TRENDS IN NUTRIENTS AND PESTICIDES IN THE NATION'S RIVERS AND STREAMS

LESSONS FOR UNDERSTANDING AND MANAGING WATER QUALITY

USGS

Nutrients

- How and why have nutrients in rivers changed over time?

Pesticides

- How and why have pesticides in rivers changed over time?

Conclusions

- Key changes in the Mississippi River Basin
- Lessons for national water-quality management

USGS

Nutrients

Photograph from Franklin D. Roosevelt Presidential Library Museum

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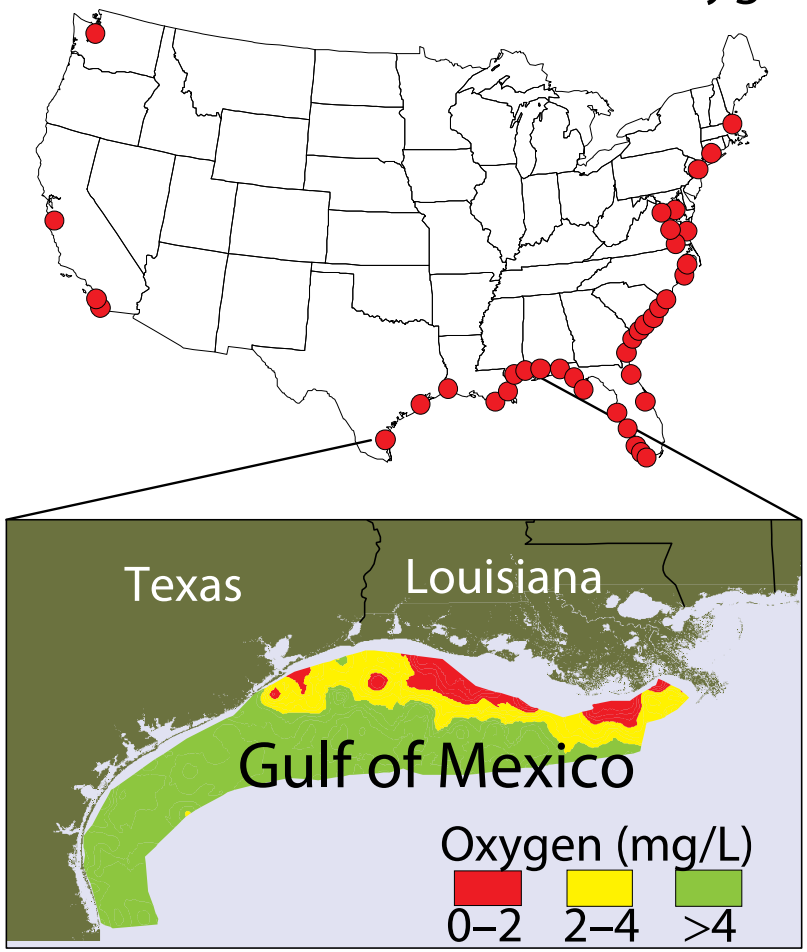
Nutrient Concerns: Estuaries

Estuaries with low dissolved oxygen



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Nutrient Concerns: Drinking Water

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HISTORIC NITRATE LEVELS IN DES MOINES WATER WORKS' SOURCE WATER

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Monday, May 13, 2013

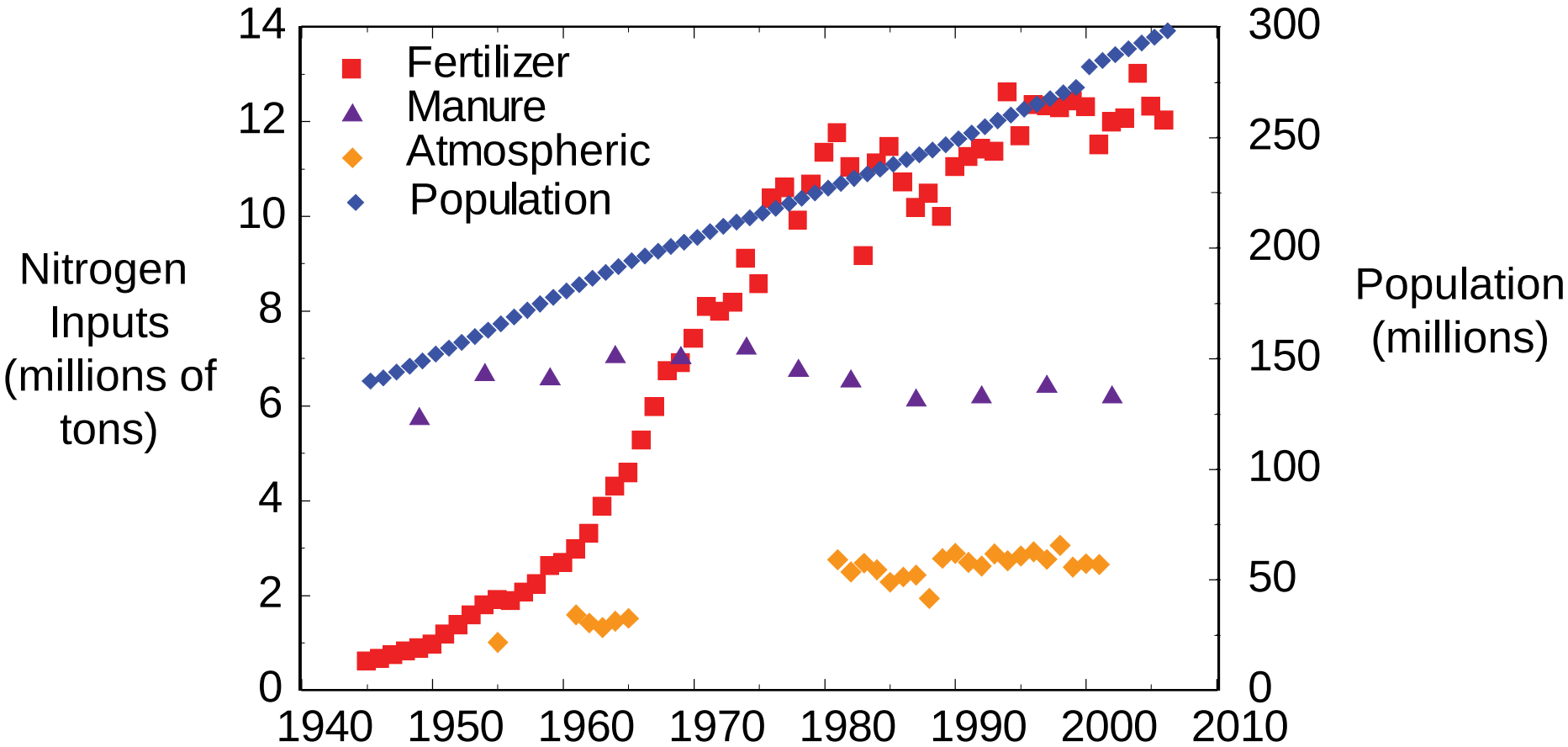
Nitrate levels in Des Moines Water Works' source water reached historic levels last week, at 24 milligrams per liter (mg/l) in the Raccoon River and 17.87 mg/l in the Des Moines River. Currently at Des Moines Water Works' river intake locations, the Raccoon River is reporting 21.04 and the Des Moines River is reporting 17.56 mg/l; however, higher numbers are being seen upstream. This new record follows the continued upward trend of nitrate concentrations since fertilizer use and increased row-crop agriculture began in the mid-1960s. It has been calculated that last week's nitrate load surpassed last year's entire nitrate load.

Through extensive and expensive water treatment, Des Moines Water Works' finished drinking water currently has a nitrate level of 7.5 mg/l. The Environmental Protection Agency's (EPA) maximum contaminant level (MCL) for nitrate levels in finished drinking water is 10 mg/l.

