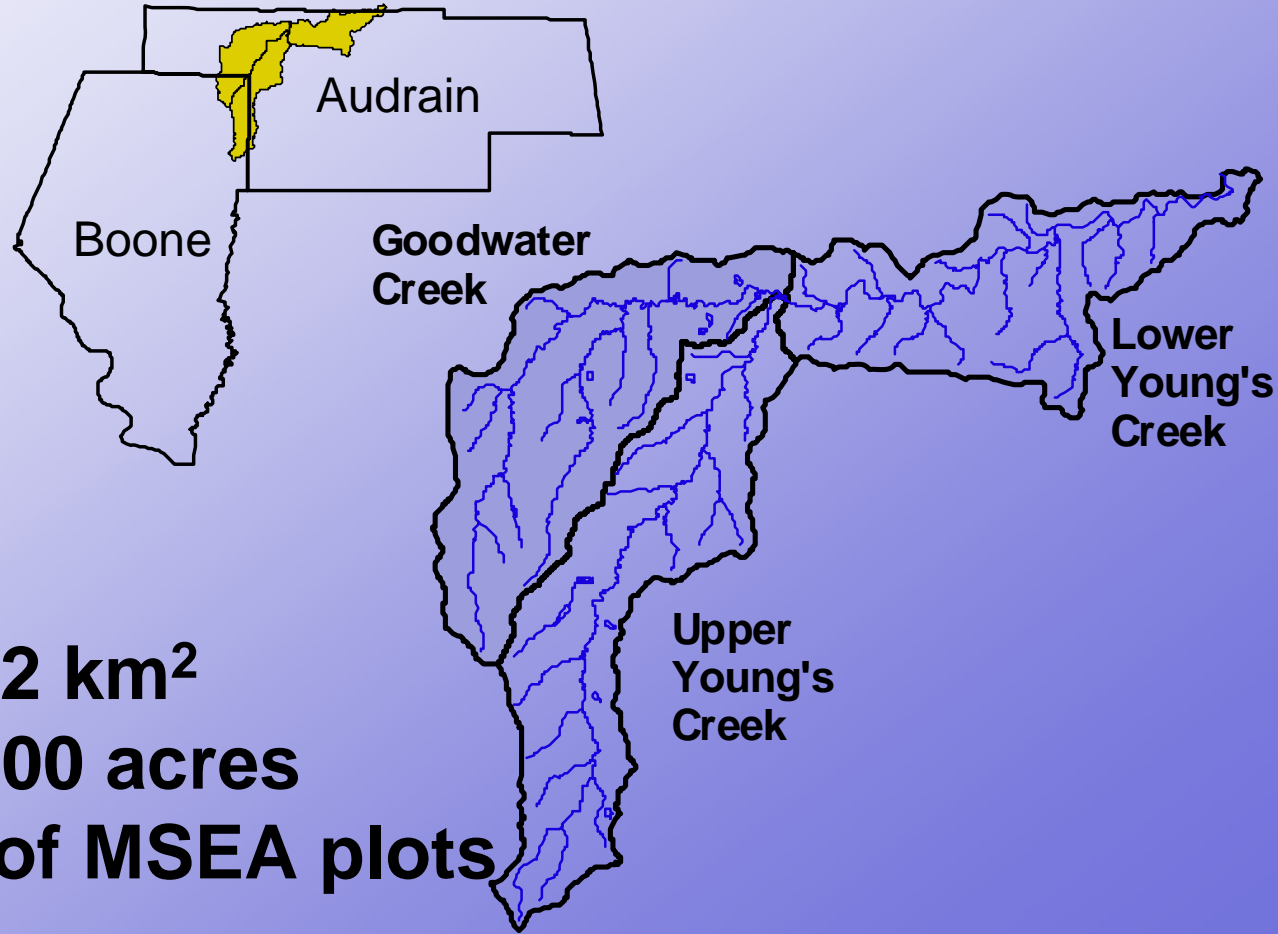
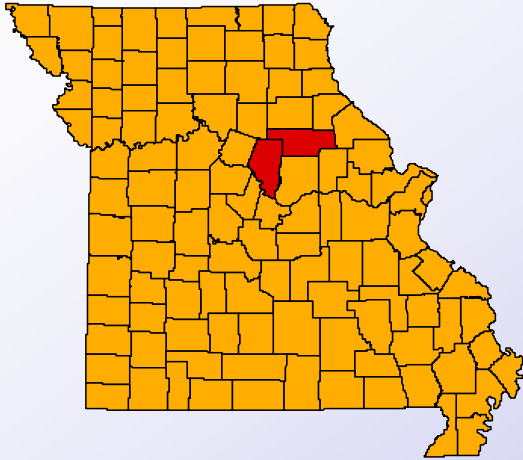


