

A Balanced Approach to Monitoring: Benefits of Collaboration

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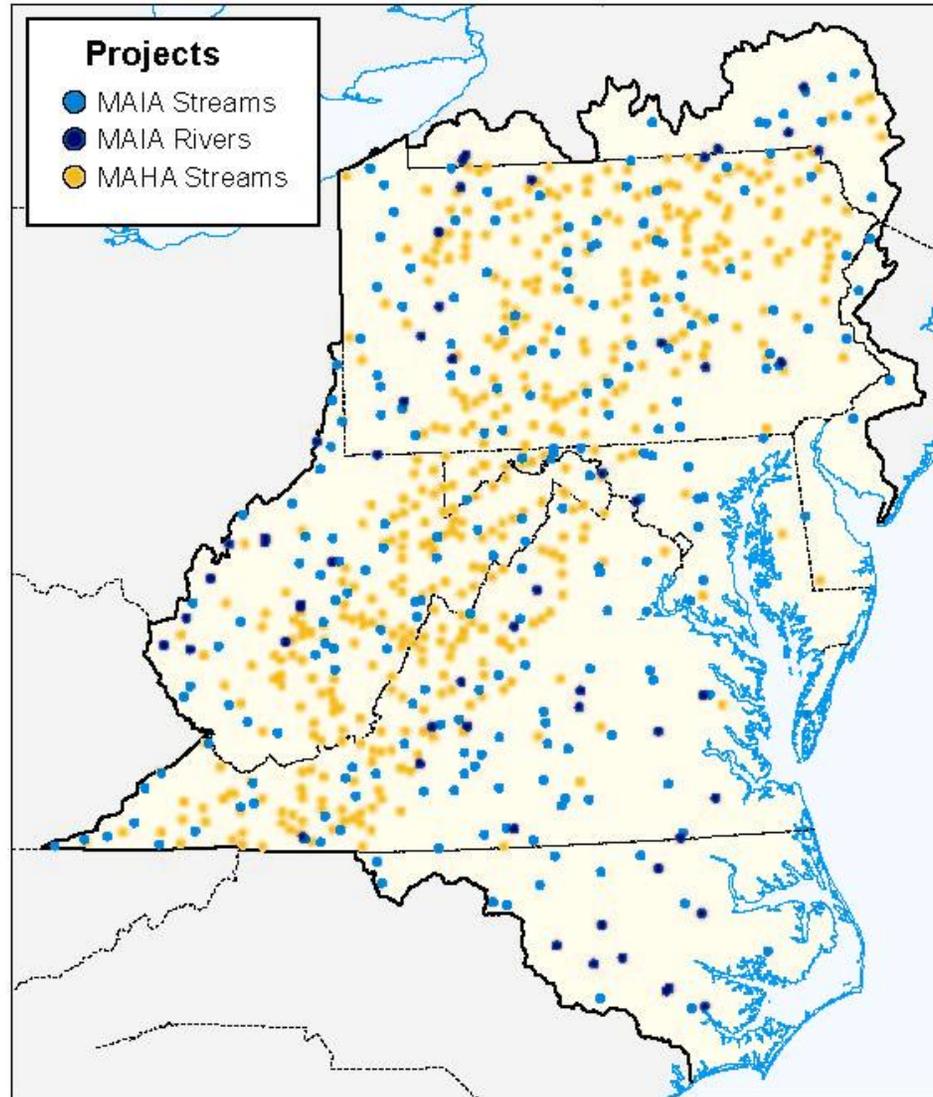
Balanced approach to ambient monitoring using multiple designs

- **Probabilistic sampling** (many sites, fewer samples): random site selection; limited temporal coverage
- **Targeted sampling** (fewer sites, many samples): specific site selection; wide temporal coverage
- **Predictive tools**

U.S. Environmental Protection Agency's Mid-Atlantic Integrated Assessment



Sampling Points



Are there problems in the Mid-Atlantic?