USGS

A look back over the past century

Nitrogen sources have increased



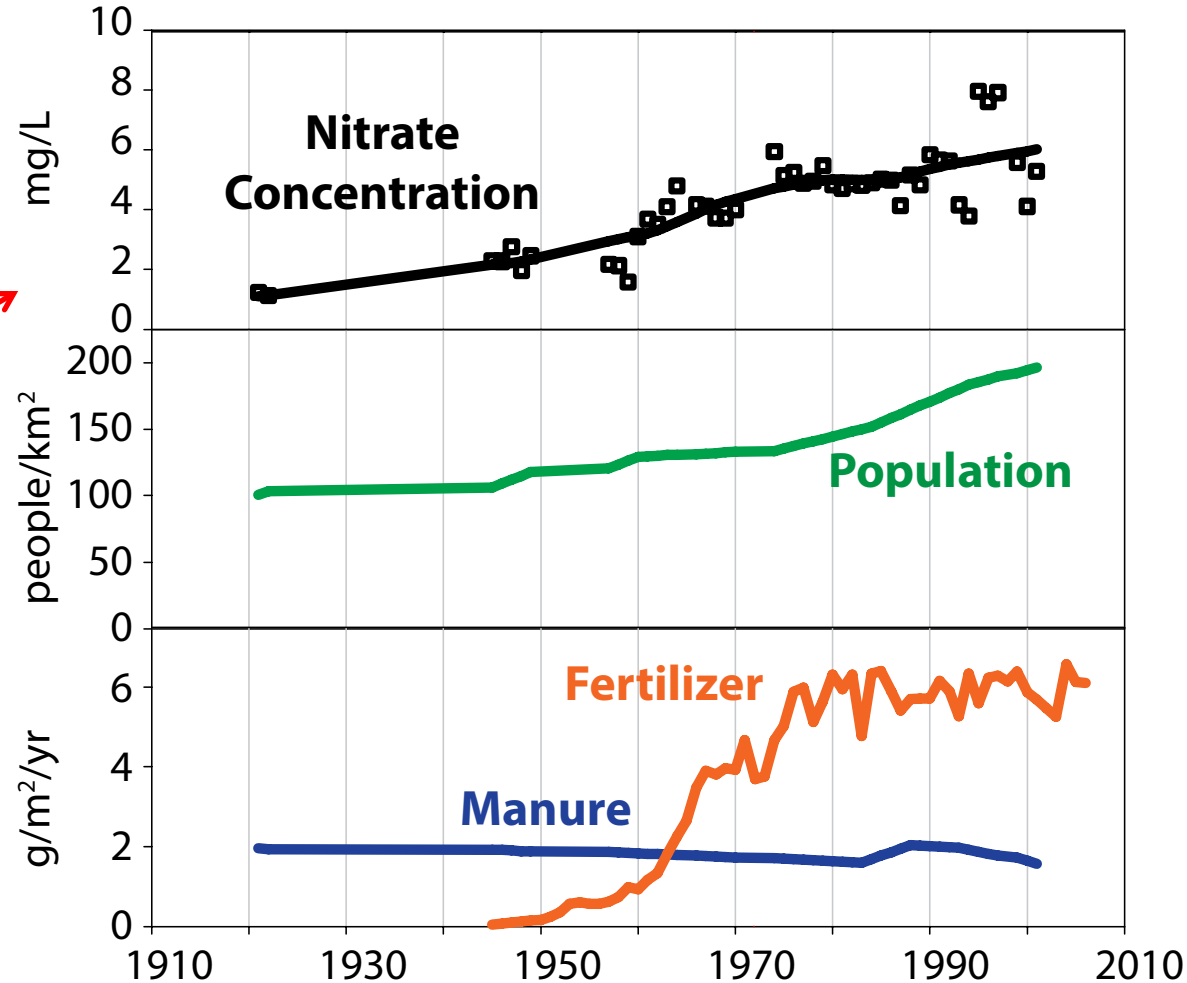
USGS

A look back over the past century

Nitrogen in rivers has increased

Illinois River at Peoria, Ill

Sites with early 20th century data



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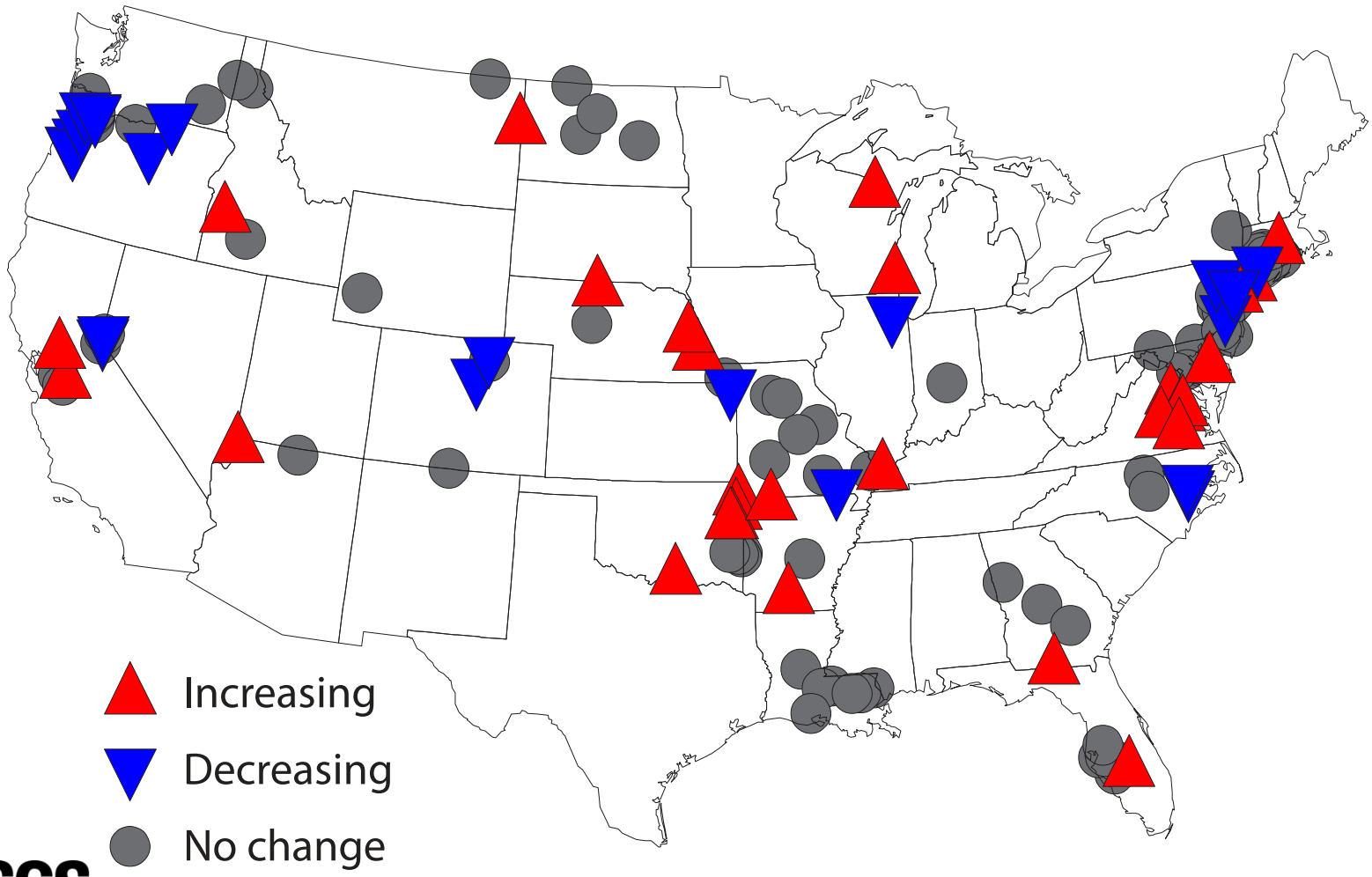
Nitrogen Trends in U.S. Rivers
1993 - 2003



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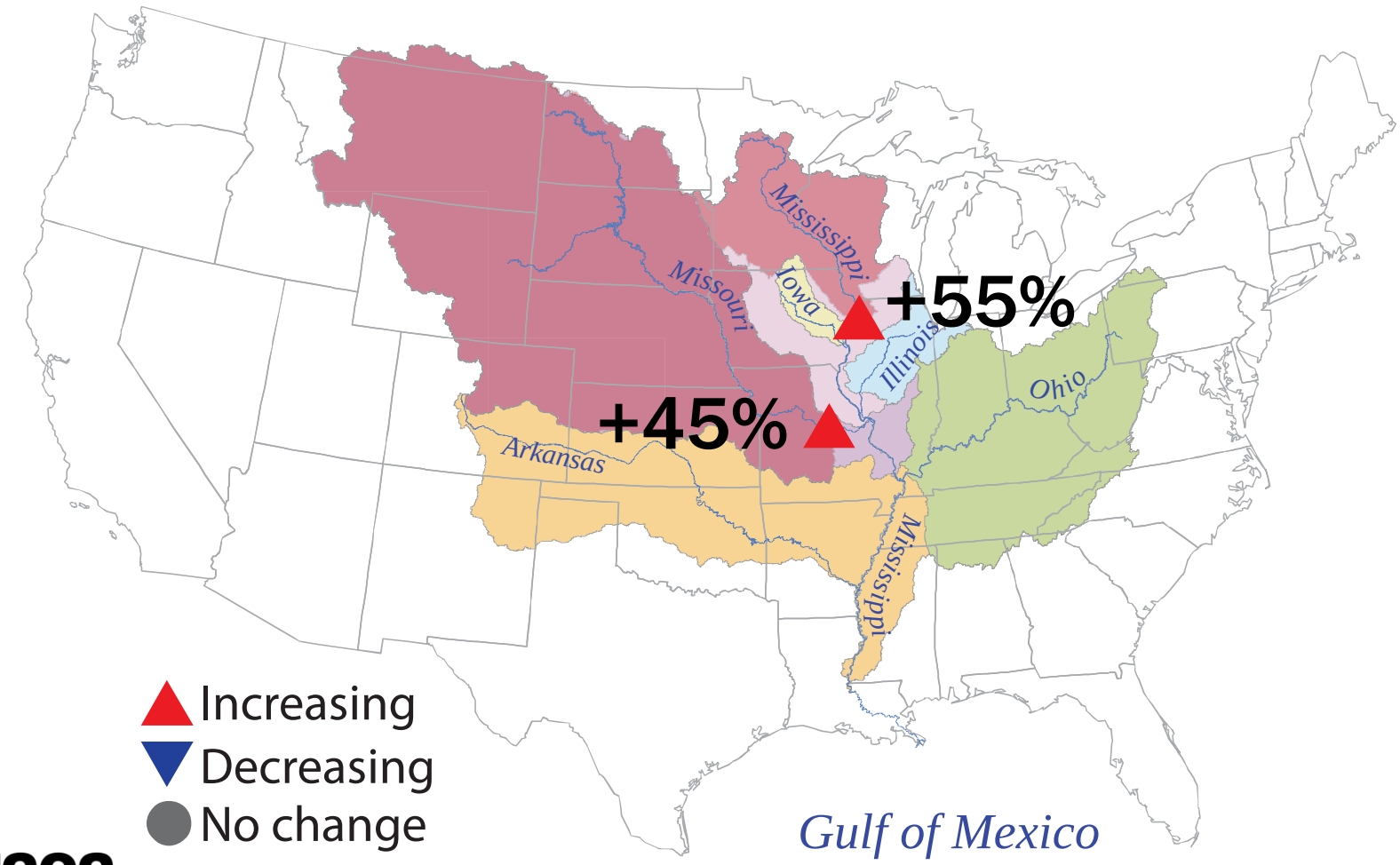
Nitrate Trends in the Mississippi River
1980-2010