# **Best Management Practices in the CEAP Goodwater Creek Watershed: What, Where, and Why?**

Claire Baffaut, Steve H. Anderson,  
Robert N. Lerch, Bridget E. Murphy,  
E. John Sadler, J. Sandy Rikoon

Heartland Regional Workshop  
Nebraska City, NE June 08

# Goodwater Creek Experimental Watershed

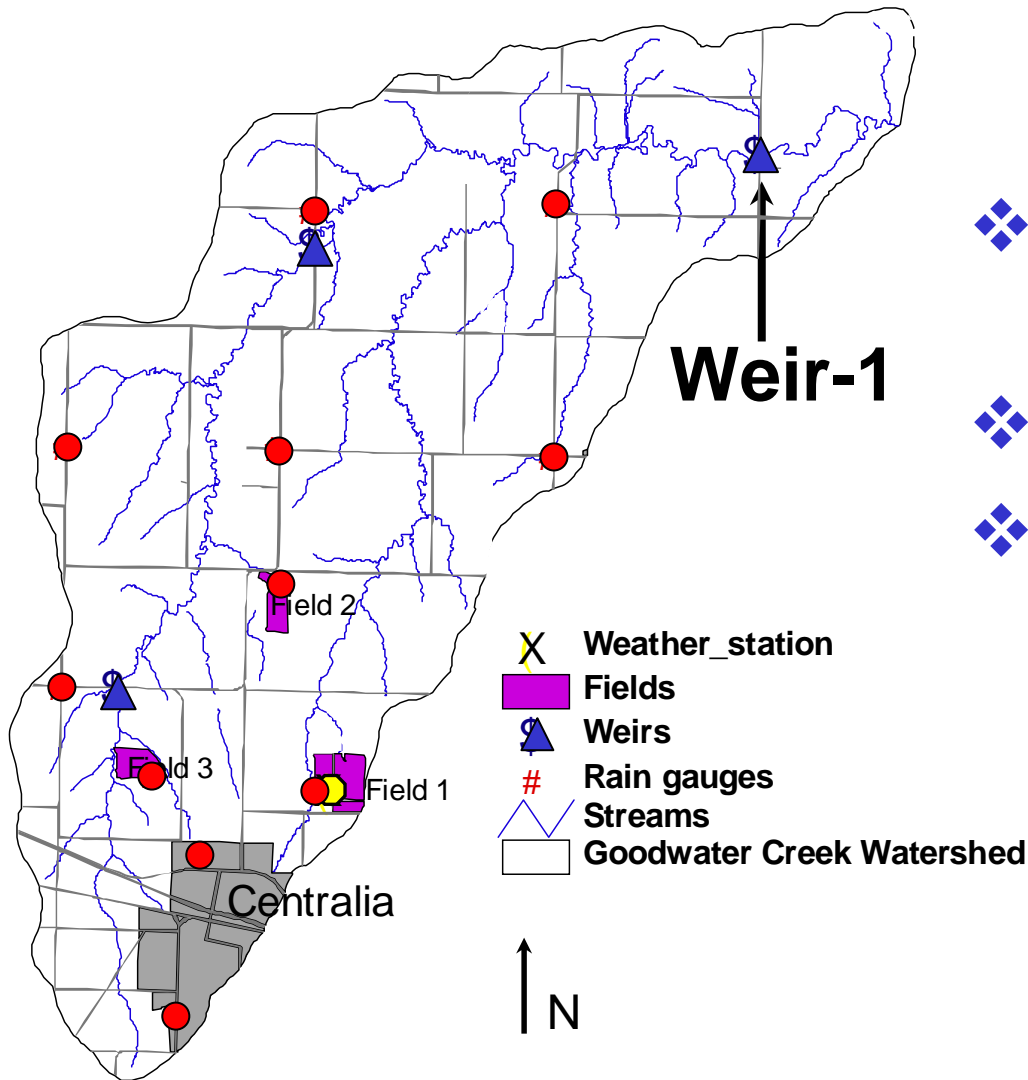


**72 km<sup>2</sup>**

**16,000 acres**

**Location of MSEA plots**

# Goodwater Creek Experimental Watershed



❖ **Claypan 15 to 45 cm below surface**

❖ **0-3% slopes**

❖ **Land use**

- 74% Row Crops
- 6% Woodland
- 18% Grassland
- 2% Urban

# Questions / Objectives

- ❖ **What practices are in place?**
- ❖ **Did it make a difference?**
- ❖ **Why have farmers decided to implement these practices?**
- ❖ **How can we do better?**

# Methods

## ❖ Data analysis

- NRCS: type, location and installation date of BMPs.
- Survey of 18 producers in the watershed:
  - ✓ **Farm 27,400 acres.**
  - ✓ **5,000 acres in the watershed (~35% of watershed farm land)**
- Herbicide water quality data since 1992.

