

# Pesticides in Iowa's Water Resources: Historical Trends and New Issues

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# Outline

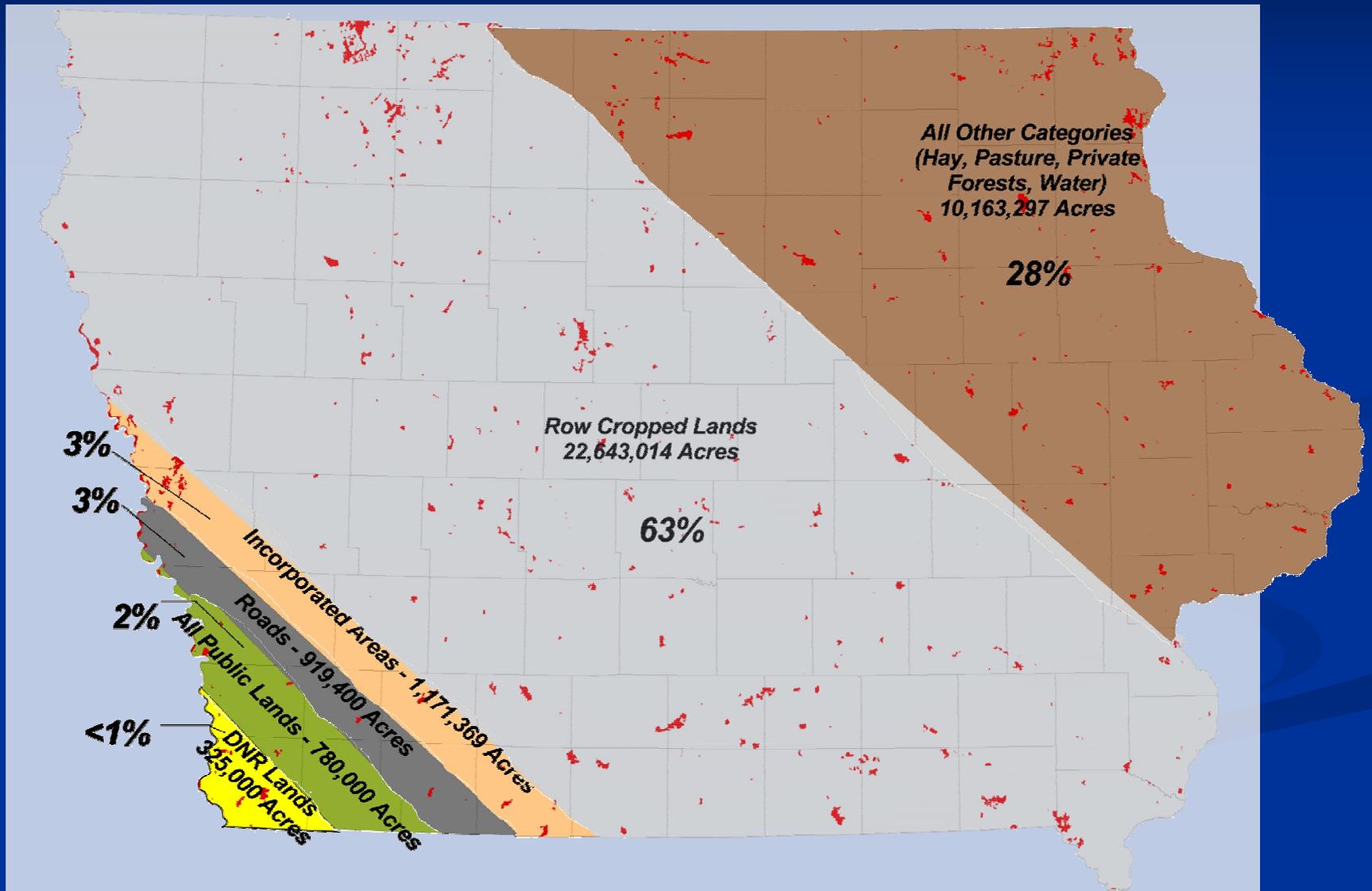
- Pesticide Use in Iowa
- Current Status and Historical Trends
- New Approaches for Understanding

# Occurrence of Pesticides in Water Resources

Function of:

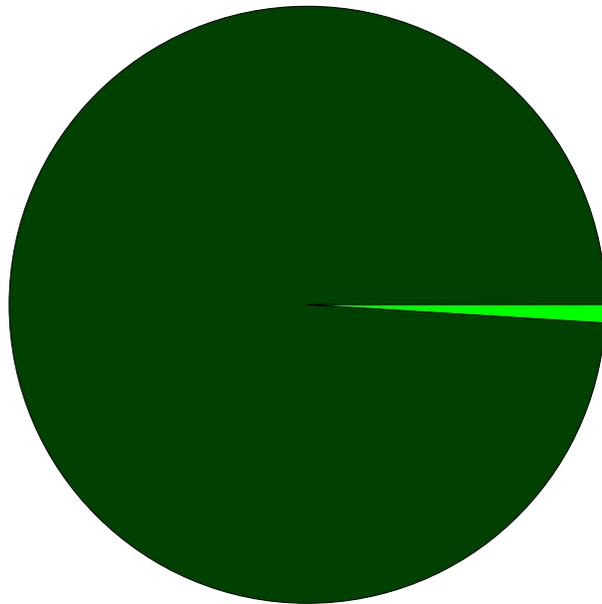
1. Use
2. Soil Characteristics
3. Rainfall Timing and Amount
4. Pesticide Properties

# Land Use in Iowa (2002)

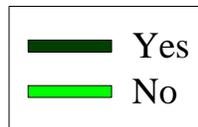
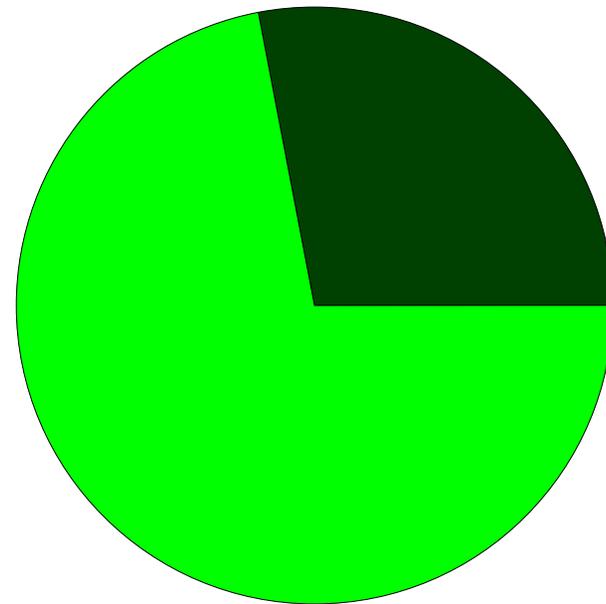


# Percent of Iowa Acres Treated

*Herbicides*



*Insecticides*



Source: Pesticide Movement: What Farmers Need to Know, Iowa State Extension, PAT-36