USGS

Nitrate Trends in the Mississippi River
1980-2010



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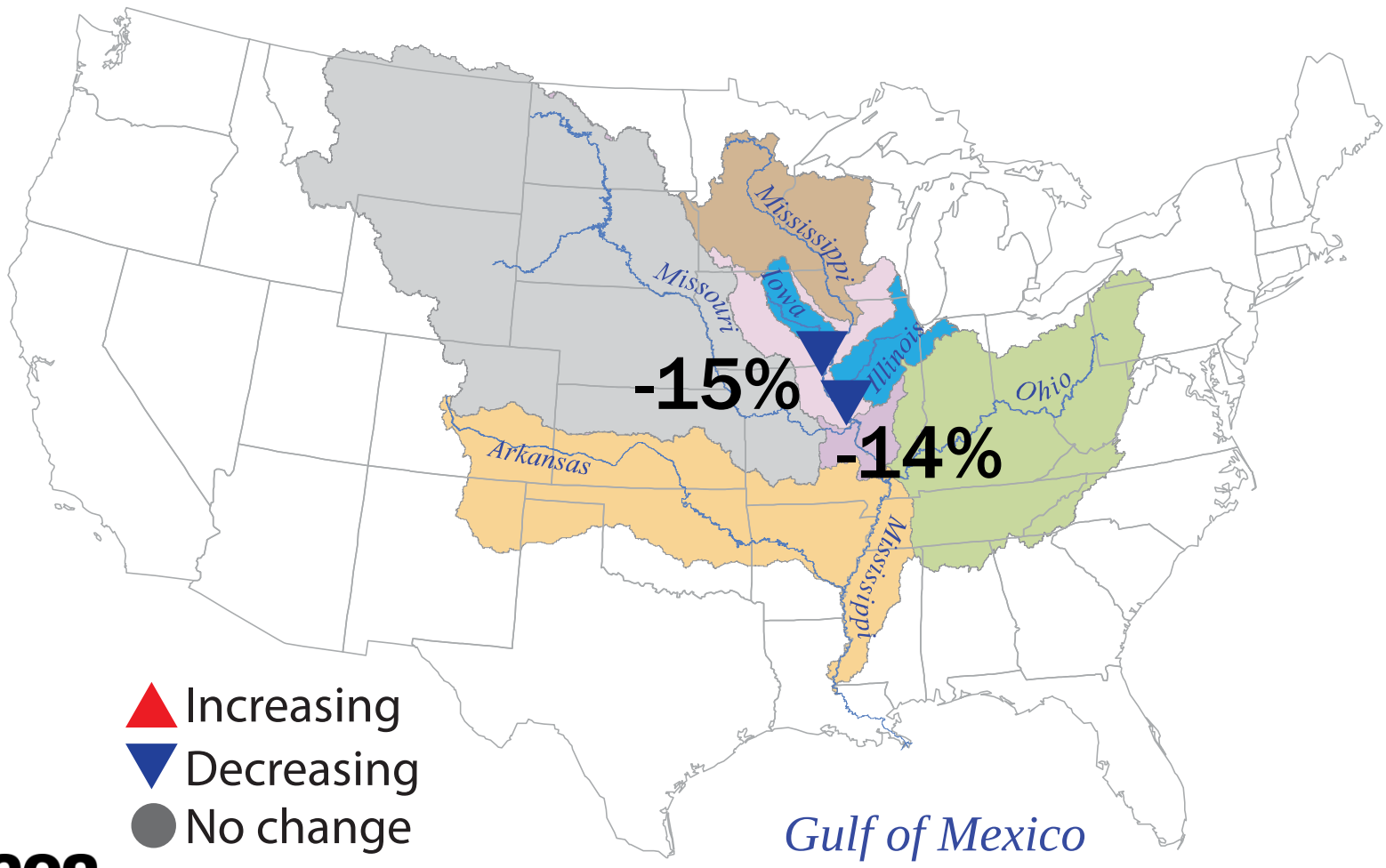
Nitrate Trends in the Mississippi River
1980-2010



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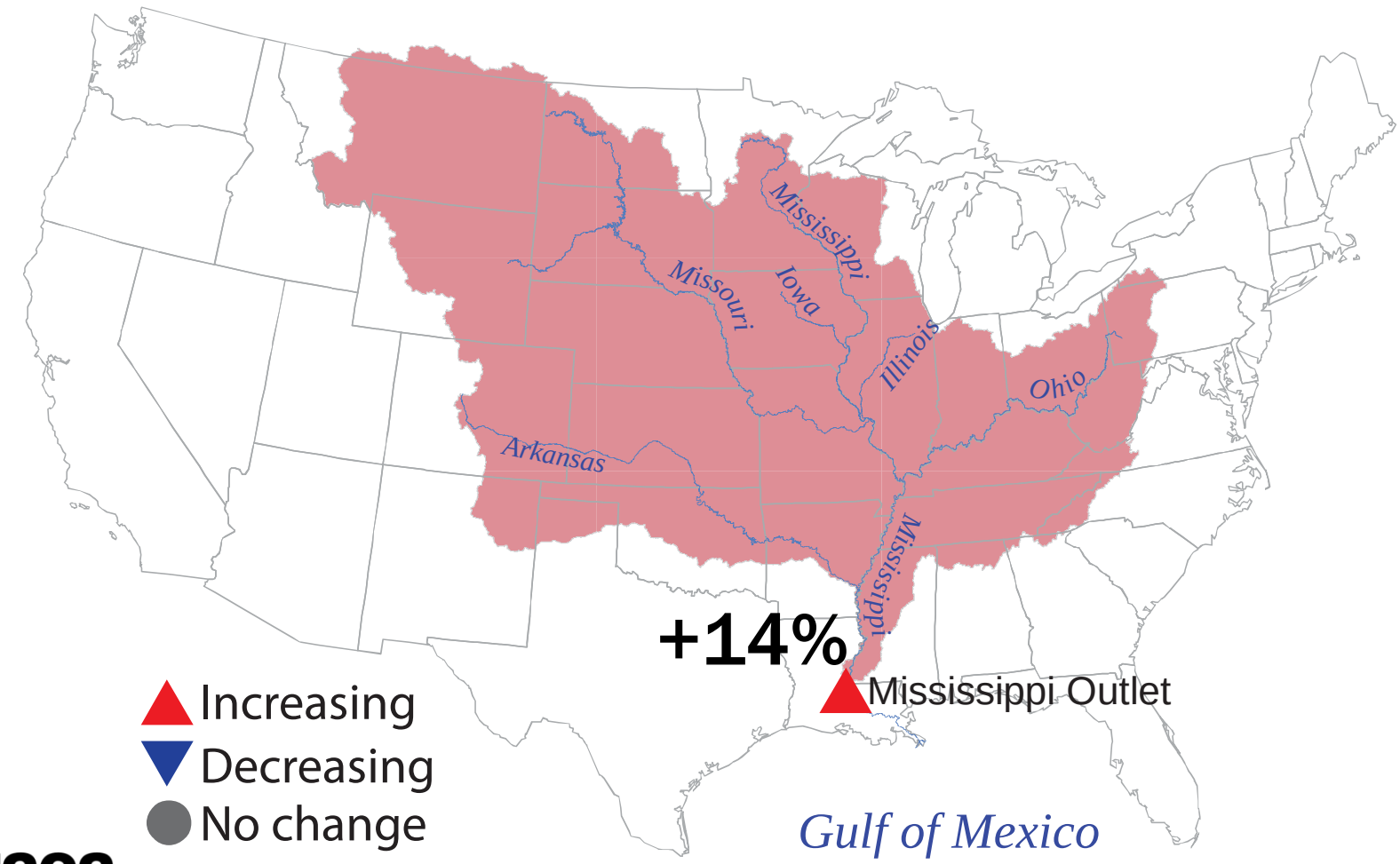
Nitrate Trends in the Mississippi River
1980-2010