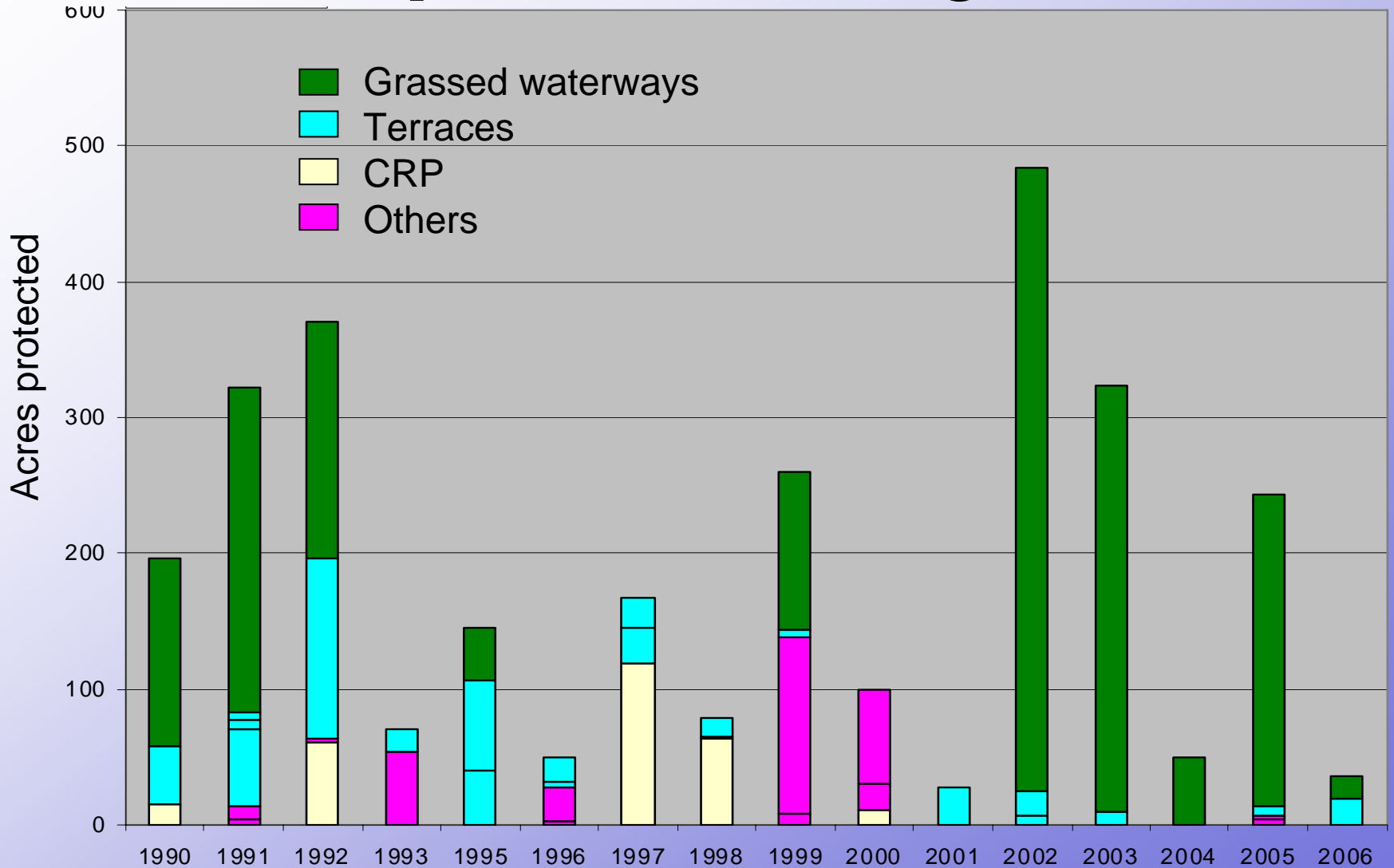
## ❖ Modeling

- SWAT model of the watershed
  - ✓ **calibration from 1993 to 1997**
  - ✓ **validation based on 1998 to 2003 (will be updated to 2006)**
  - ✓ **Run several scenarios**