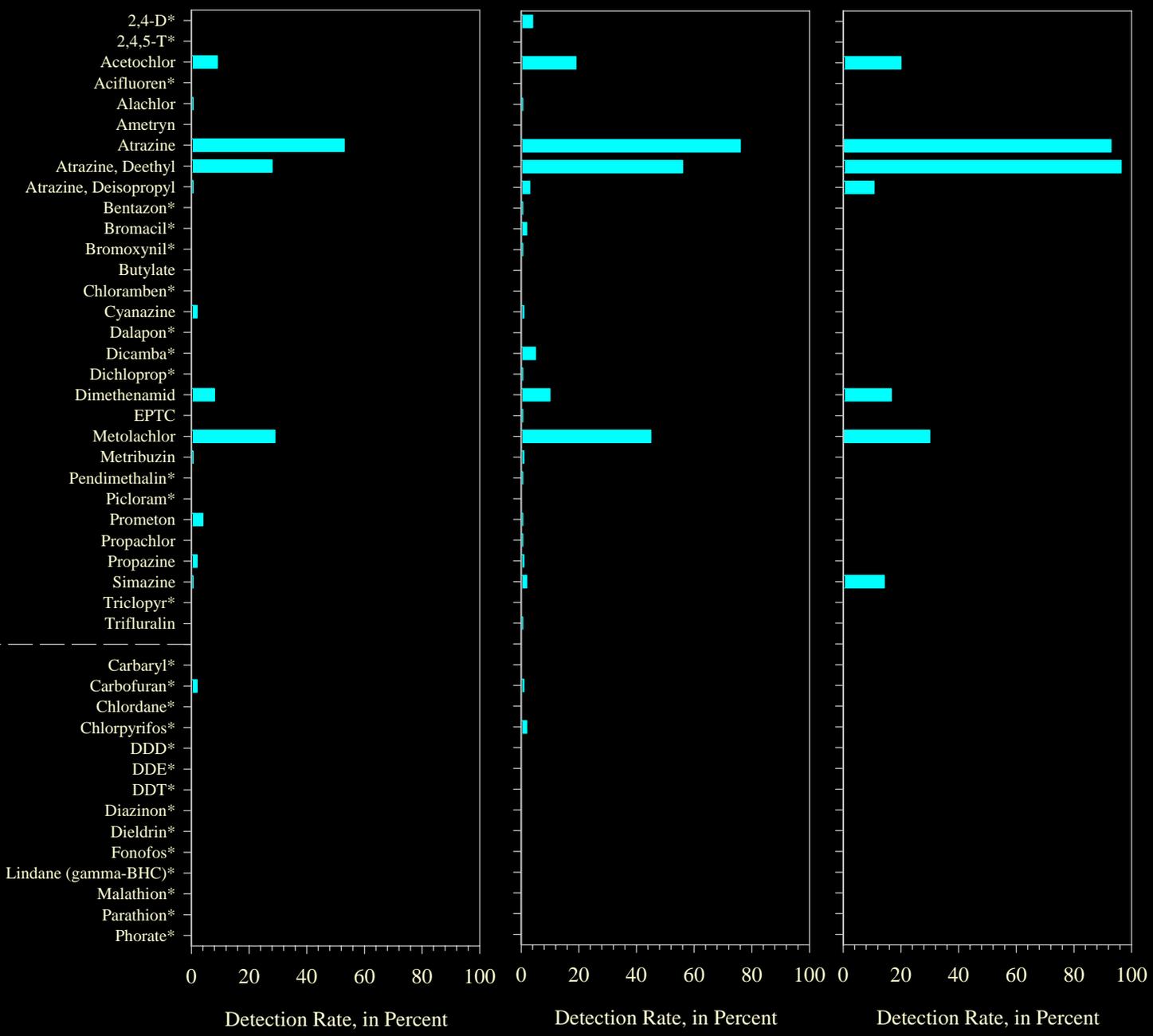
2000, Non-City Stream Sites

2001, Non-City Stream Sites

2002, Non-City Stream Sites

*Herbicides*

*Insecticides*

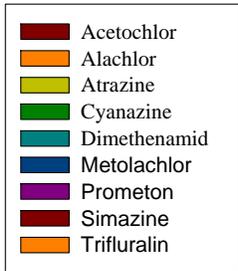
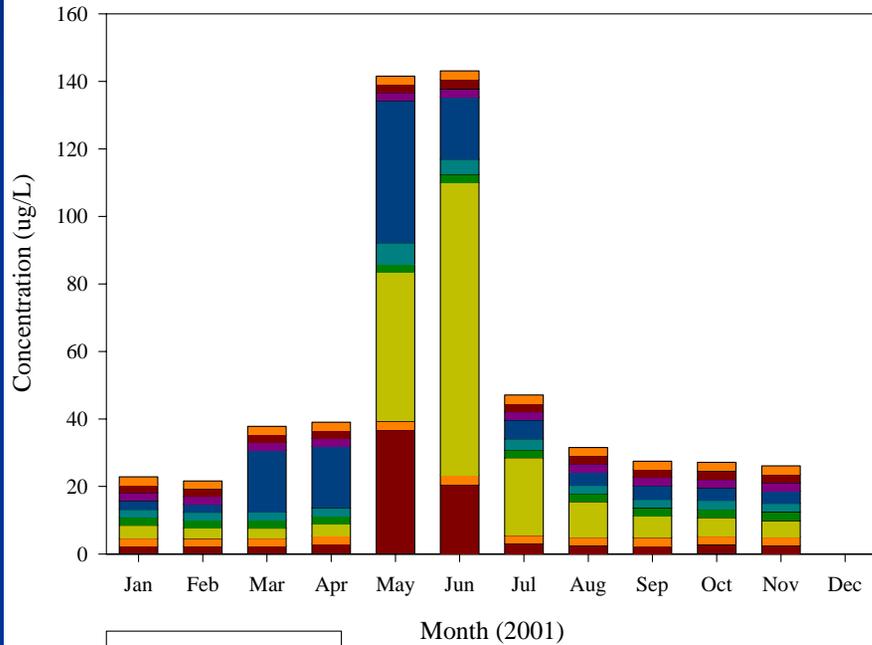


Some  
Very  
Common;  
Others  
Less so

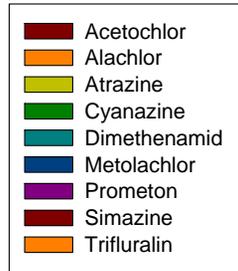
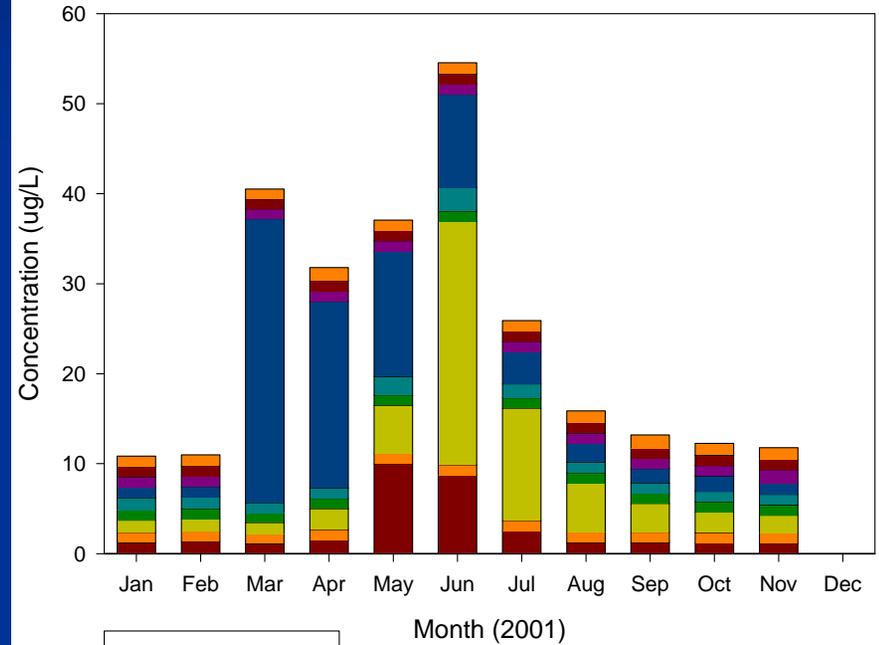
Few  
Detects

\* Parameters analyzed April through July; all others analyzed monthly.

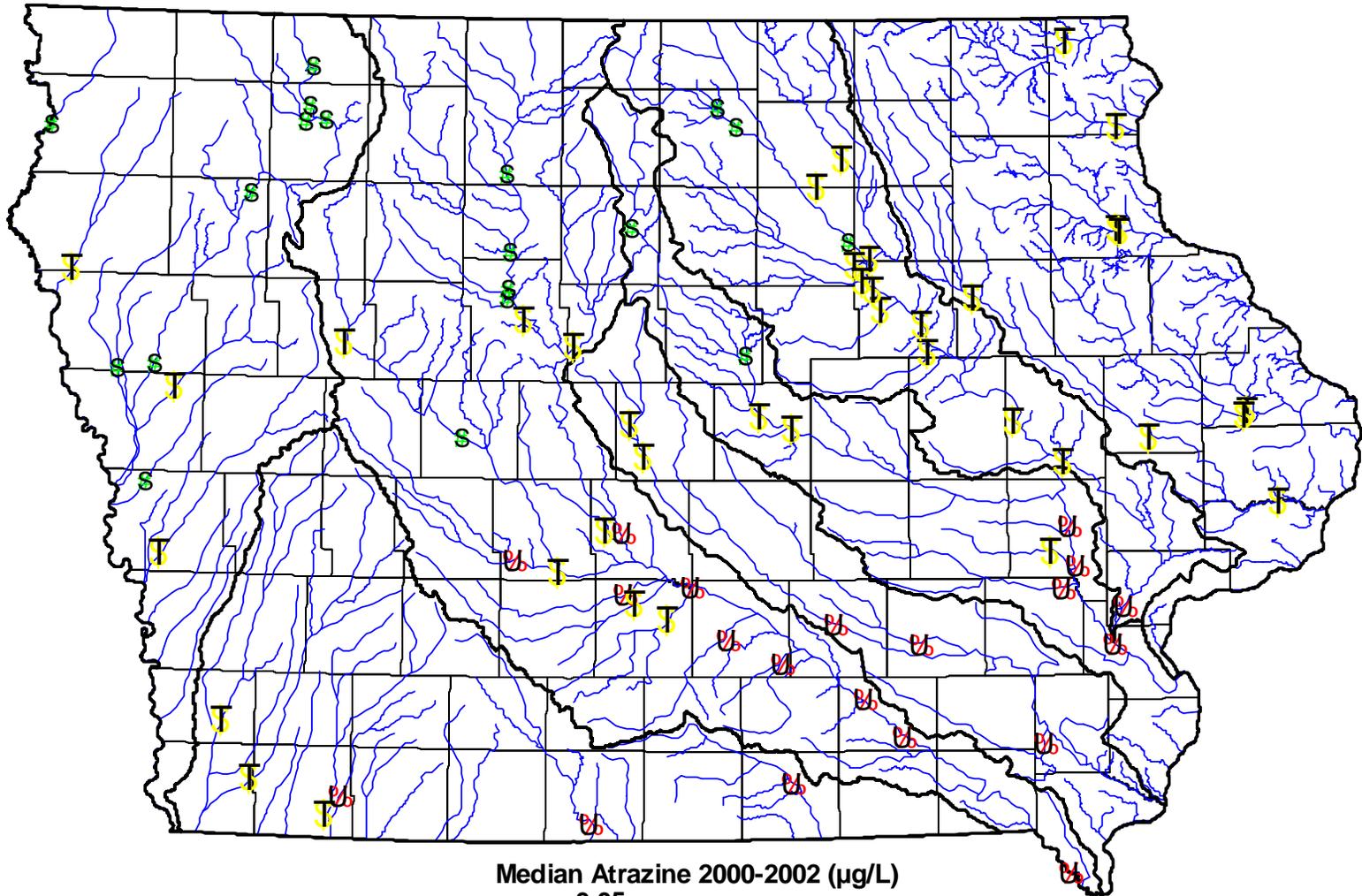
Pesticide Concentration for Non-City Sites



Pesticide Concentration for City Sites



# Median Pesticide Concentration 2000-2002 ( $\mu\text{g/L}$ )



Median Atrazine 2000-2002 ( $\mu\text{g/L}$ )