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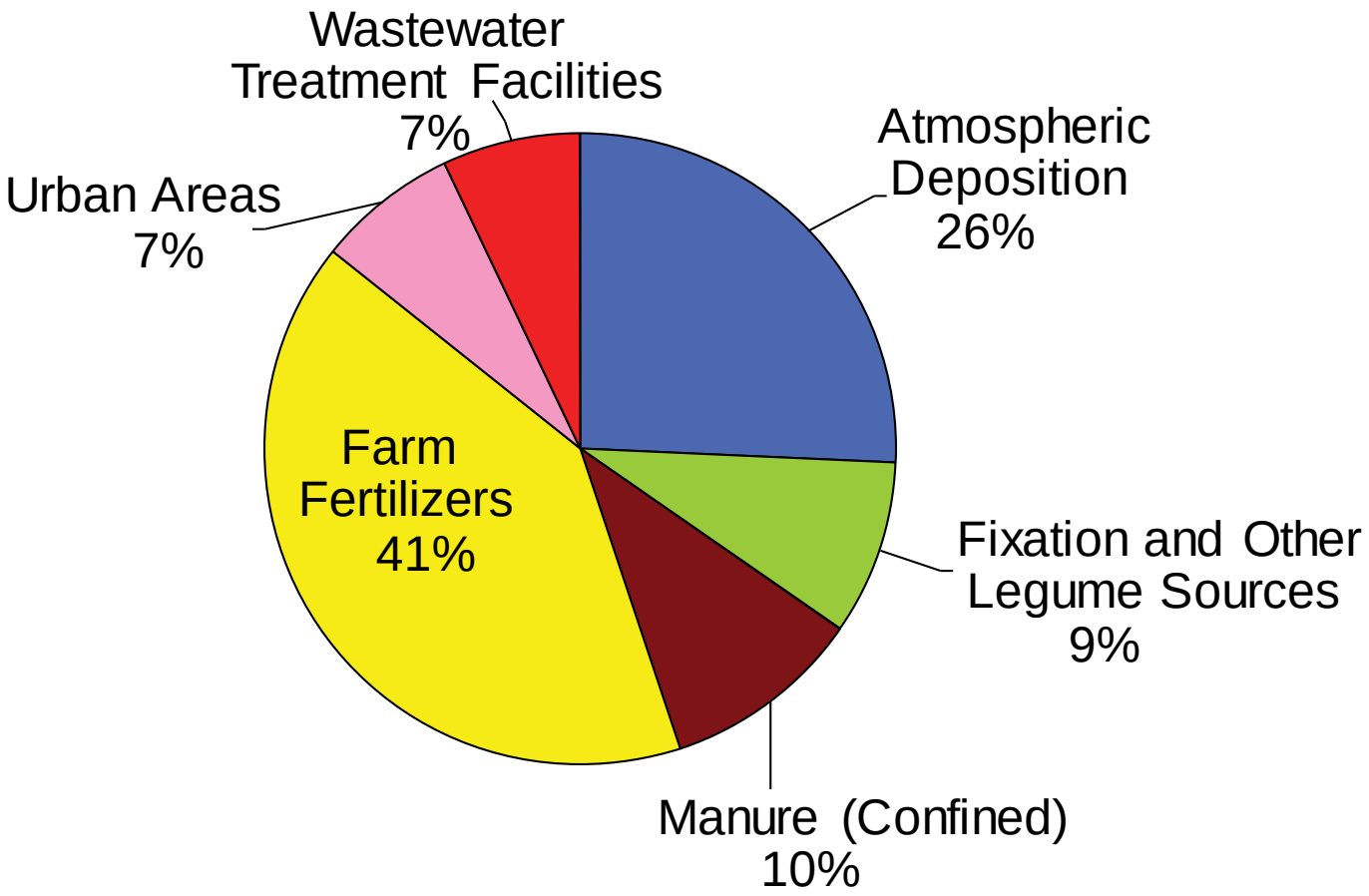
Many sources can affect nutrient trends

Sources of nitrogen to the Gulf of Mexico from the Mississippi River Basin in 2002



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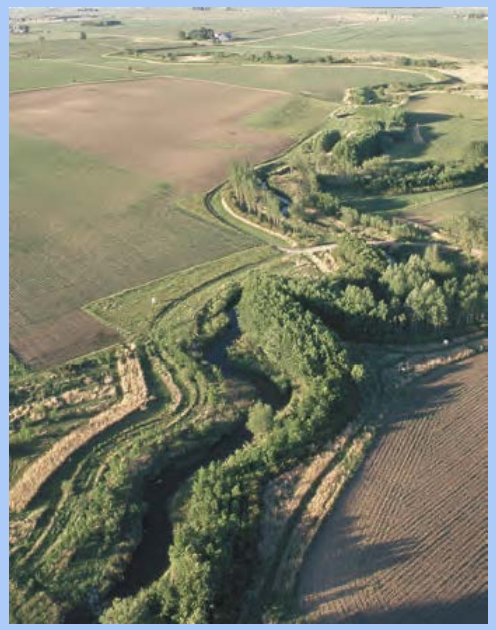
Management practices can affect nutrient trends



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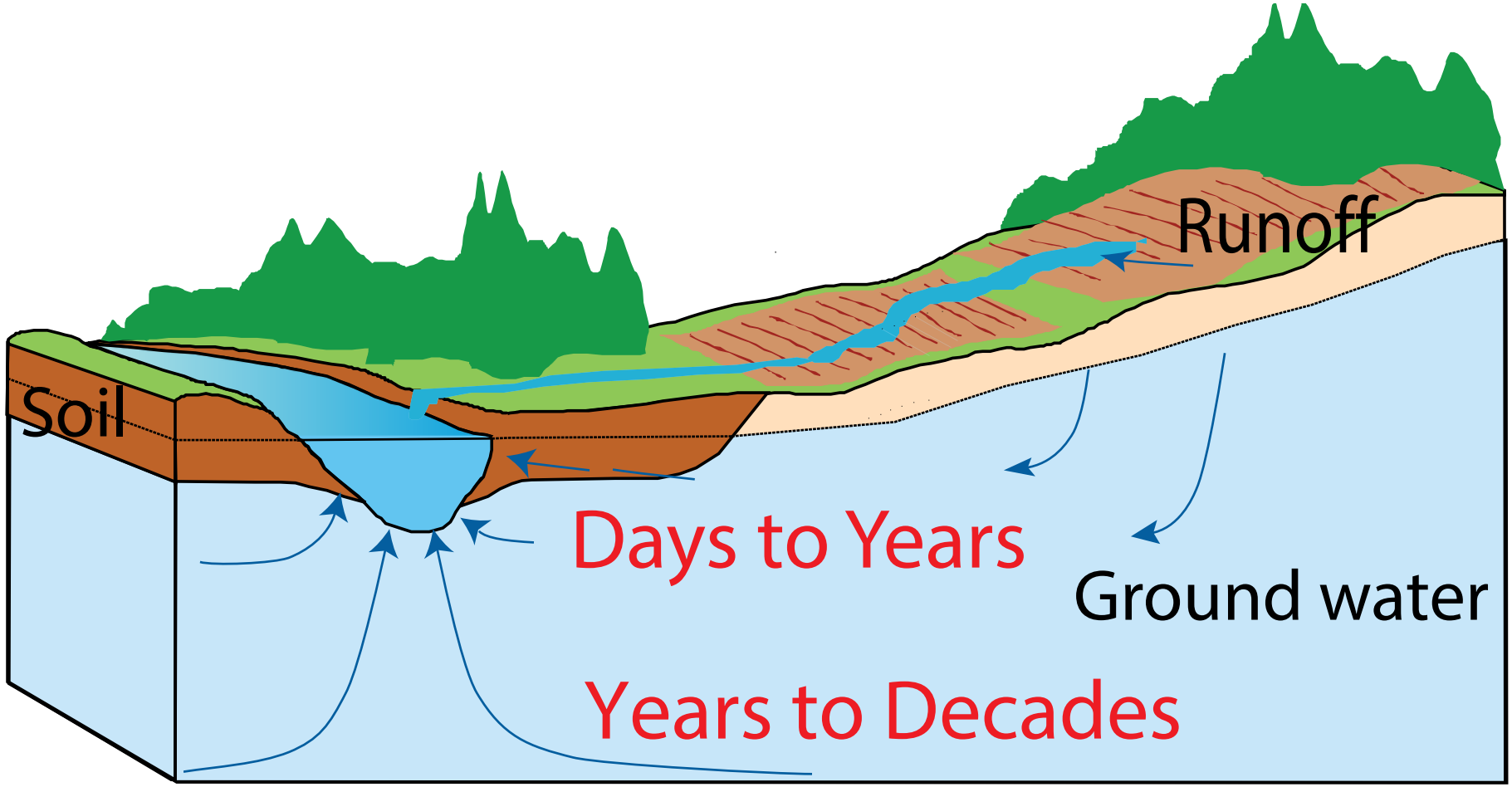
Ground water can affect nutrient trends