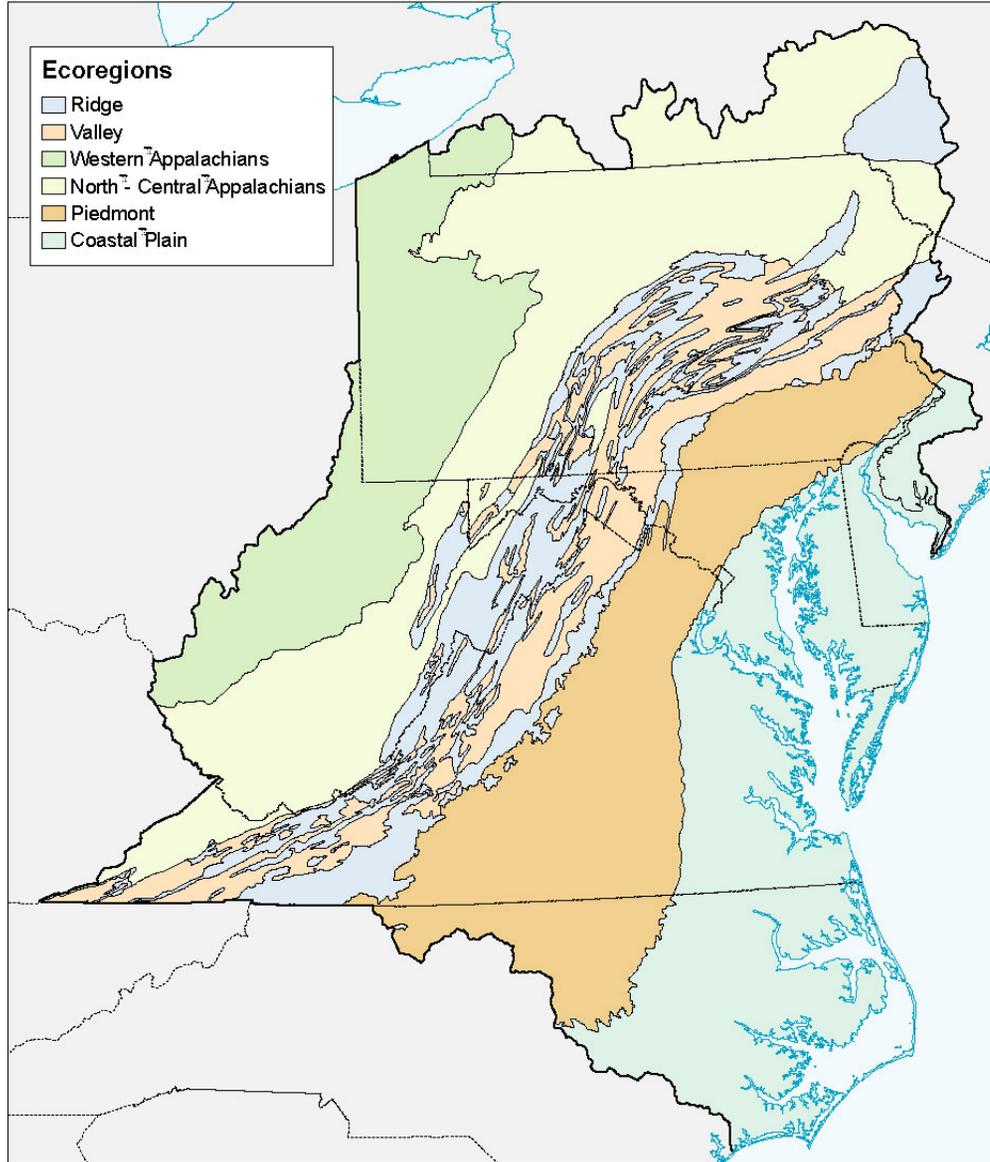
Percent of Stream Resource in:

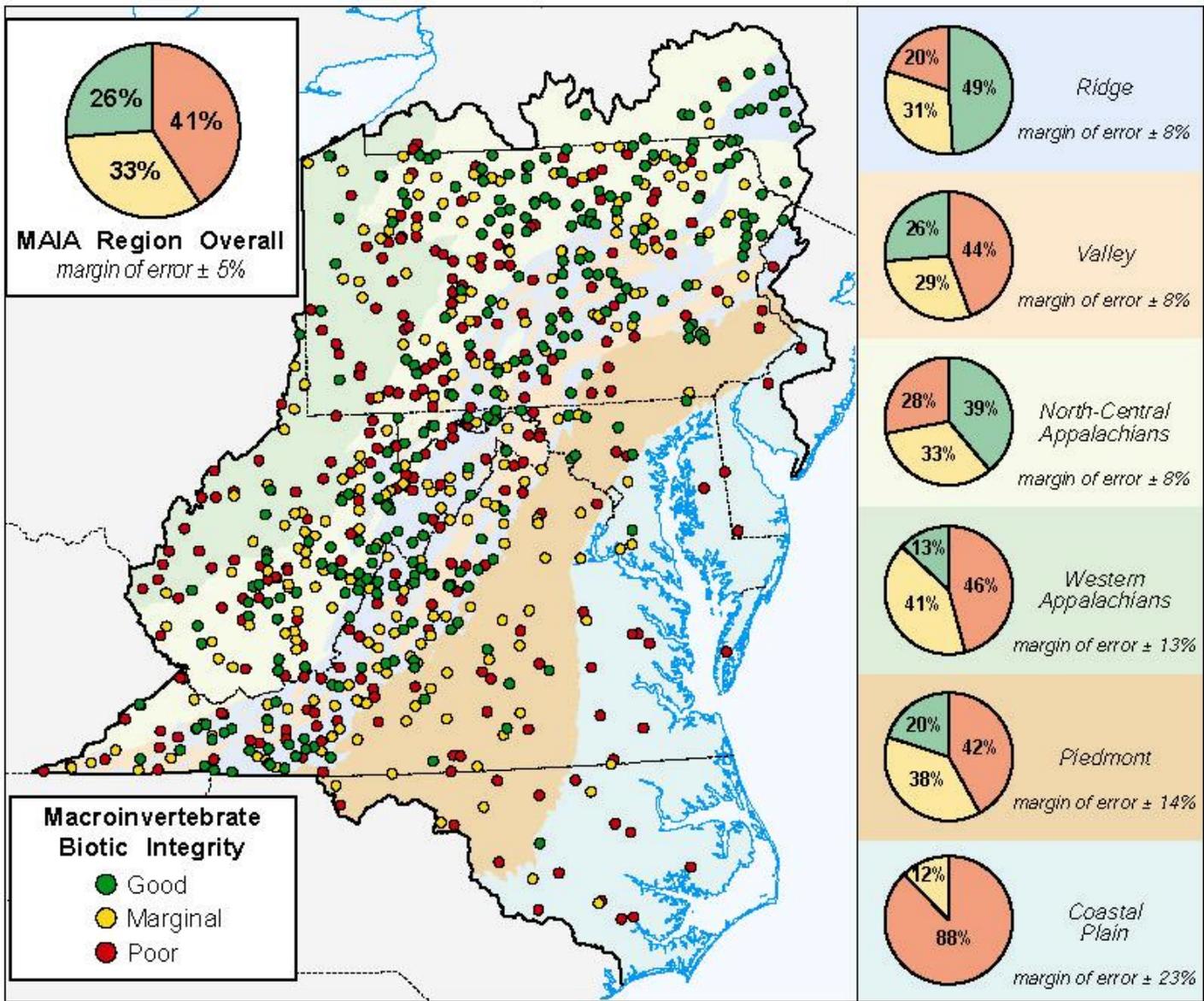
	Good Condition	Marginal Condition	Poor Condition
FISH	21	42	21
MACRO-INVERTS	26	33	41
ALGAE	30	37	33

Are problems in the Mid-Atlantic region widely distributed?

- Are there sub-regions in good condition that should be targets for protection efforts?
- Are there sub-regions in poor condition that would be targets for restoration?