S  $<0.05$

T  $0.05 - 0.1$

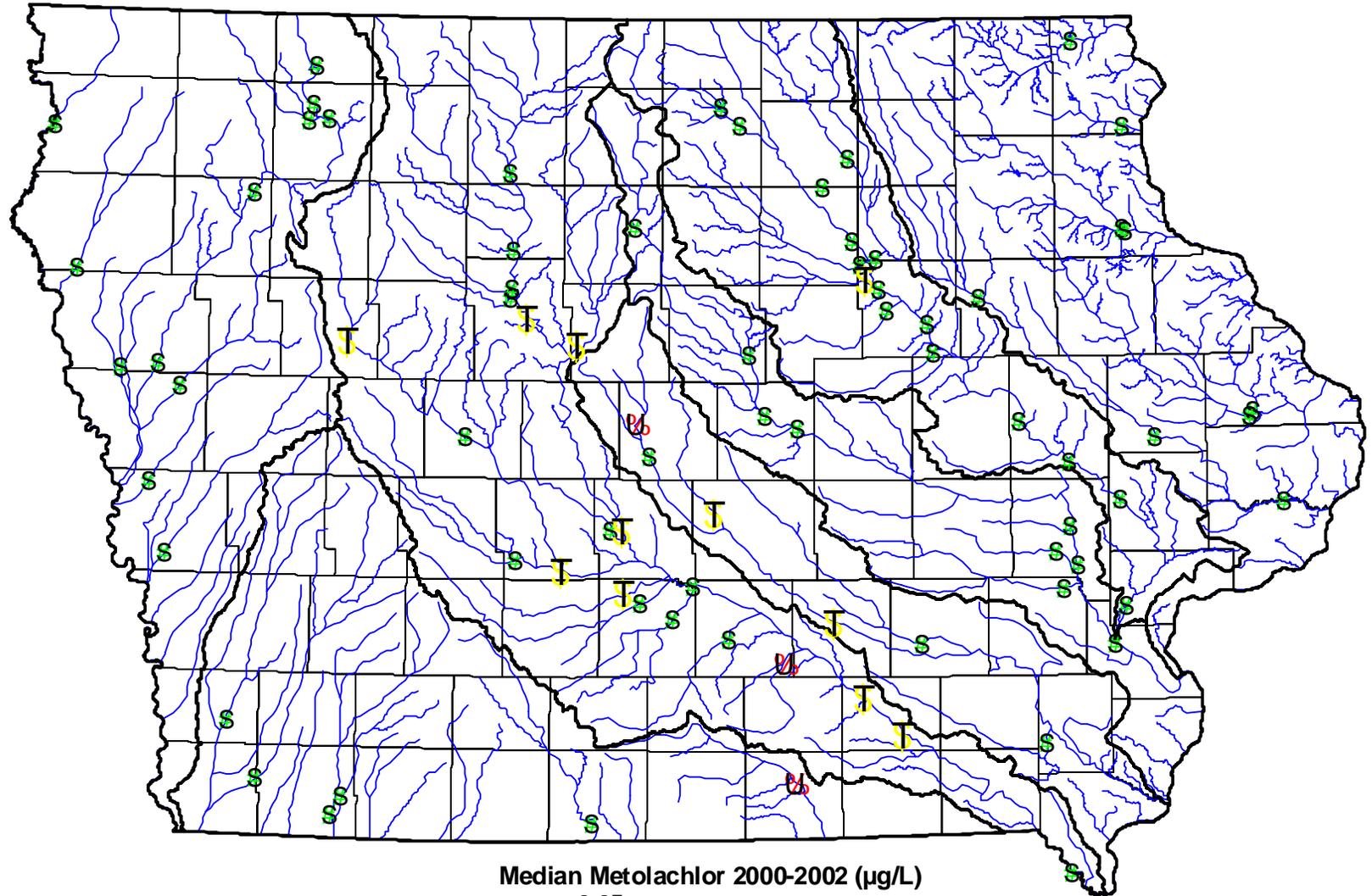
Lb  $>0.1$

Major River Basins

Rivers

Counties

# Median Pesticide Concentration 2000-2002 ( $\mu\text{g/L}$ )



Median Metolachlor 2000-2002 ( $\mu\text{g/L}$ )