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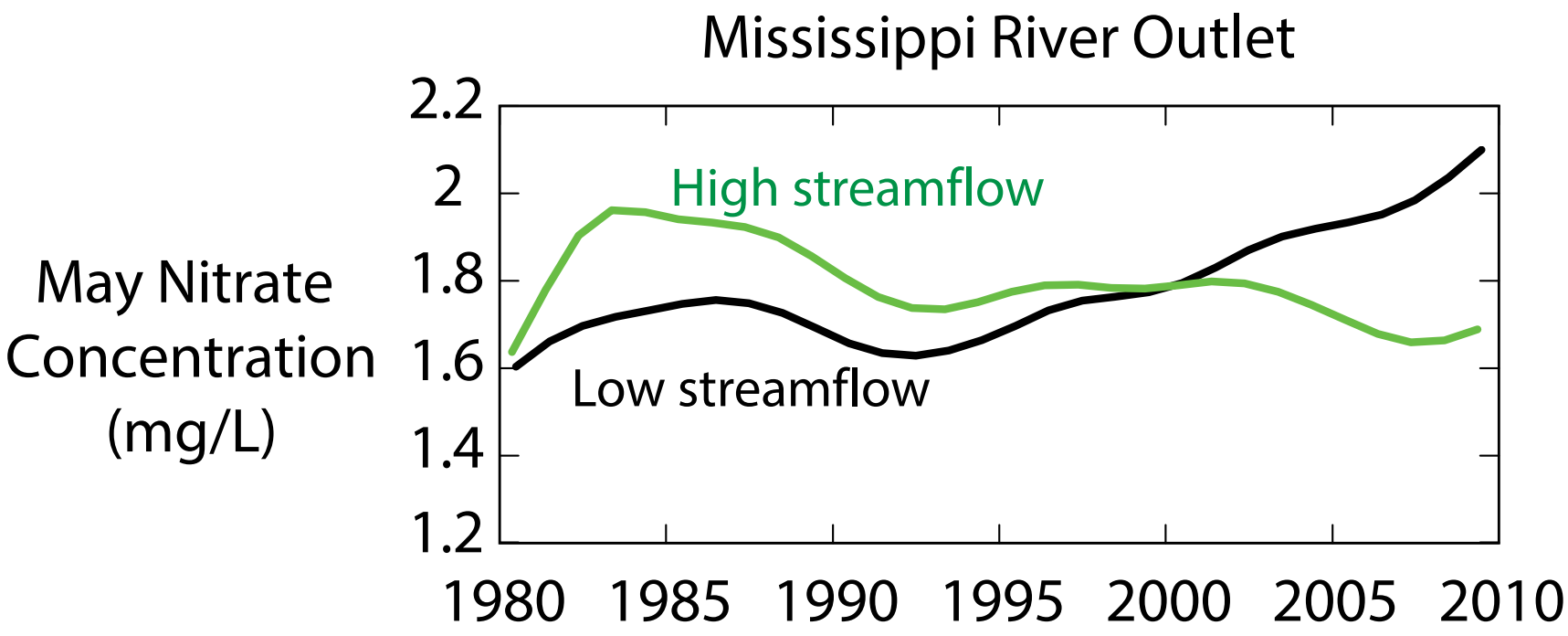
Ground water may be an increasing source of nitrate to the Mississippi River



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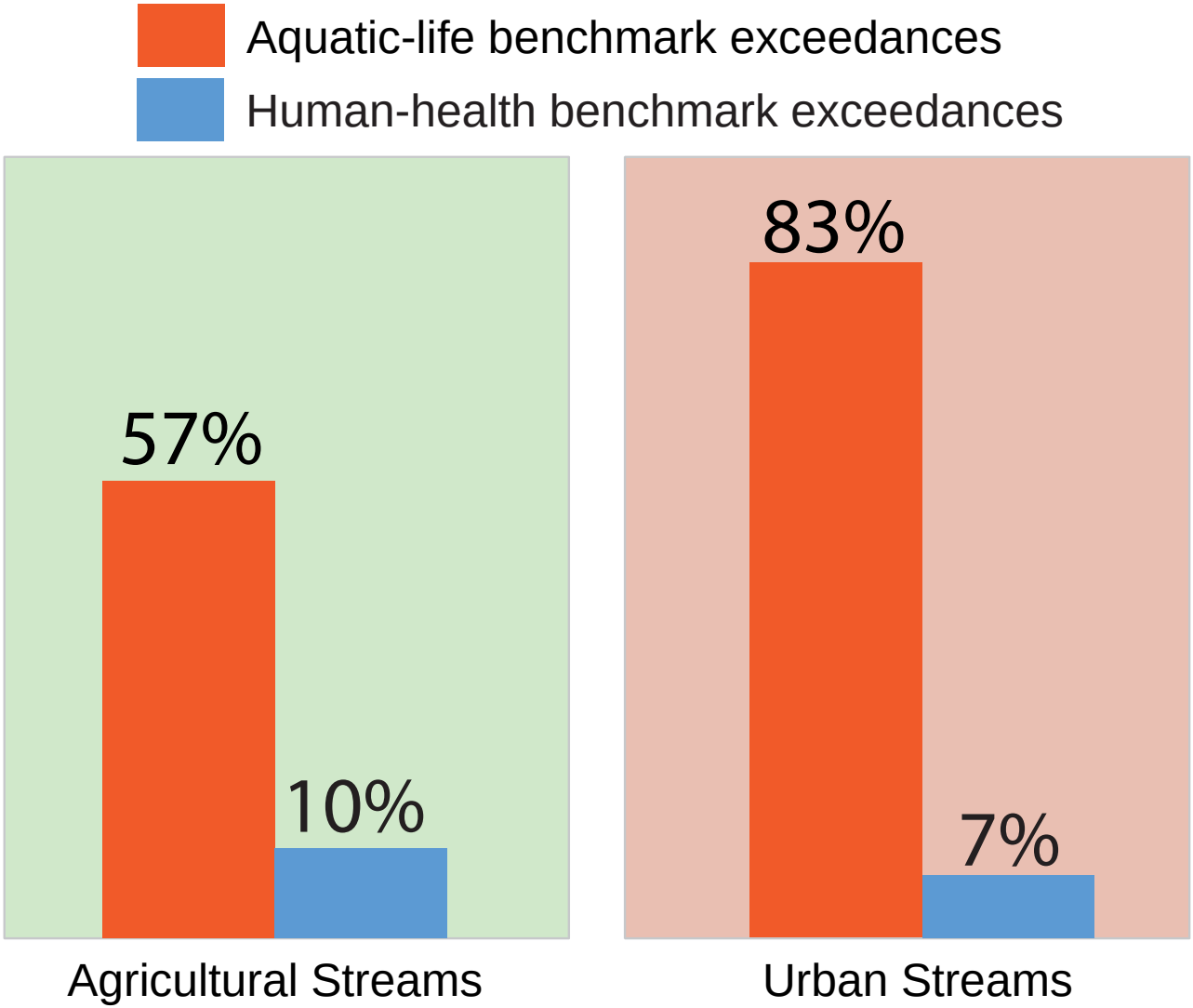
Photograph courtesy of Alan McCracken, Kansas City, MO

Pesticides

USGS

Pesticide concerns

Percentage of sites with exceedances



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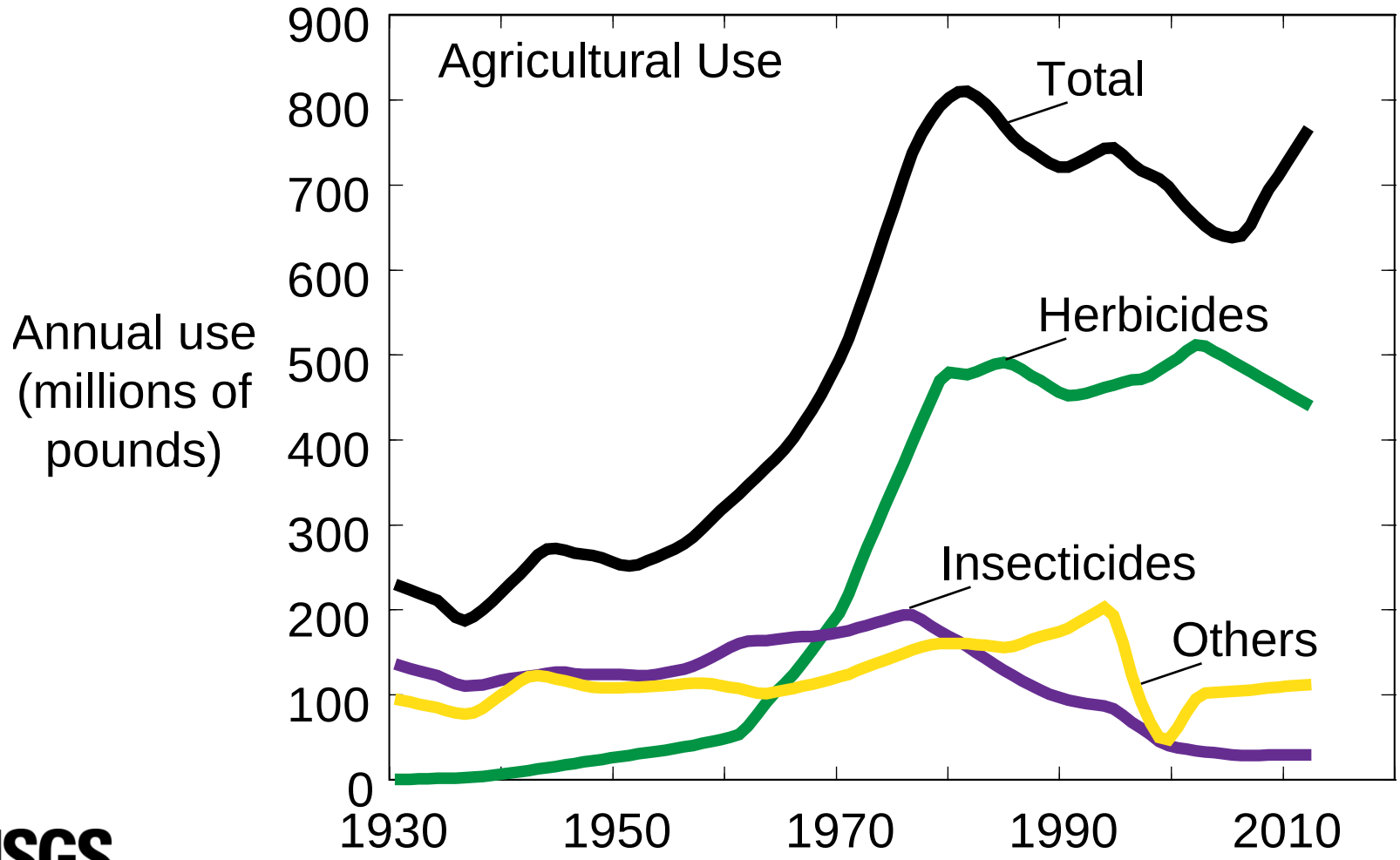
A look back over the past century