Ecological Regions

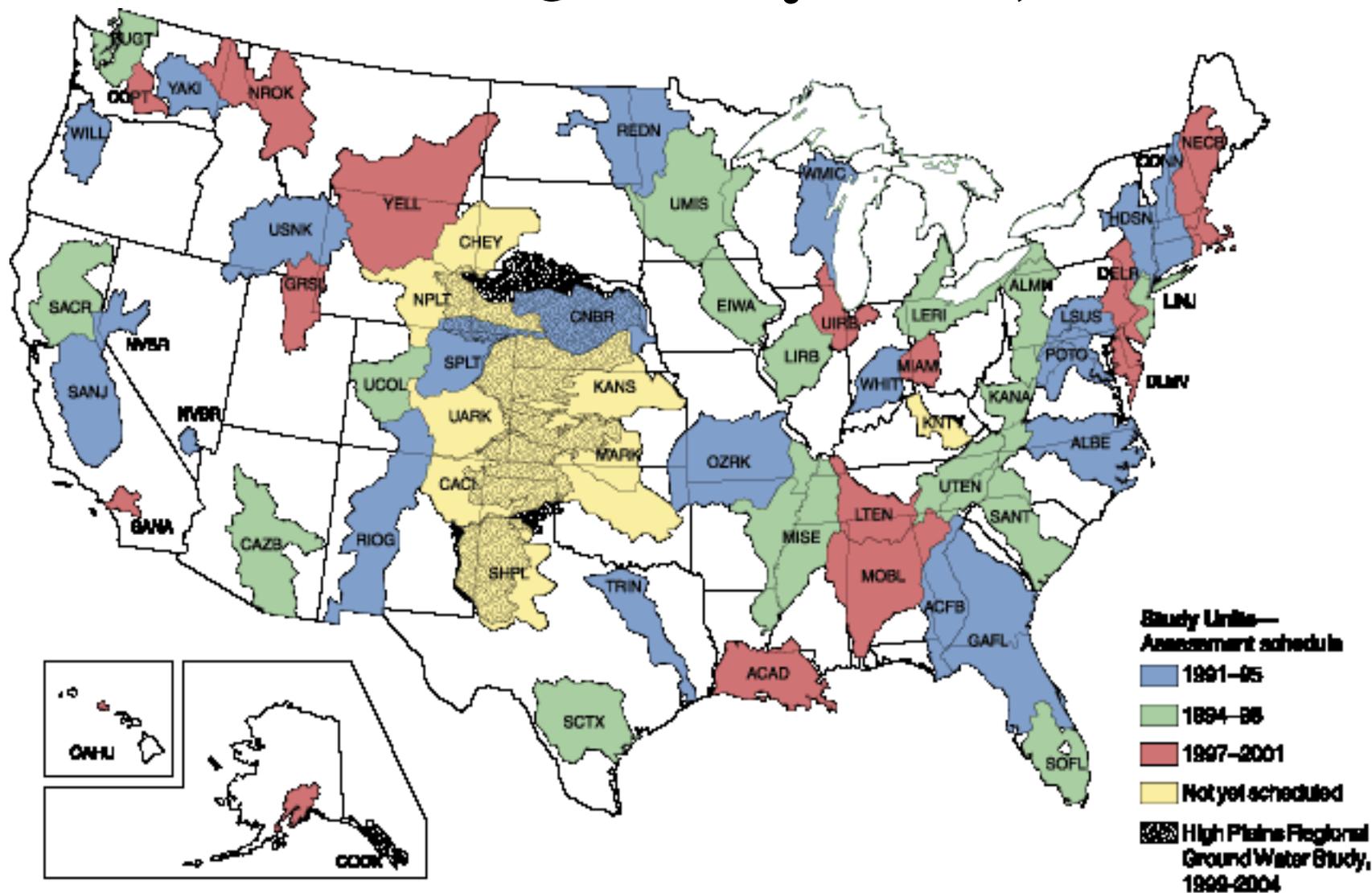




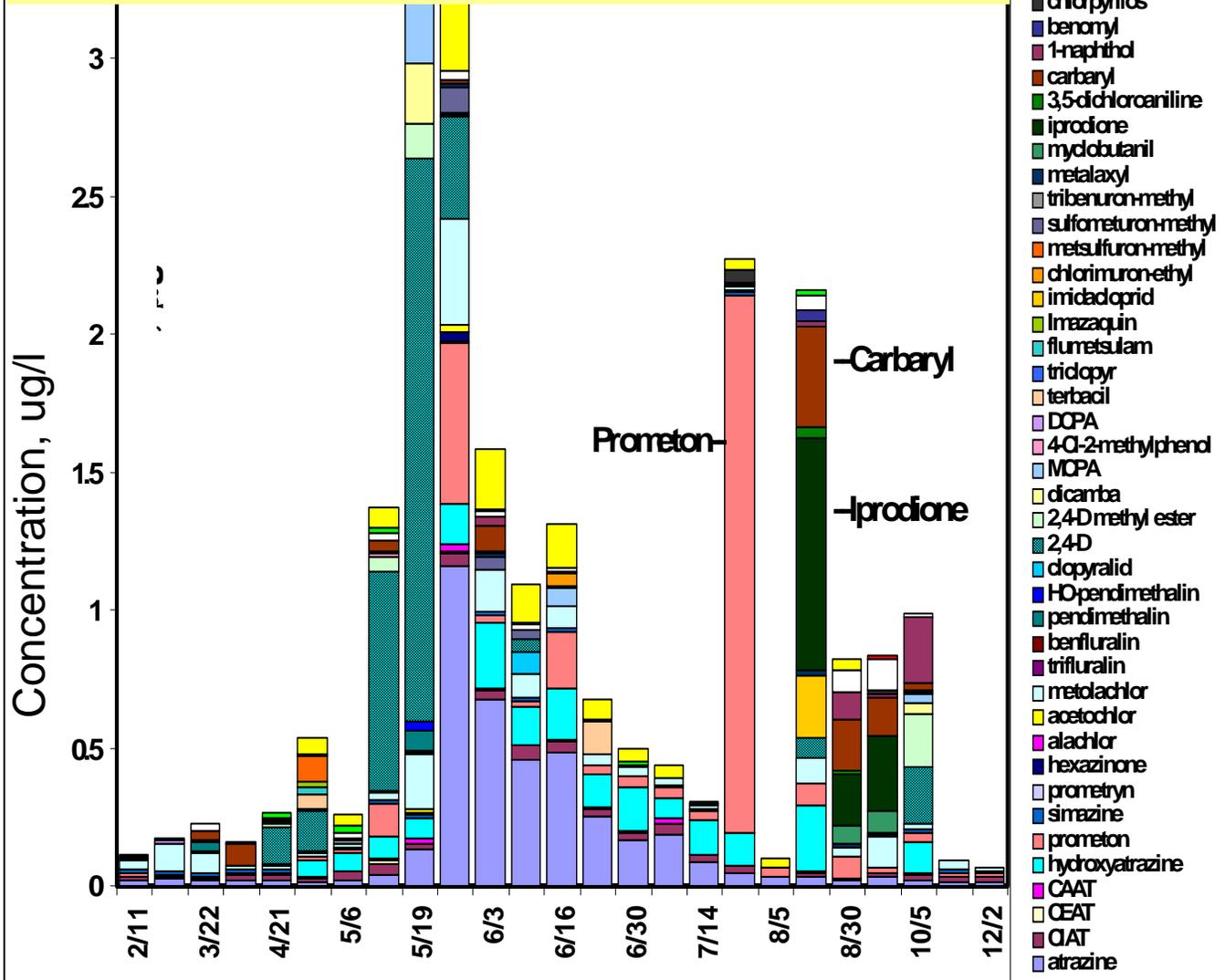
Sources, transport, causes, and effects

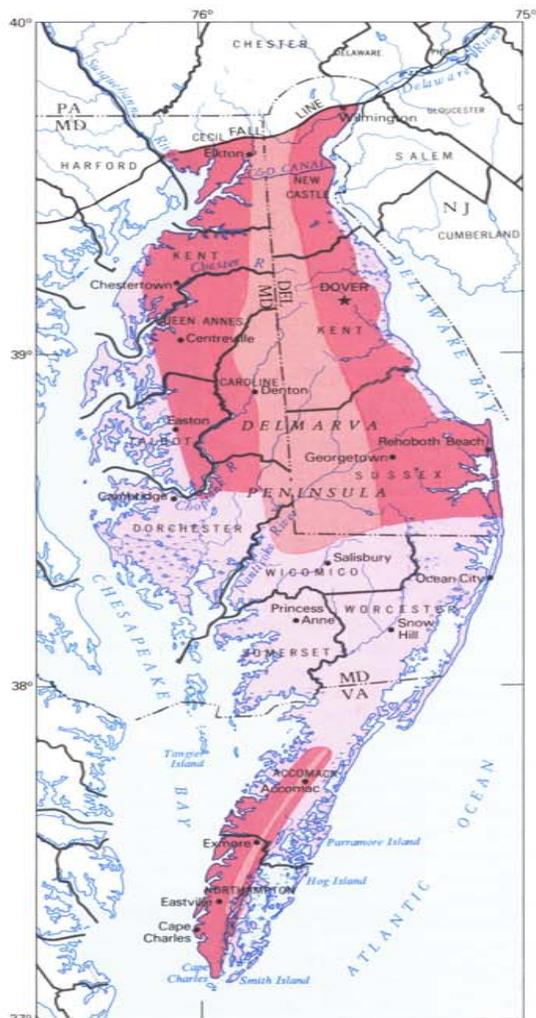
- How do agricultural, urban, and natural sources affect conditions?
- Do natural features, such as geology and soils, make some streams and ground water more vulnerable to contamination than others?
- How do land-management practices affect contamination over time?
- How do flow and ground water affect transport of contaminants and ecosystem health?
- Are conditions better or worse at certain times of year?
During floods and droughts?