S  $<0.05$

T 0.05 - 0.1

B  $>0.1$

Major River Basins

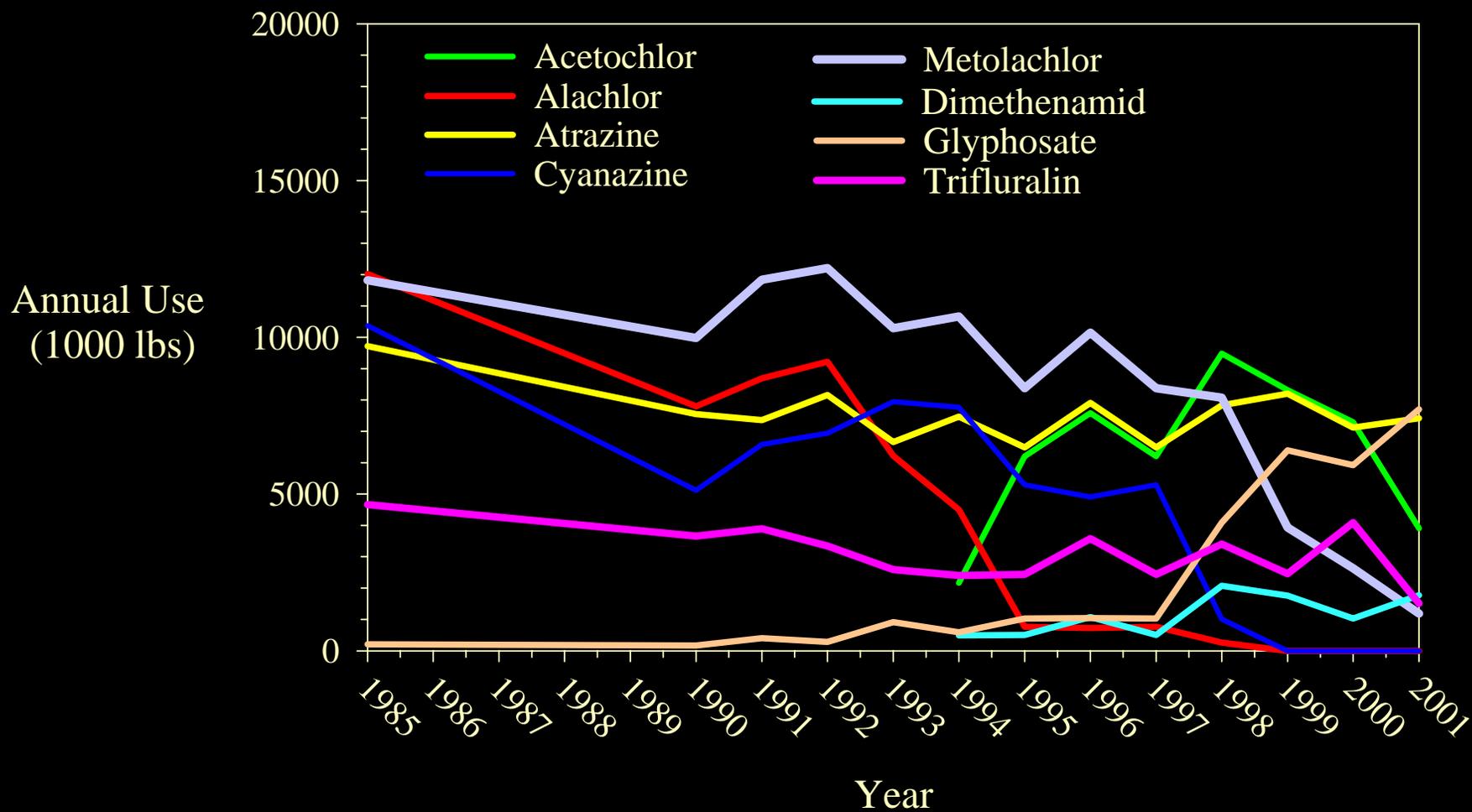
Rivers

Counties

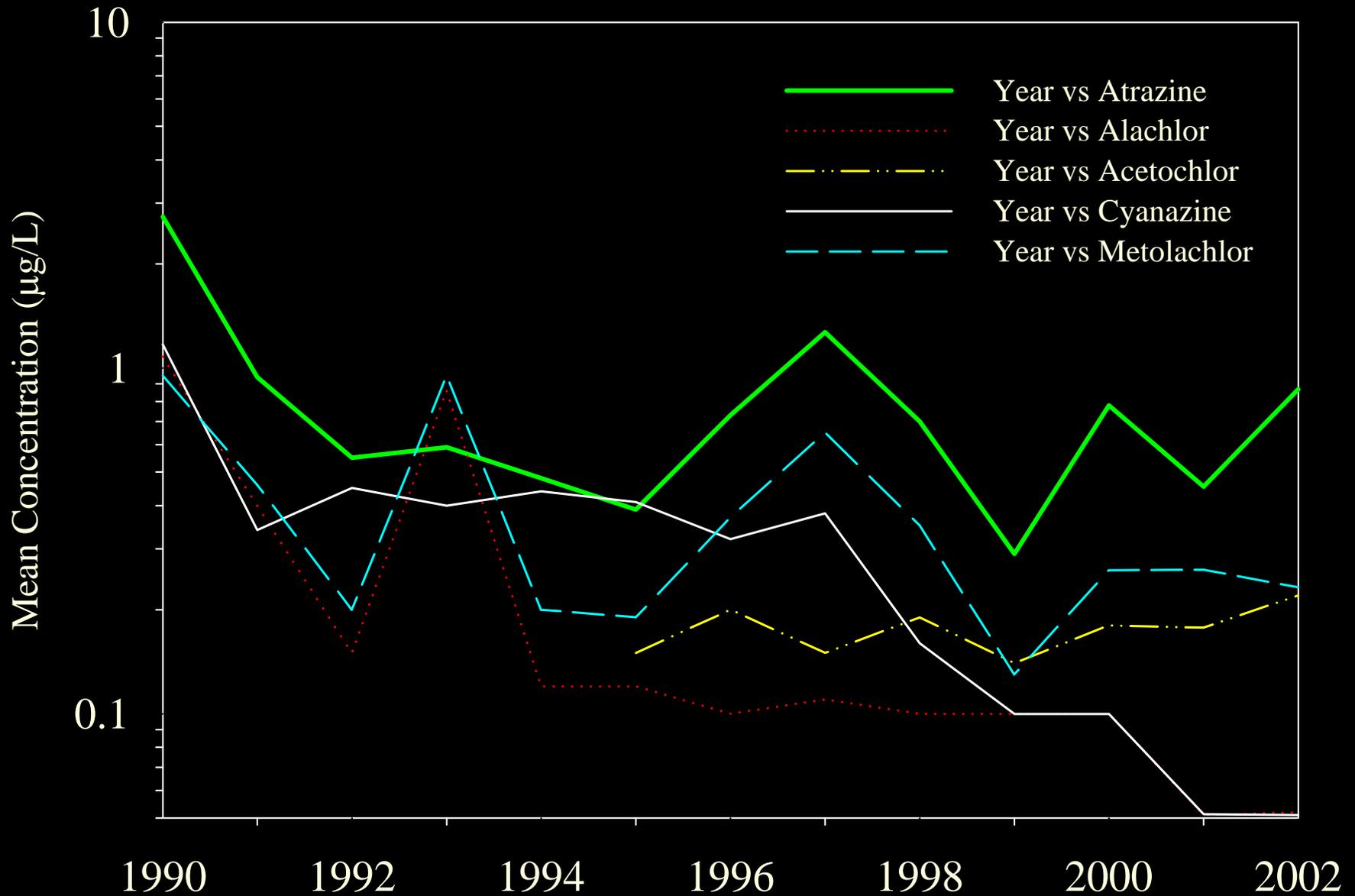
# Limited Monitoring Historically

- Project Driven Studies
- Few Long Term Sites (16 ambient since 1986 with quarterly sampling)
- IAPEST – Compilation database of all available pesticide data in Iowa

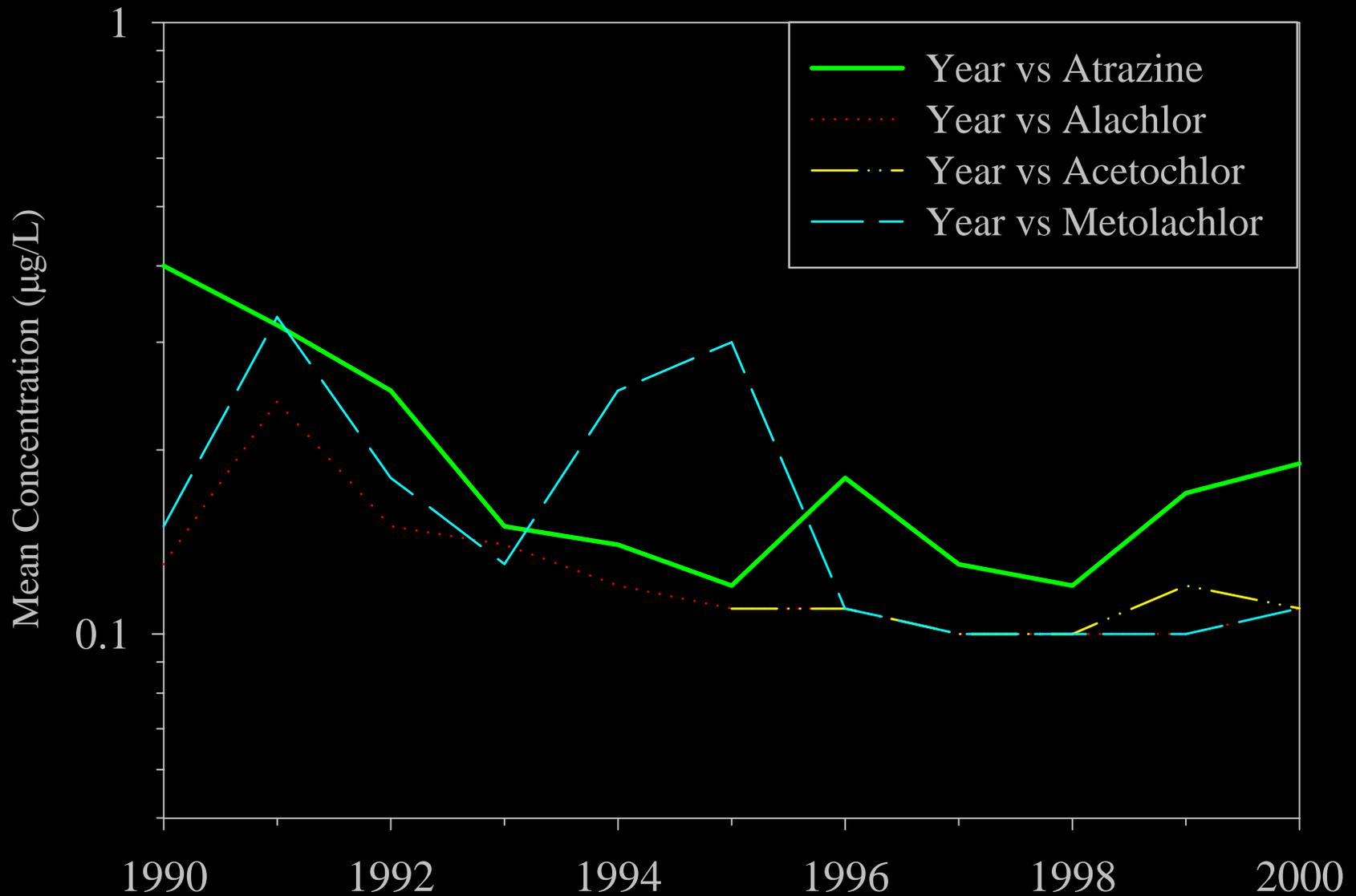
## Temporal Trends in Herbicide Use - Iowa



# Mean Concentrations of Surface Water Sites 1990-2002



# Mean Concentrations of Groundwater Sites



# Linking Use to Occurrence

- Lacking detailed data on pesticide use
- Requires indirect methods of estimation
- Iowa Groundwater Protection Act of 1990
  - Sales of pesticides reported by Dealer