Pesticide use has increased



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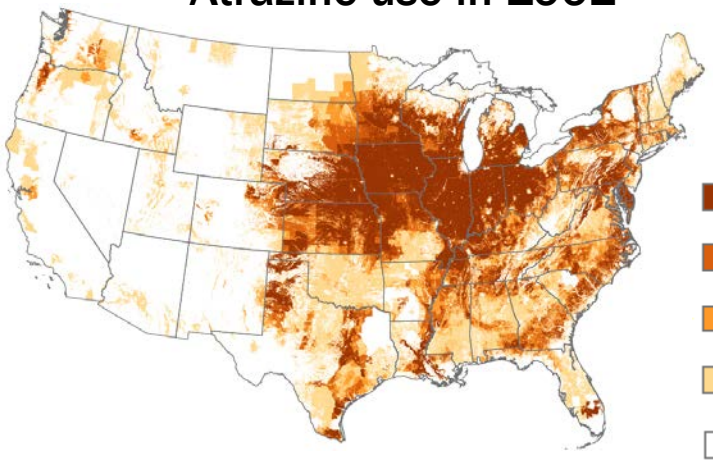
Unique patterns of use and change in use

Atrazine use in 1992



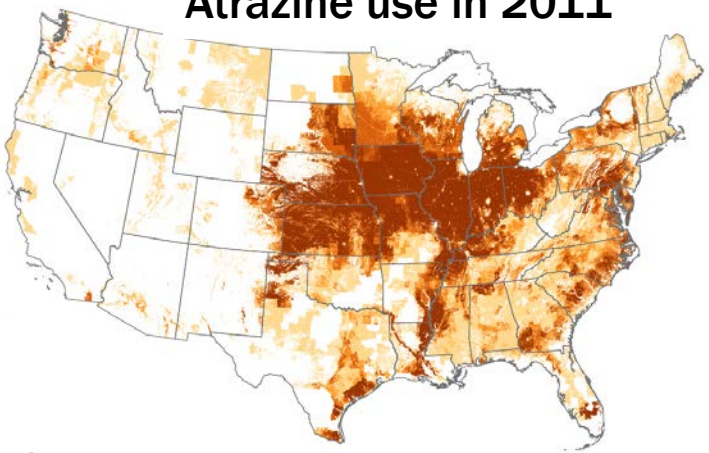
Use

High

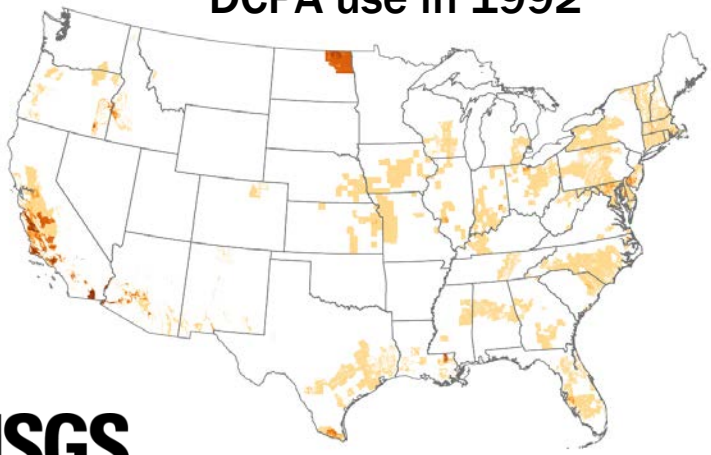
Low

No estimated use

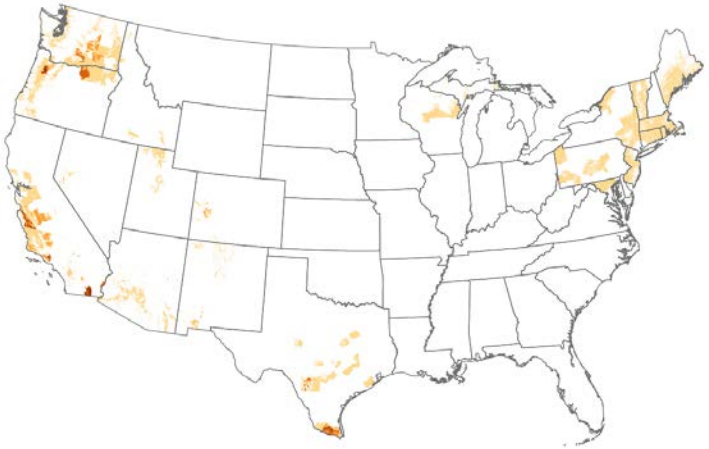
Atrazine use in 2011



DCPA use in 1992



DCPA use in 2011



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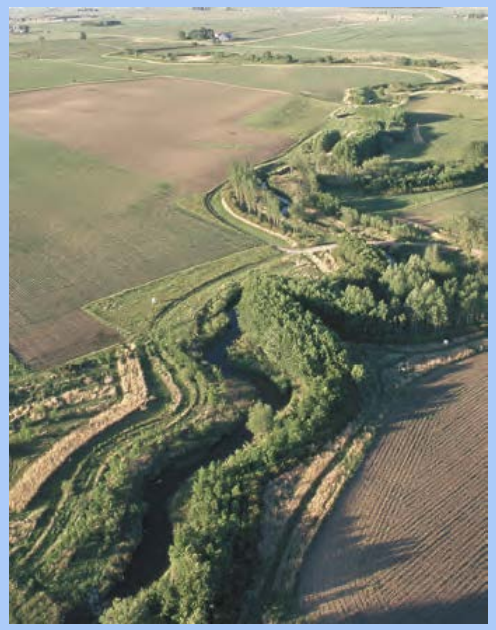
Management practices can affect pesticide trends