NAWQA study areas, 1991 - 2001



Seasonal Stream Pesticide Occurrence in a Mixed Suburban-Agricultural Setting

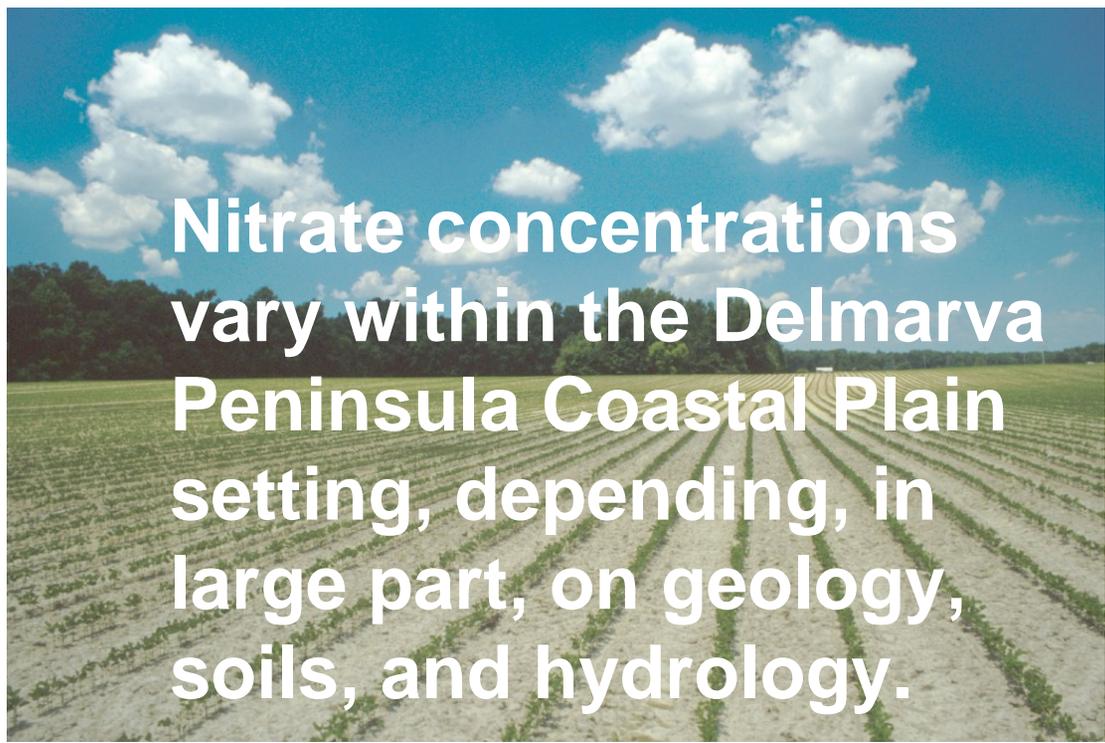




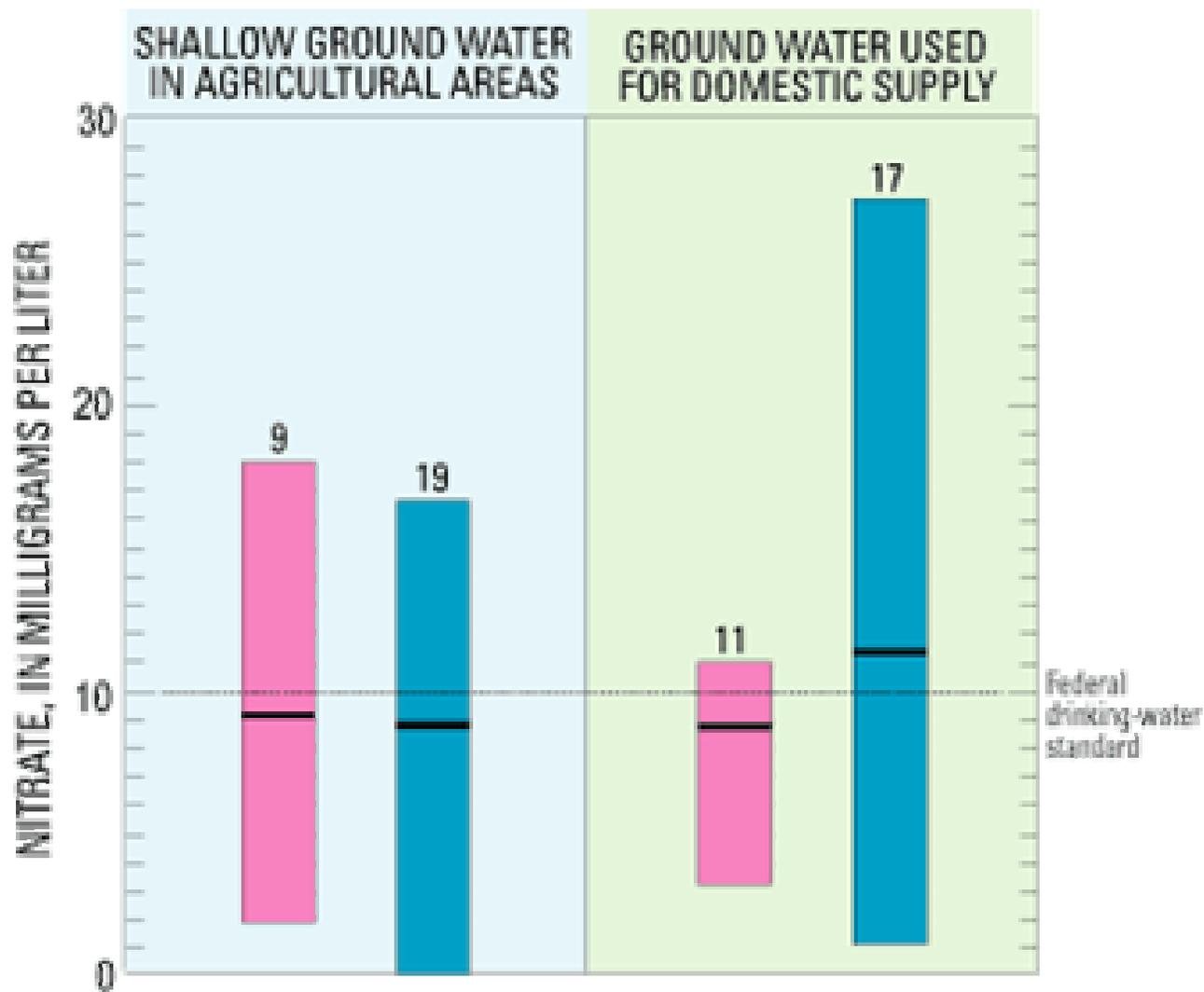
EXPLANATION

NITRATE CONCENTRATIONS VARY REGIONALLY, DEPENDING ON FACTORS SUCH AS GEOLOGY, SOILS, LAND USE, AND HYDROLOGY

- AREA WITH LITTLE NITRATE
- AREA WITH DETECTABLE CONCENTRATIONS OF NITRATE, GENERALLY LESS THAN 10 MILLIGRAMS PER LITER
- AREA WITH DETECTABLE CONCENTRATIONS OF NITRATE, COMMONLY NEAR OR EXCEEDING 10 MILLIGRAMS PER LITER



Nitrate concentrations vary within the Delmarva Peninsula Coastal Plain setting, depending, in large part, on geology, soils, and hydrology.



EXPLANATION 19 Number of samples

1988–1990

1999–2001

Maximum

Median

Minimum

Balanced approach with multiple monitoring designs

- Probabilistic based (or “random”) designs
- Targeted designs
- **Predictive tools**