# Process for Converting Reported Sales Data

Sales Data Reported to IDALS

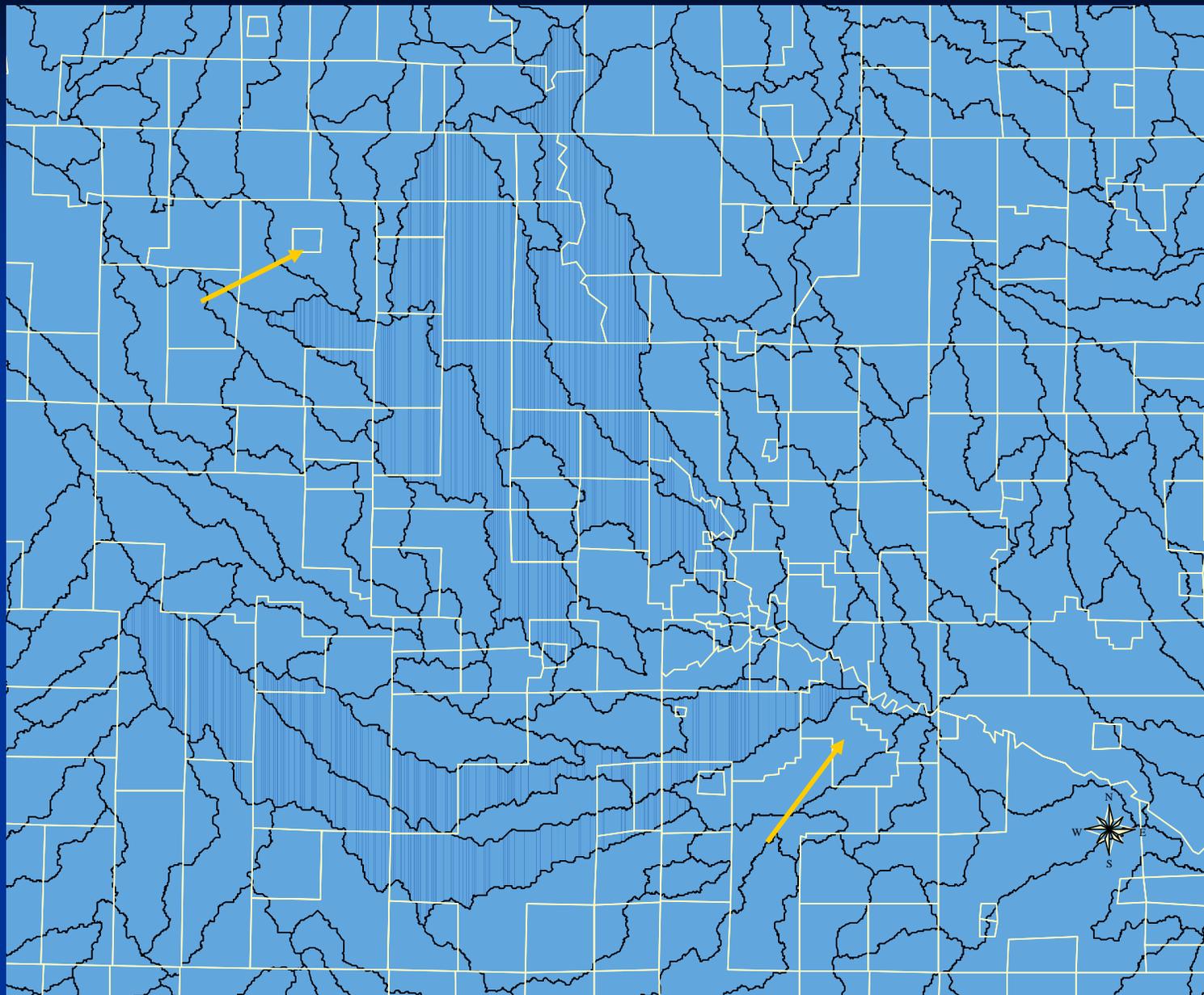
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graph TD; A[Sales Data Reported to IDALS] --> B[Dollars are Converted to Lbs -> ISU Ext]; B --> C[Link Lbs to Zip Code and Sum by County]; C --> D[GIS Coverage of Sales];
```

Dollars are Converted to Lbs → ISU Ext

Link Lbs to Zip Code and Sum by County

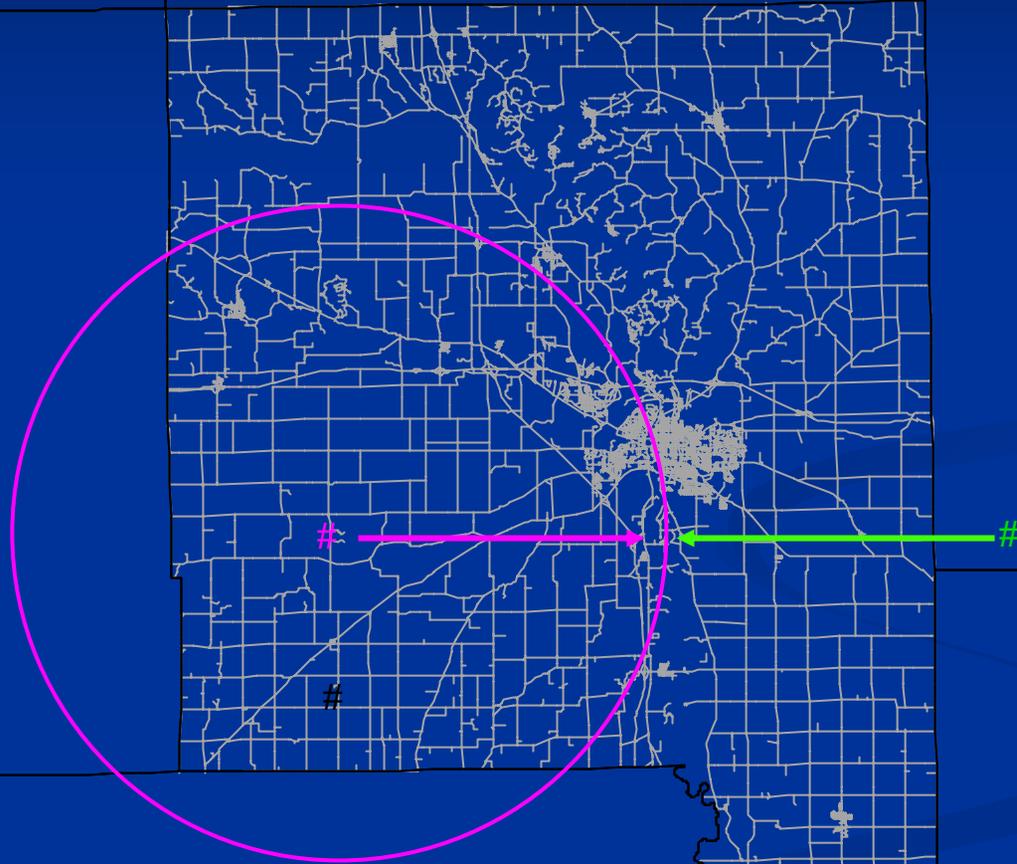
GIS Coverage of Sales

# Stream Watersheds with Zip Codes Superimposed

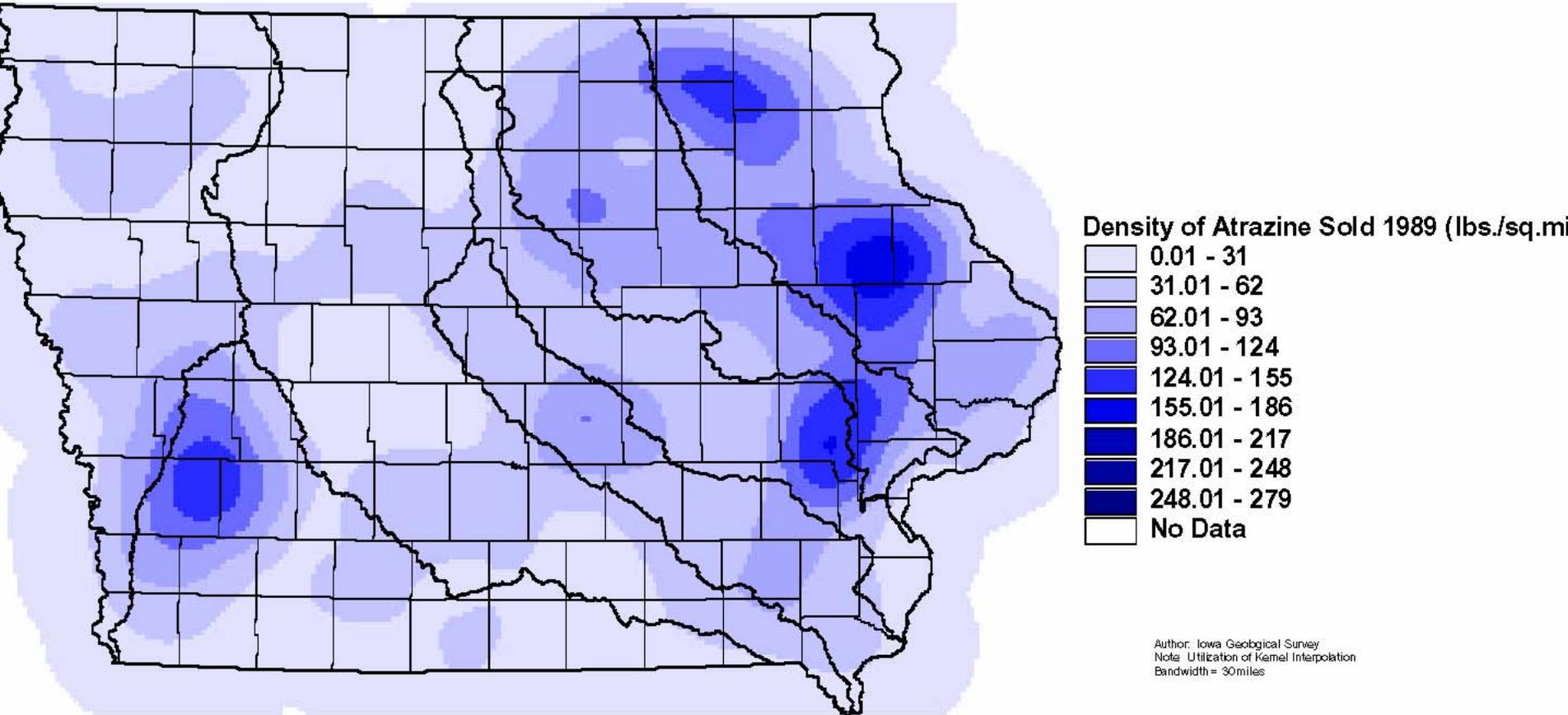


# Distributing Sales by Point Locations

Kernel Modeling: Decay Function from centroid to boundary