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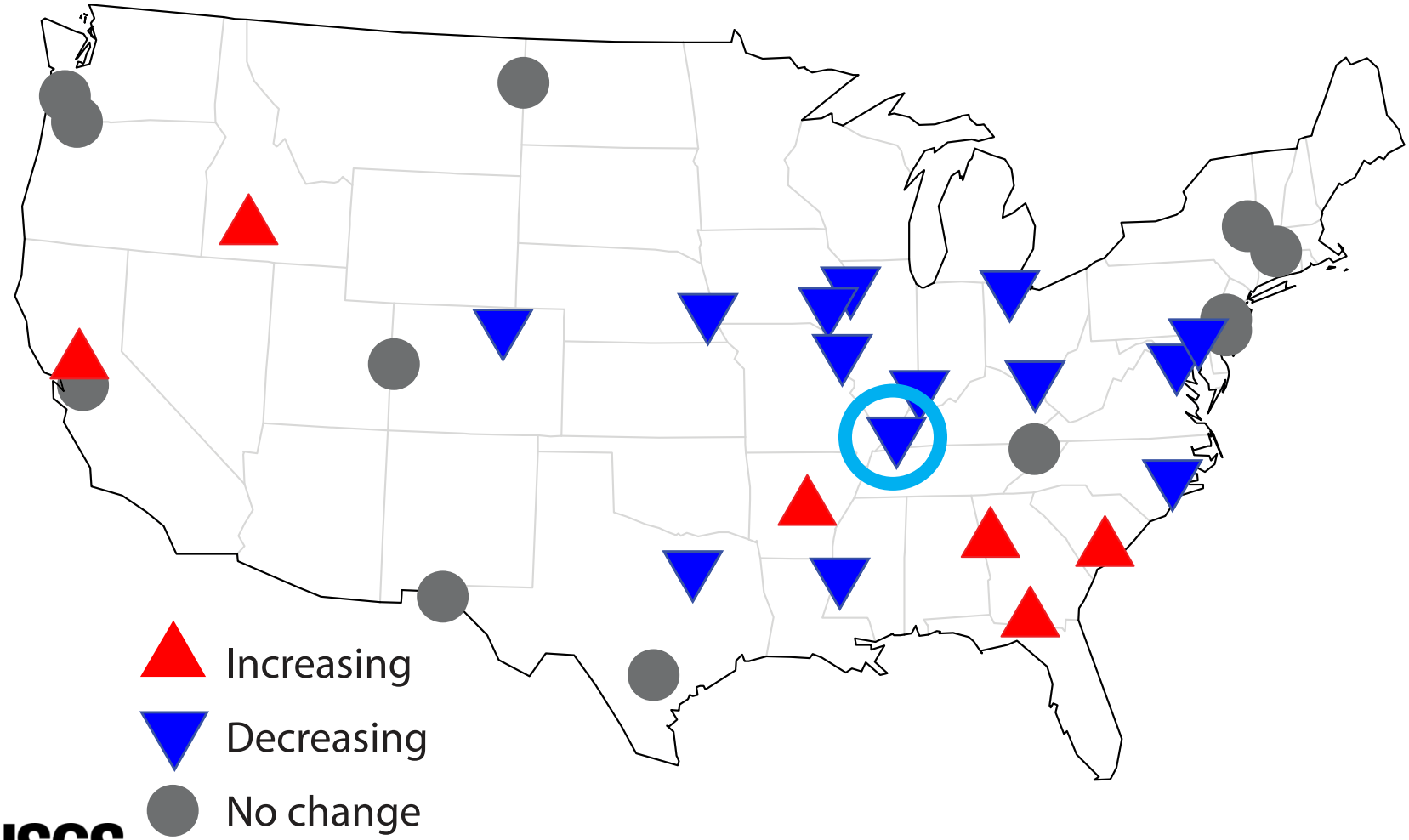
Metolachlor Trends in U.S. Rivers
1997 - 2006



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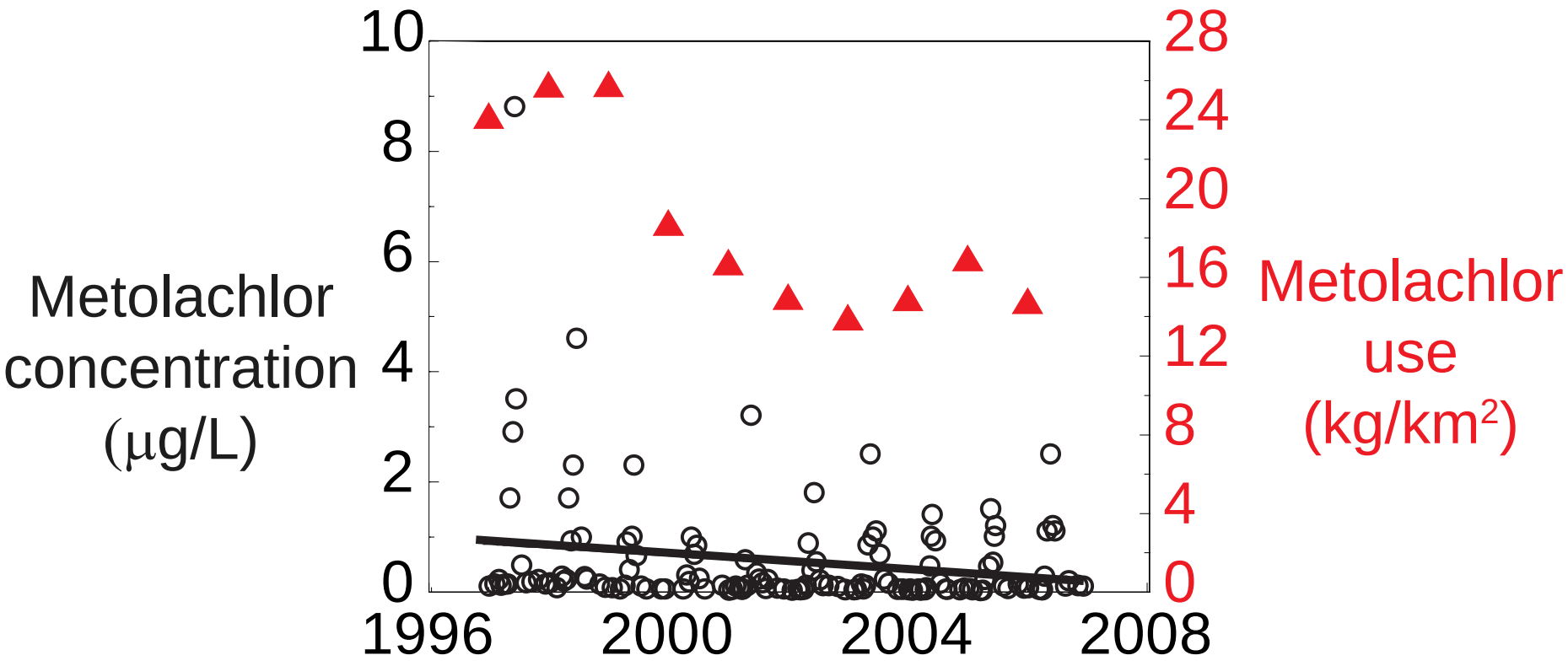
Metolachlor Trends in Wabash River, IN
1997 - 2006



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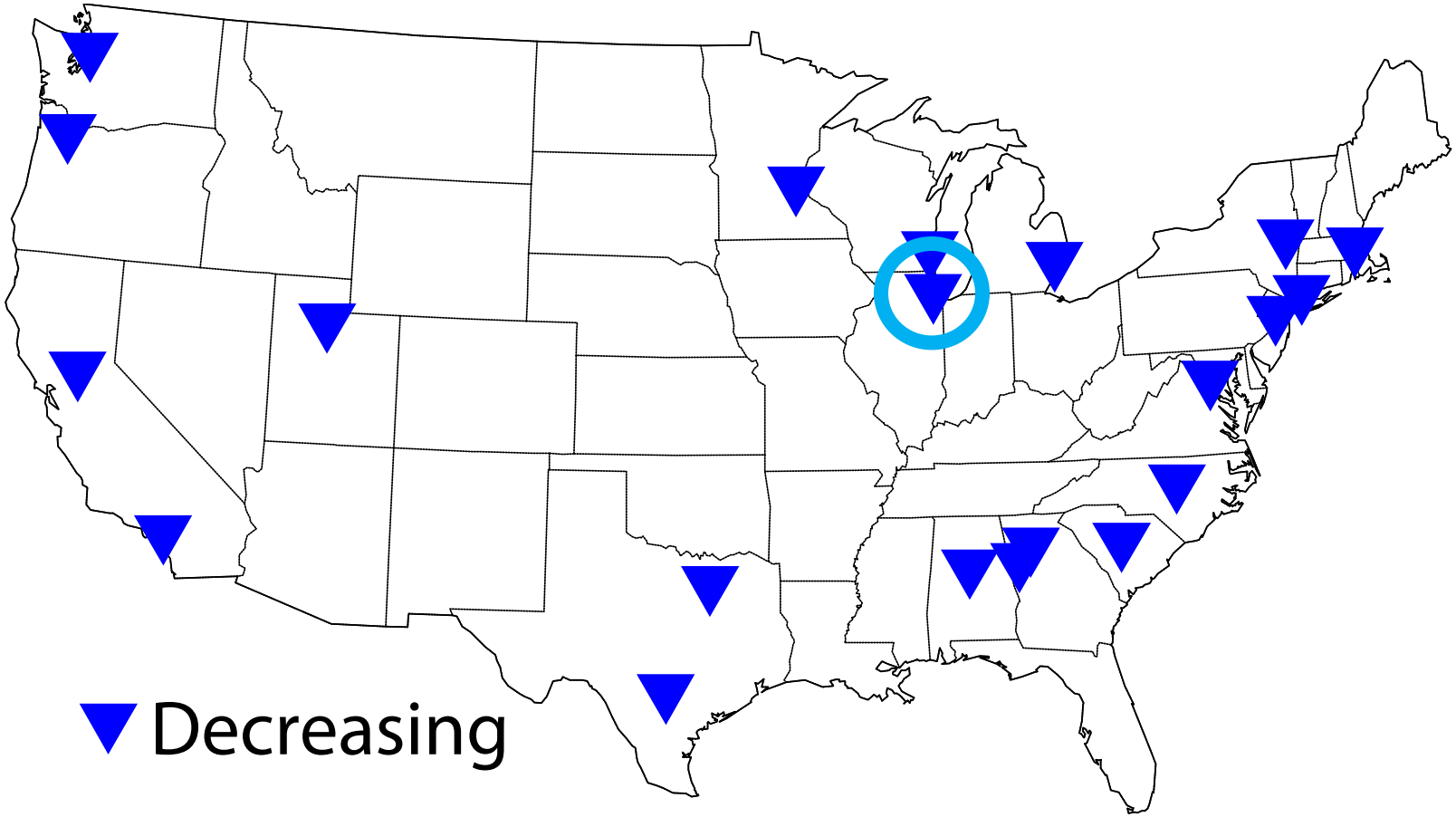
Diazinon Trends in Urban Streams
2000 - 2008



