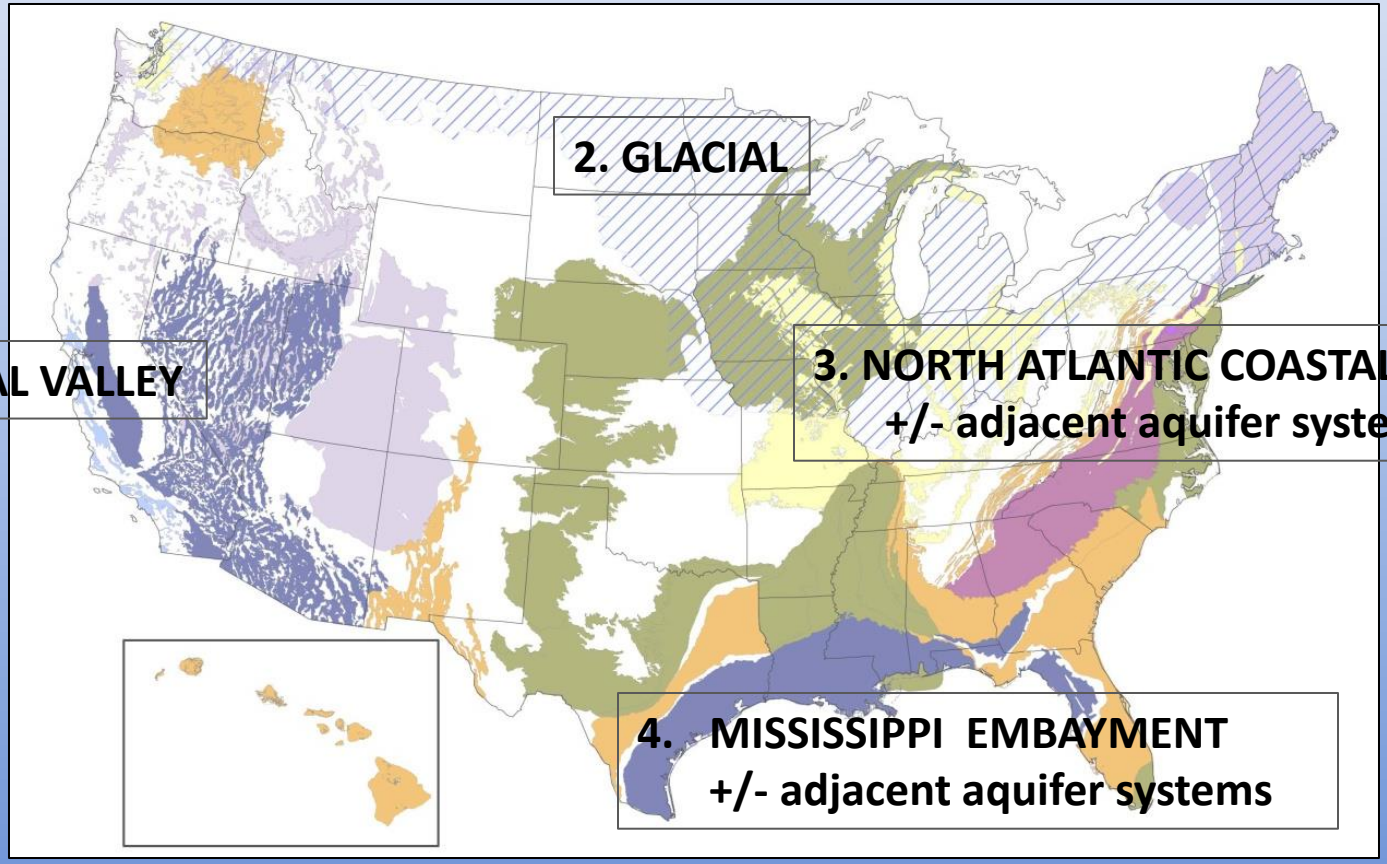
Up-gradient



Down-gradient



PRINICIPAL AQUIFERS SELECTED FOR MODELING



COLLABORATION AND COORDINATION WITH GROUND WATER RESOURCES PROGRAM

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QUESTIONS?

Prinicipal Aquifer Analysts are your primary contact

Glacial – Paul Stackelberg, pestack@usgs.gov, 518-285-5652
Atlantic – Bruce Lindsey, blindsey@usgs.gov, 717-730-6964
Gulf – Jeanie Barlow, jbarlow@usgs.gov, 601-933-2984
Western – Laura Bexfield, bexfield@usgs.gov, 505-830-7972

Groundwater Lead Scientist & Coordinator for Status & Trends
Ken Belitz, kbelitz@usgs.gov, 858-775-6309

Mapping and Modeling Coordinator
Sandy Eberts, smeberts@usgs.gov, 614-430-7740