SPARROW Estimates of Total Nitrogen for all Sources, Late 1990's

TN Kg/ha/yr

tnws_v3

dwtot

0 - 1.5

1.5 - 3

3 - 4.5

4.5 - 6

6 - 7.5

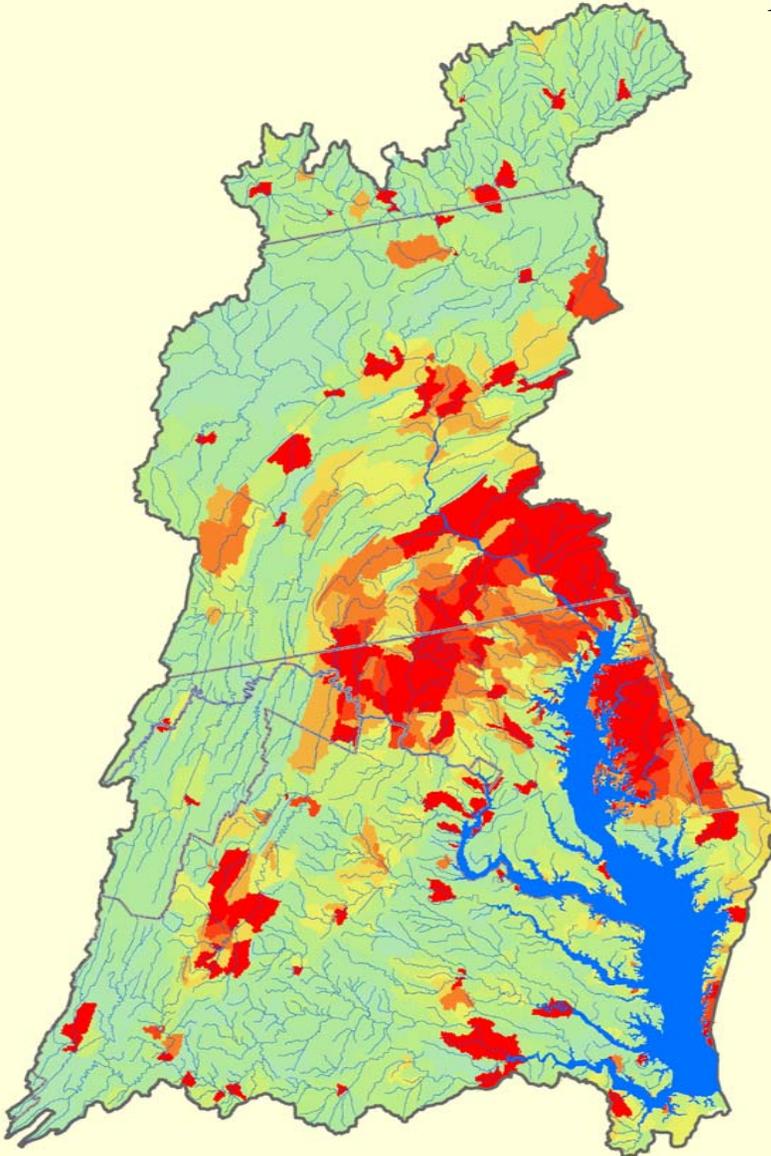
7.5 - 9

9 - 10.5

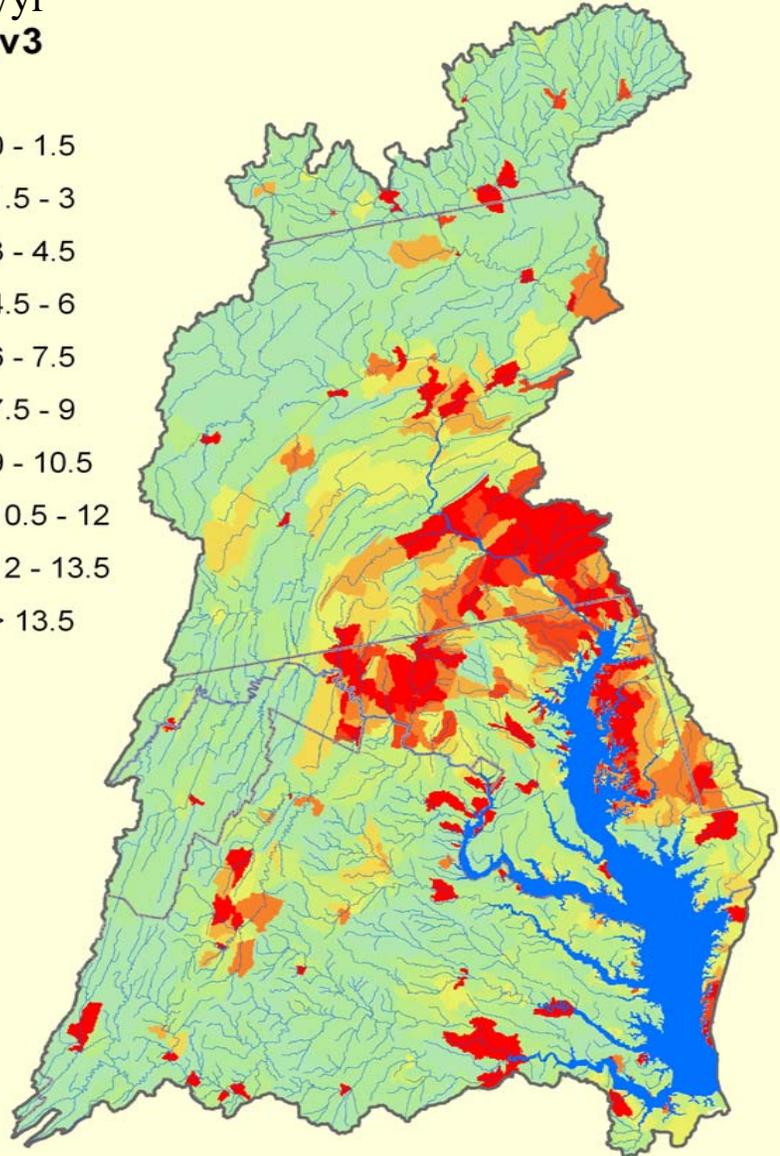
10.5 - 12

12 - 13.5

> 13.5



Incremental Yield



Delivered Yield



Water Quality Monitoring Programs



Types of Monitoring

- **Ambient Water Quality**
 - Watershed Stations
 - Trend Stations
 - Lake Monitoring
 - Special Studies
- **Biological**
- **Fish Tissue**
- **Probabilistic Stations**
- **Chesapeake Bay Monitoring**