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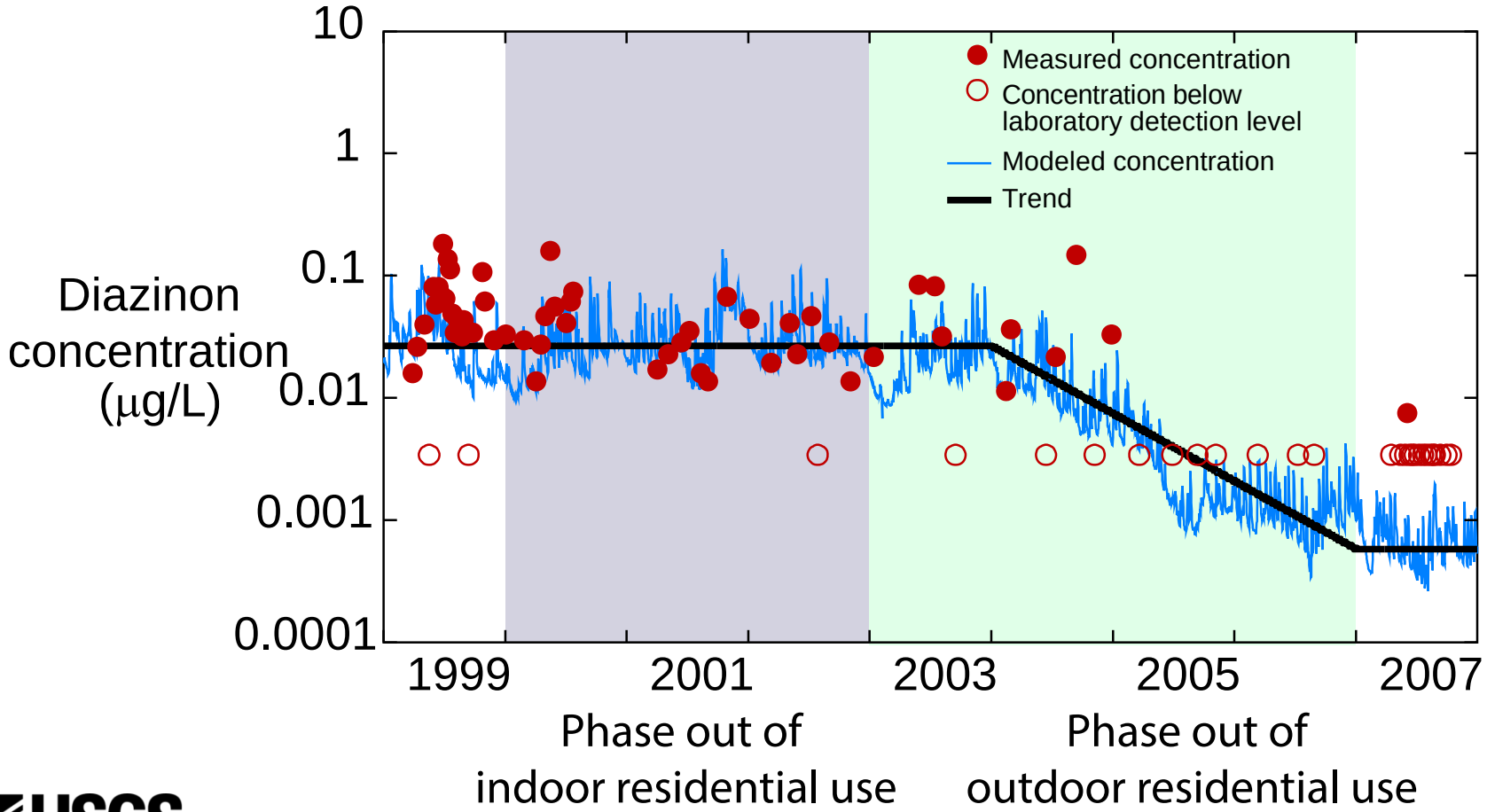
Diazinon Trends in Salt Creek, IL
2000 - 2008



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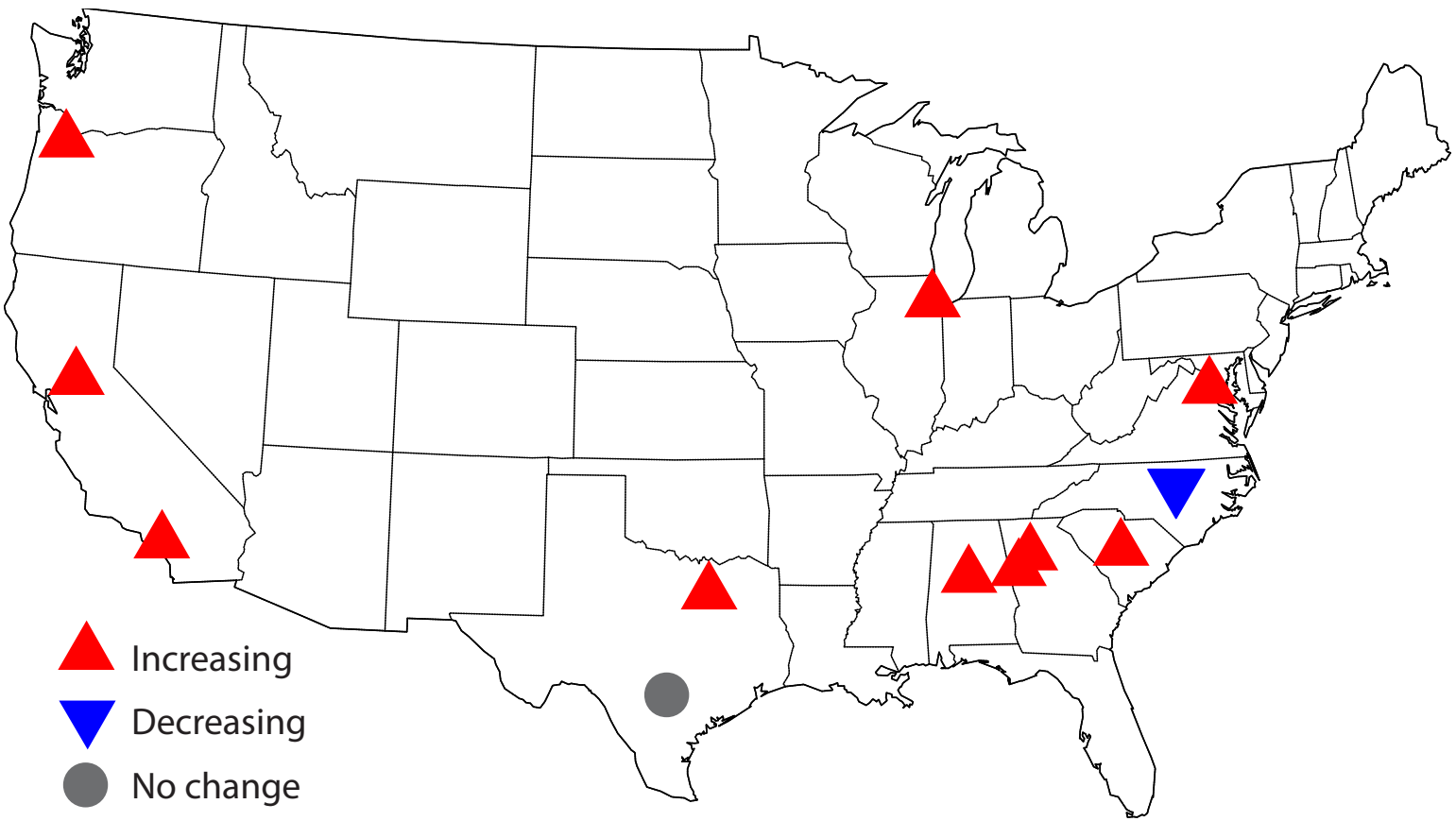
Fipronil Trends in Urban Streams
2000 - 2008



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Photograph by Lynn Betts, U.S. Department of Agriculture, Natural Resources Conservation Service

Conclusions

Nutrient and pesticide trends in the Mississippi River Basin

- **Nutrients**
  - Nitrate entering the Gulf of Mexico increased from 1980 to 2010, despite major clean-up efforts
  - Increasing nitrate in ground water is contributing to increases in rivers and can delay management efforts
- **Pesticides**
  - Many pesticides that have long been used decreased or stayed the same from the late 1990's to 2008
  - Replacement pesticides are increasing

USGS

Lessons for managing water quality

- **Source changes**
  - **Pesticides: Managing use is an effective approach to controlling pesticides**
  - **Nutrients: Complicated by multiple sources and slow movement through ground water**
- **Other management strategies**
  - **Widespread reductions associated with management not detected**
  - **Difficult to determine these effects due to lack of data**

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