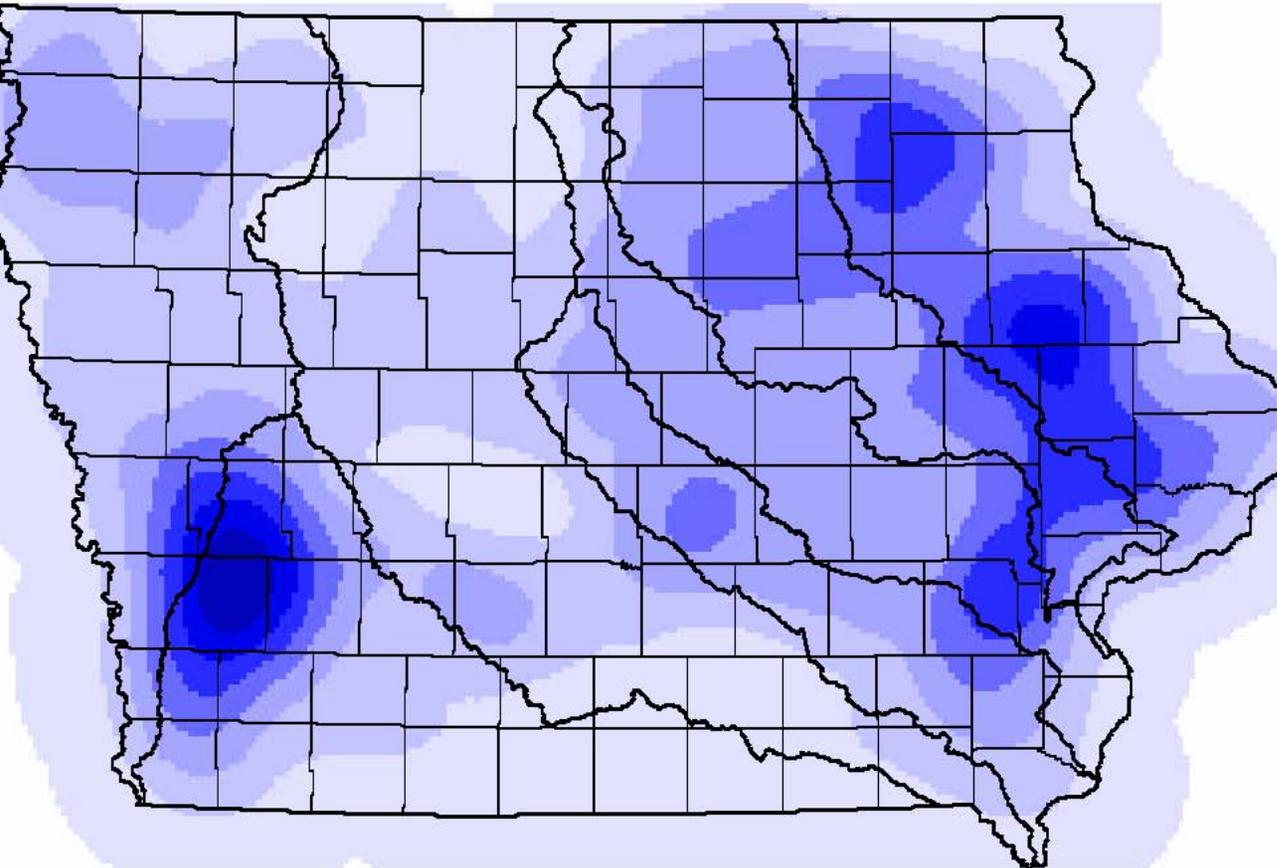
# Interpolated Density Surface of Total Atrazine Sales in 1989



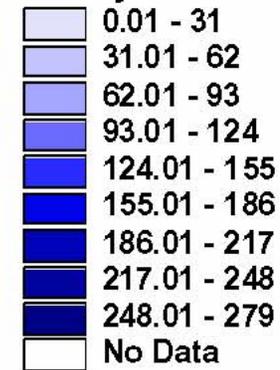
100 0 100 200 Miles



# Interpolated Density Surface of Total Atrazine Sales in 1995



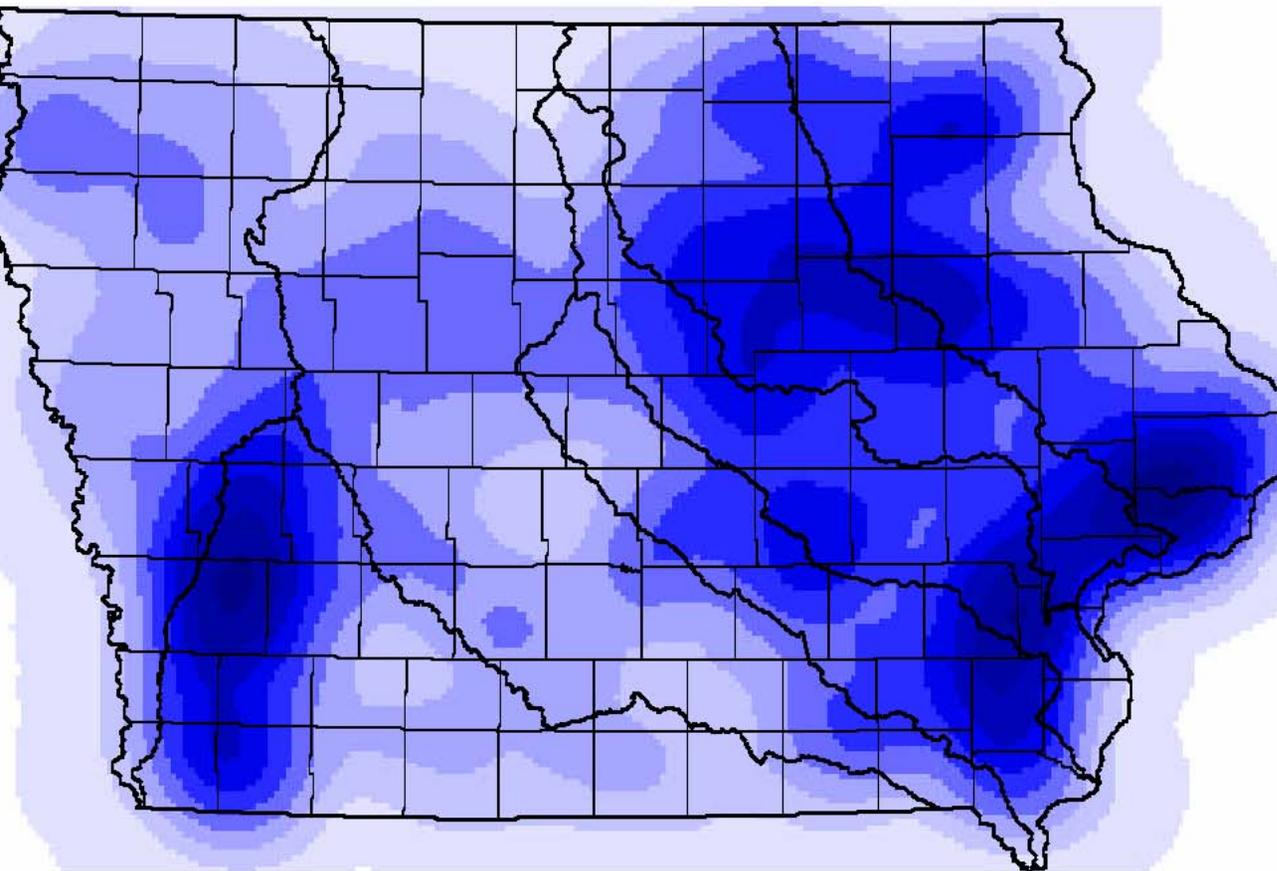
Density of Atrazine Sold 1995 (lbs./sq.mi)



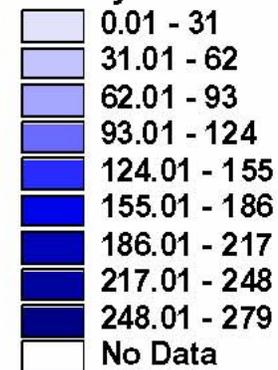
Author: Iowa Geological Survey  
Note: Utilization of Kernel Interpolation  
Bandwidth = 30 miles



# Interpolated Density Surface of Total Atrazine Sales in 2000



Density of Atrazine Sold 2000 (lbs./sq.mi)



Author: Iowa Geological Survey  
Note: Utilization of Kernel Interpolation  
Bandwidth = 30 miles

100 0 100 200 Miles