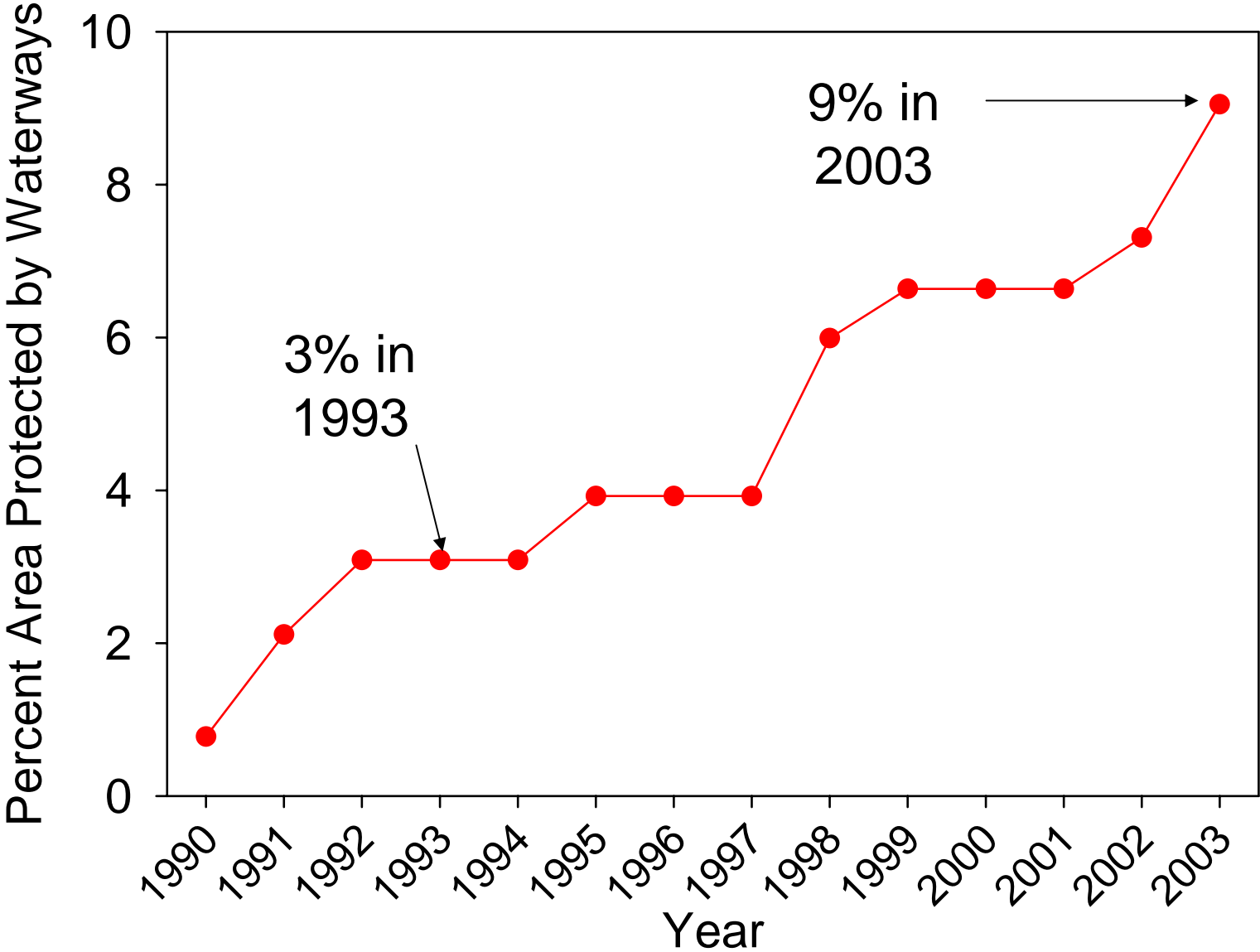
# **Assessment of Practices**

## **NRCS Input and Producer's Survey**

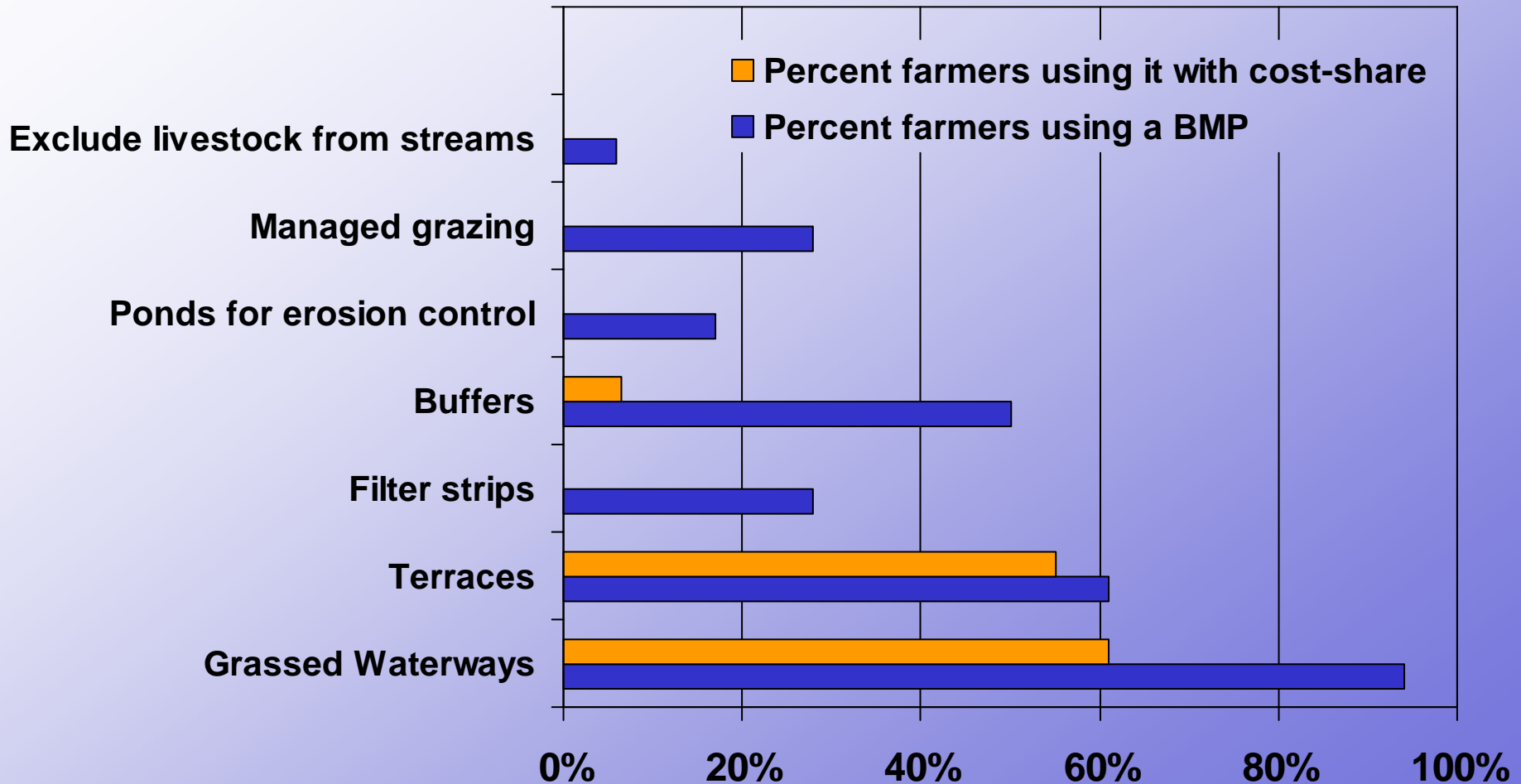