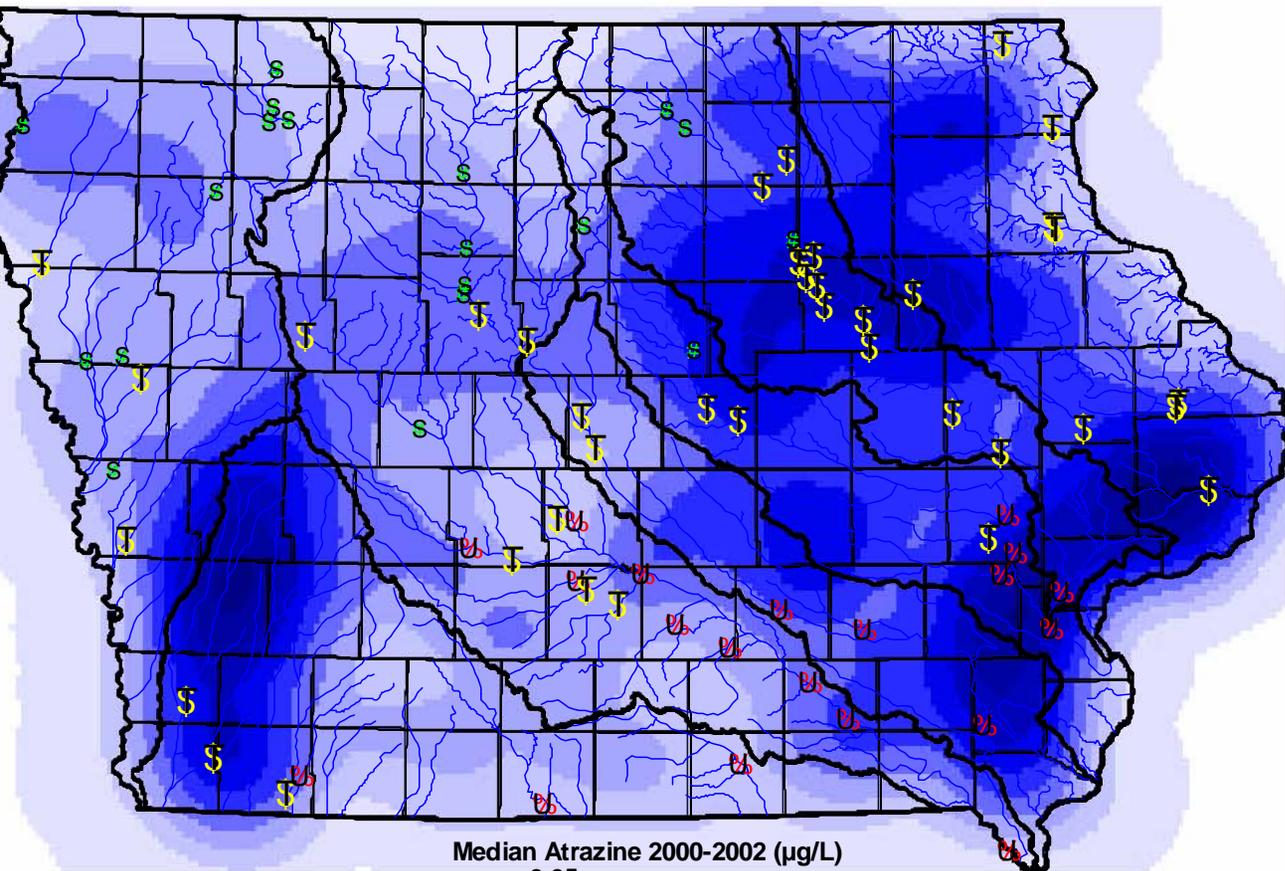


# *How Does Model Compare?*

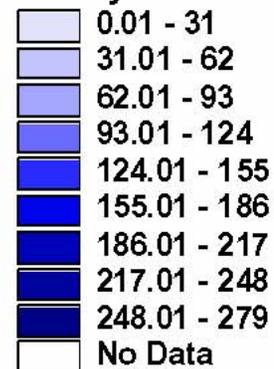
- Sales vs. Measured Water Quality
  - Environmental Lags may blur results
  - Monitoring may not perfectly match sales locations or density graphs

# Interpolated Density Surface of Total Atrazine Sales in 2000

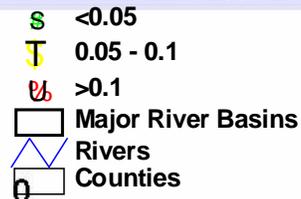
## Median Pesticide Concentration 2000-2002 ( $\mu\text{g/L}$ )



### Density of Atrazine Sold 2000 (lbs./sq.mi)



### Median Atrazine 2000-2002 ( $\mu\text{g/L}$ )



Author: Iowa Geological Survey  
 Note: Utilization of Kernel Interpolation  
 Bandwidth = 30 miles

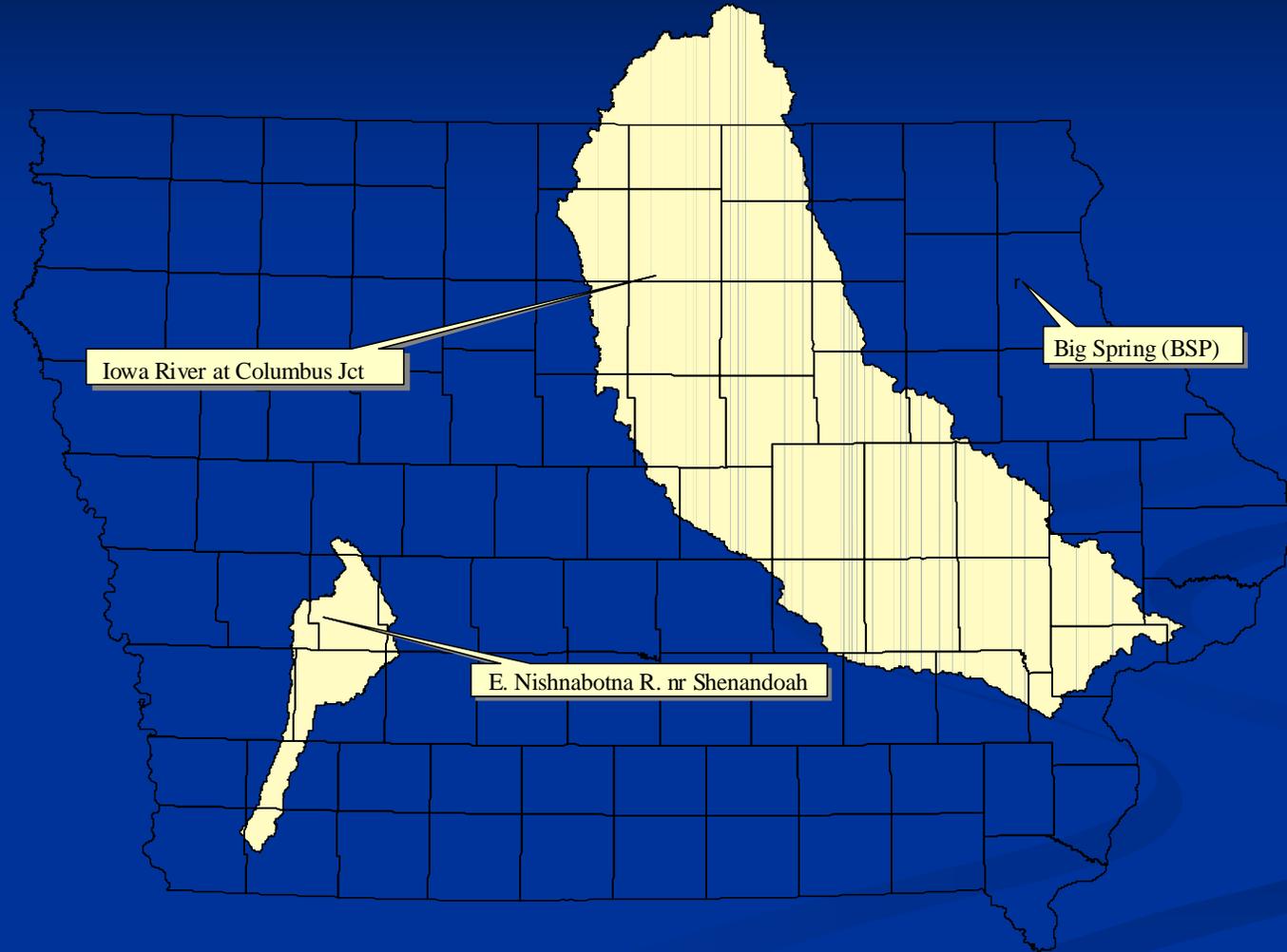
100

100

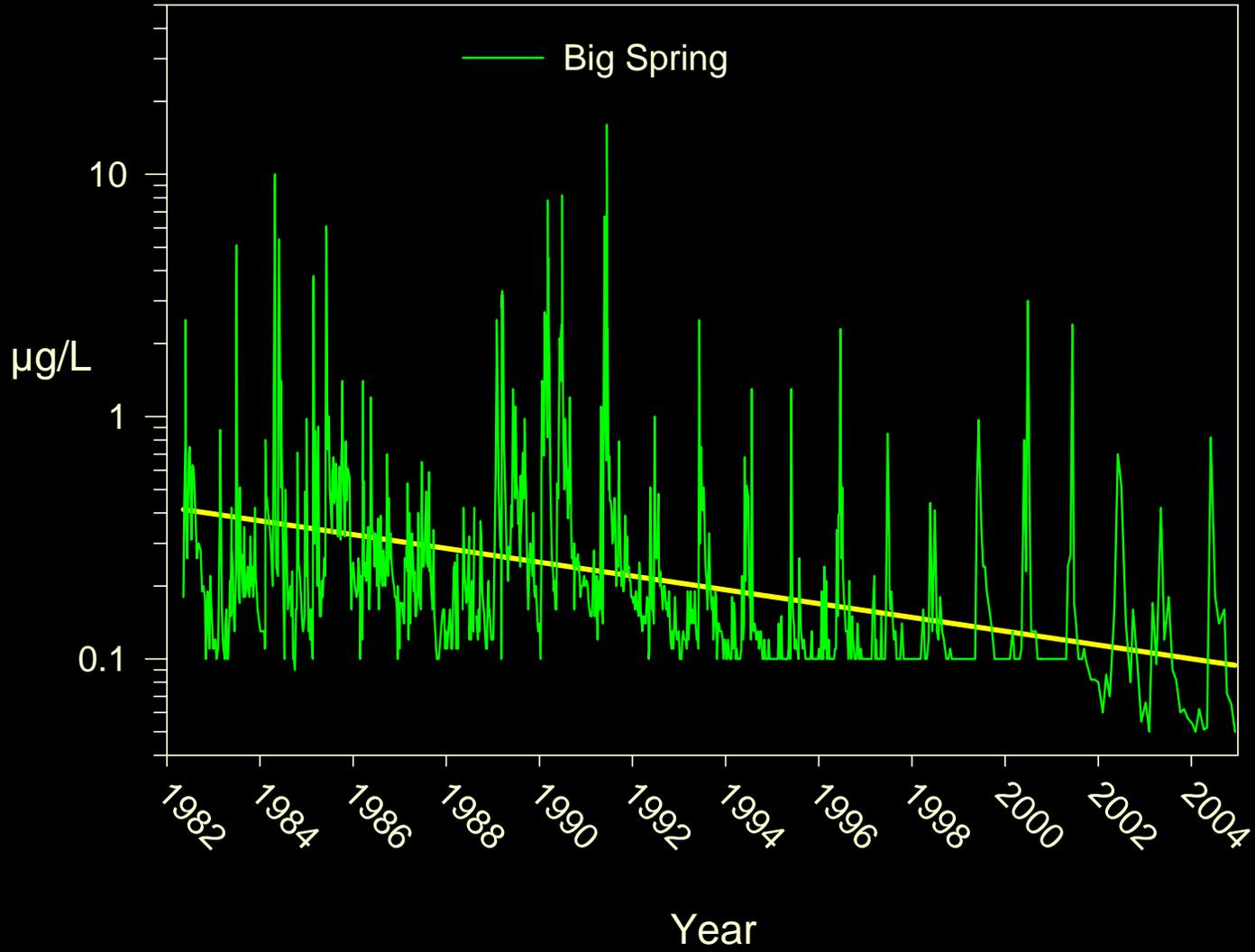
200 Miles



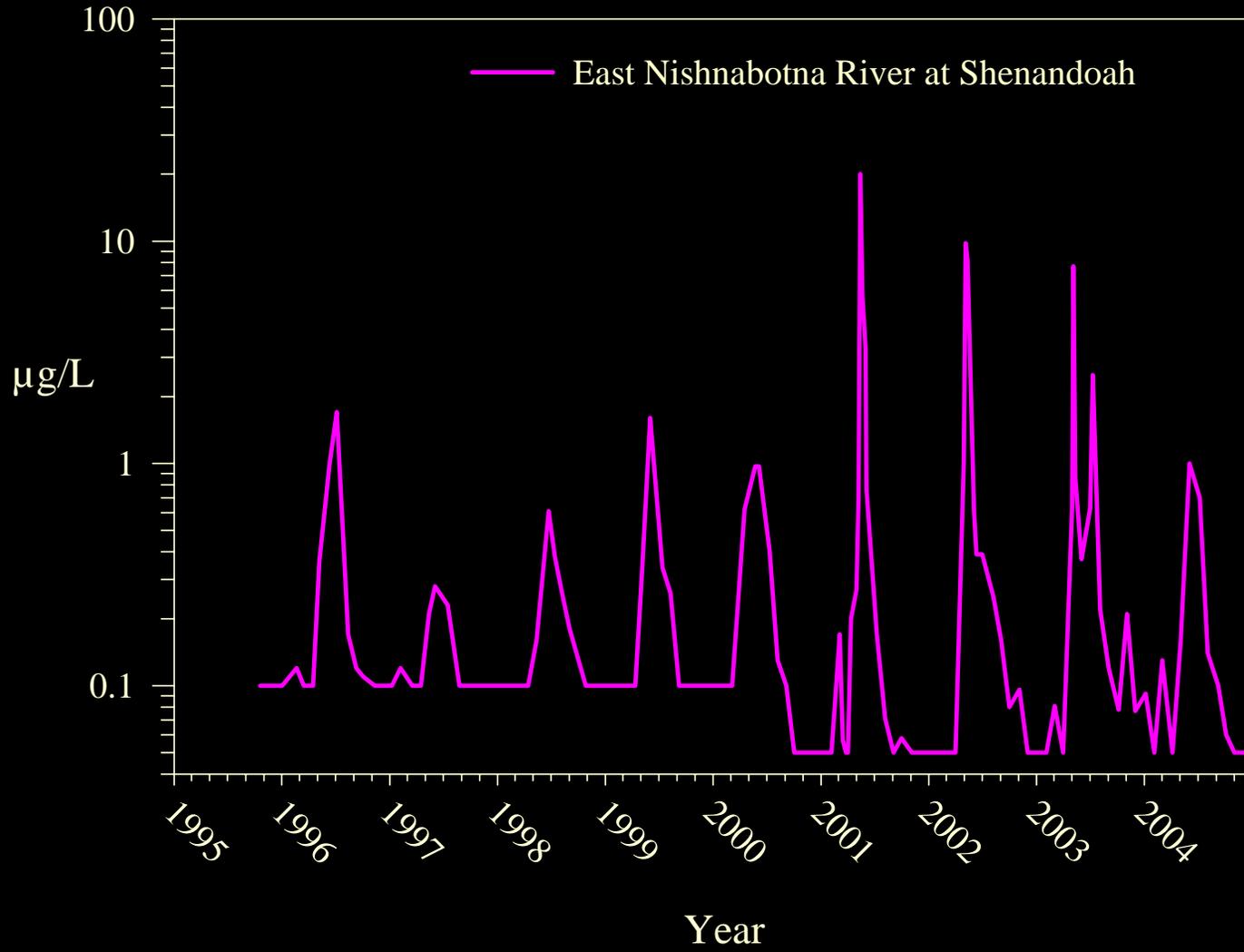
# Water Quality from Selected Watersheds



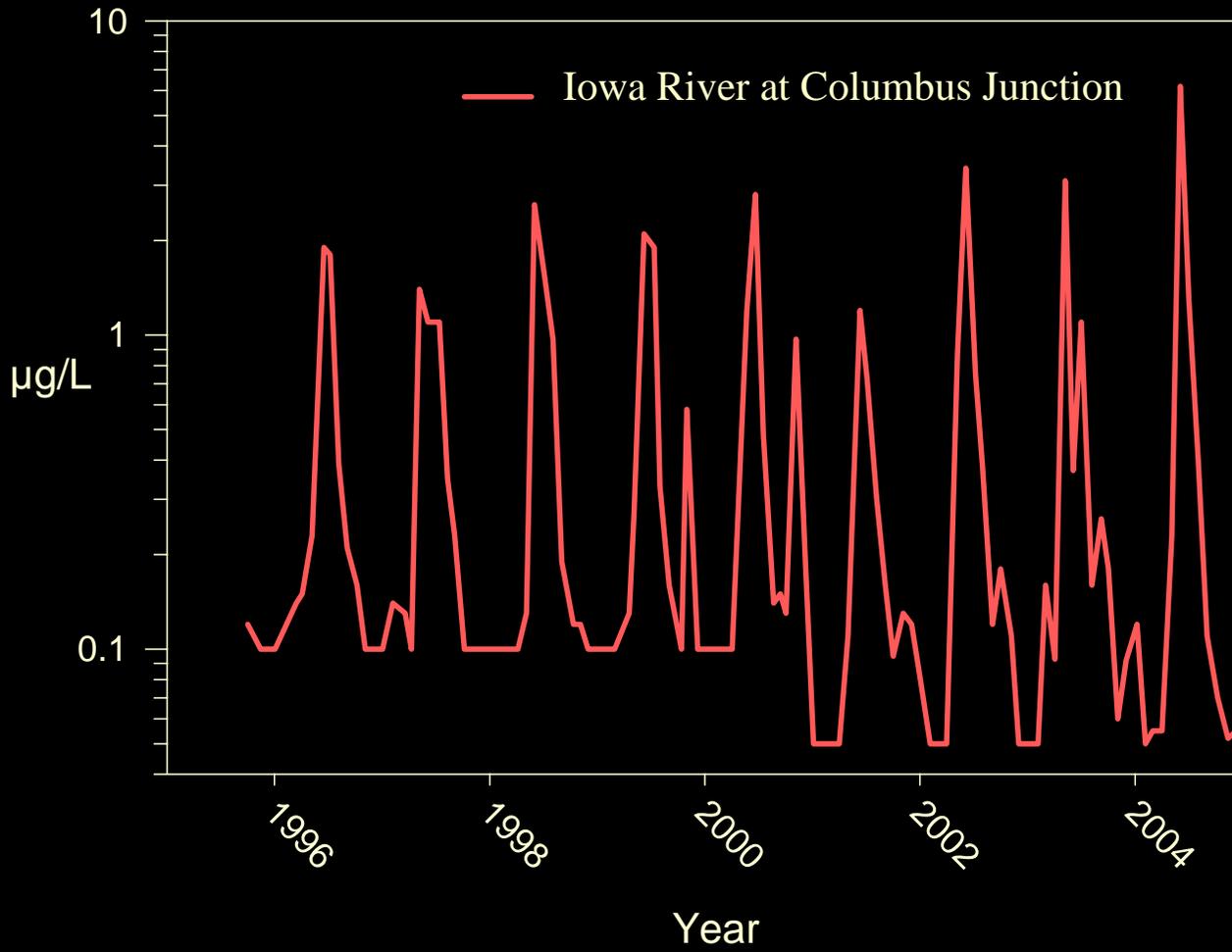
# Atrazine



# Atrazine



# Atrazine



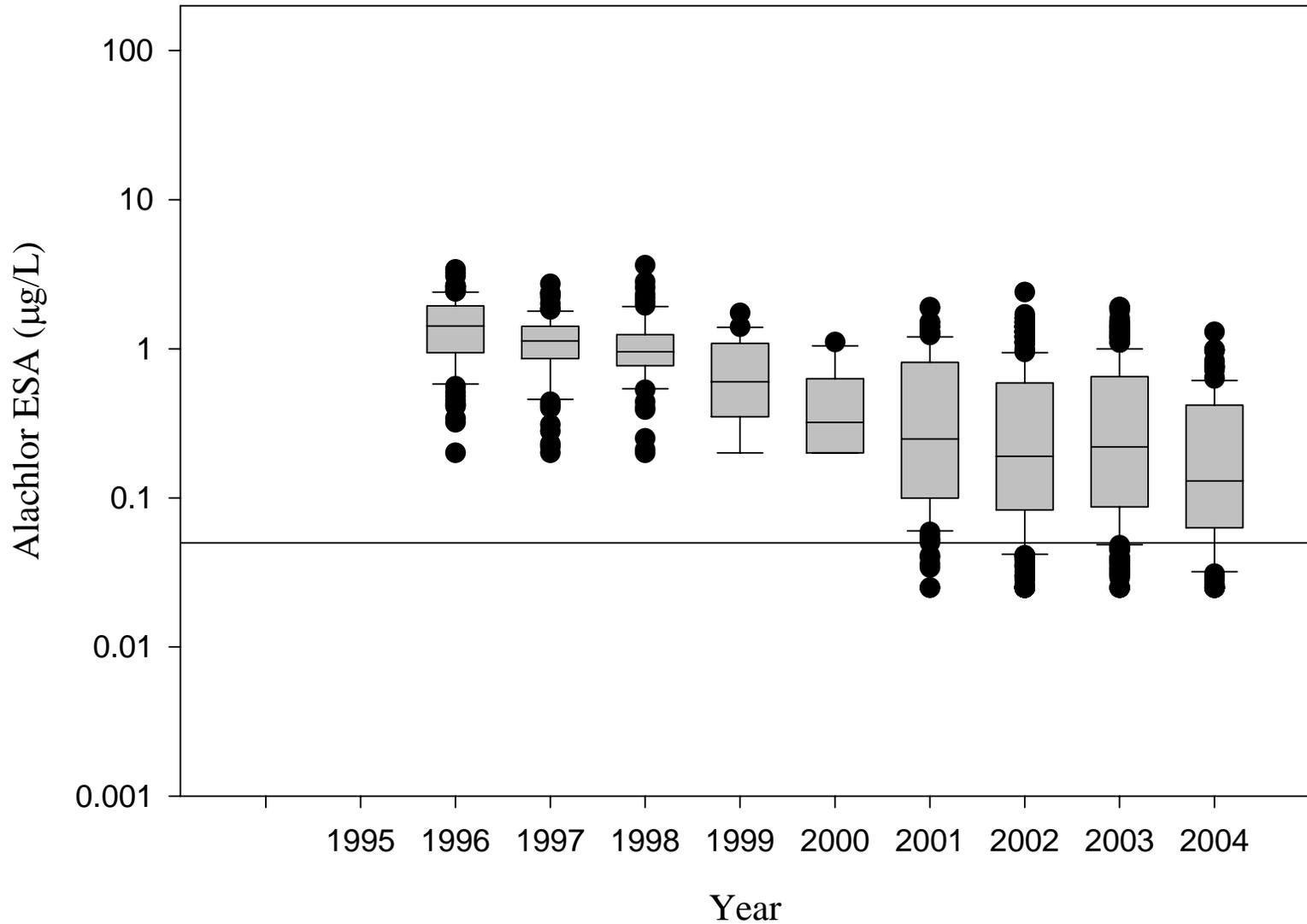
# Summary

- Use of “traditional” herbicides dropped
- Changing use reflected in local watersheds
- Some watersheds have experienced local increases; others decreases
- Improve targeted management activities

*Questions?*

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# Alachlor ESA Degradate Concentrations in Surface Water 1995-2002



# Acetochlor ESA Degradate Concentrations Surface Water 1995-2004