# Acres protected by BMPs



# Grassed Waterways



# BMPs: Survey results



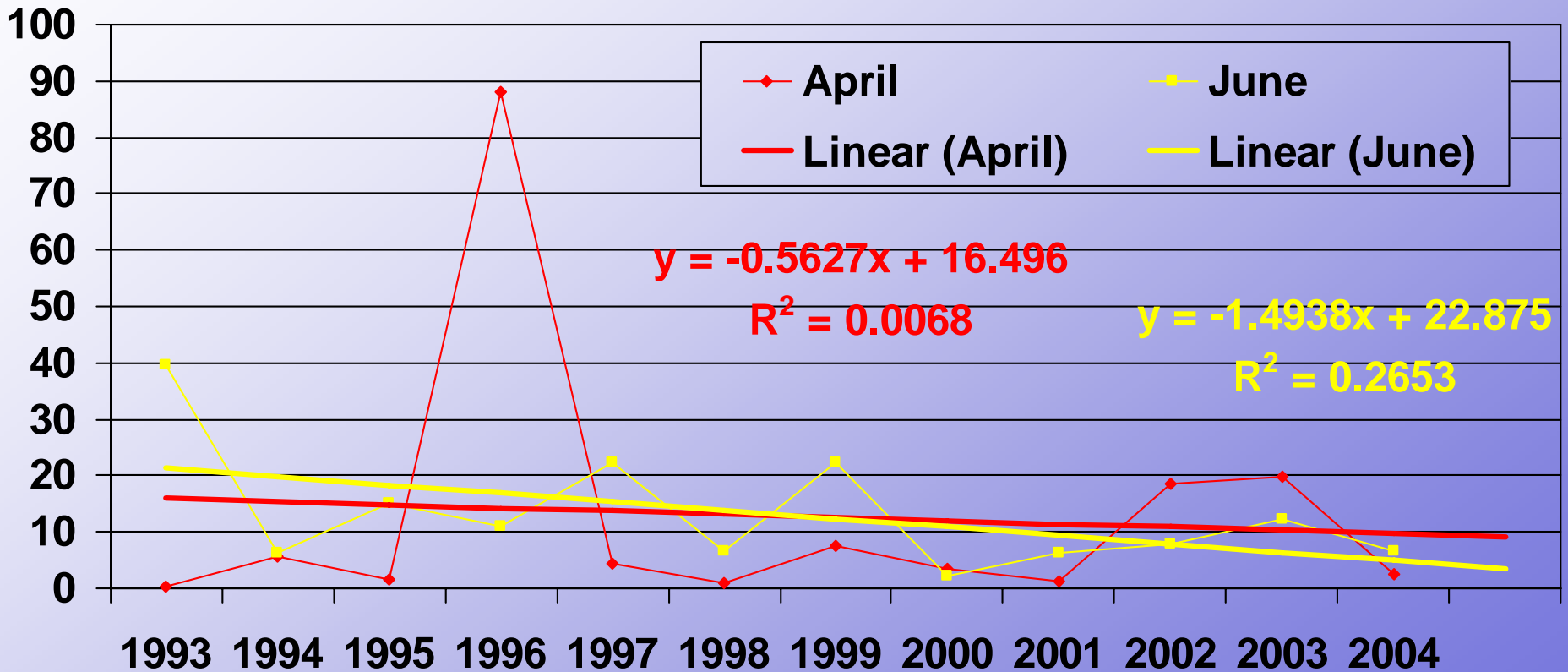
# **Effect Assessment**

## **Stream Data Analysis**

# Methods

- ❖ **Breakpoint flow data → daily flow values**
- ❖ **Sample concentrations (grab and auto sampler) → daily loads**
- ❖ **Monthly loads / average monthly flow → monthly flow weighed concentrations**

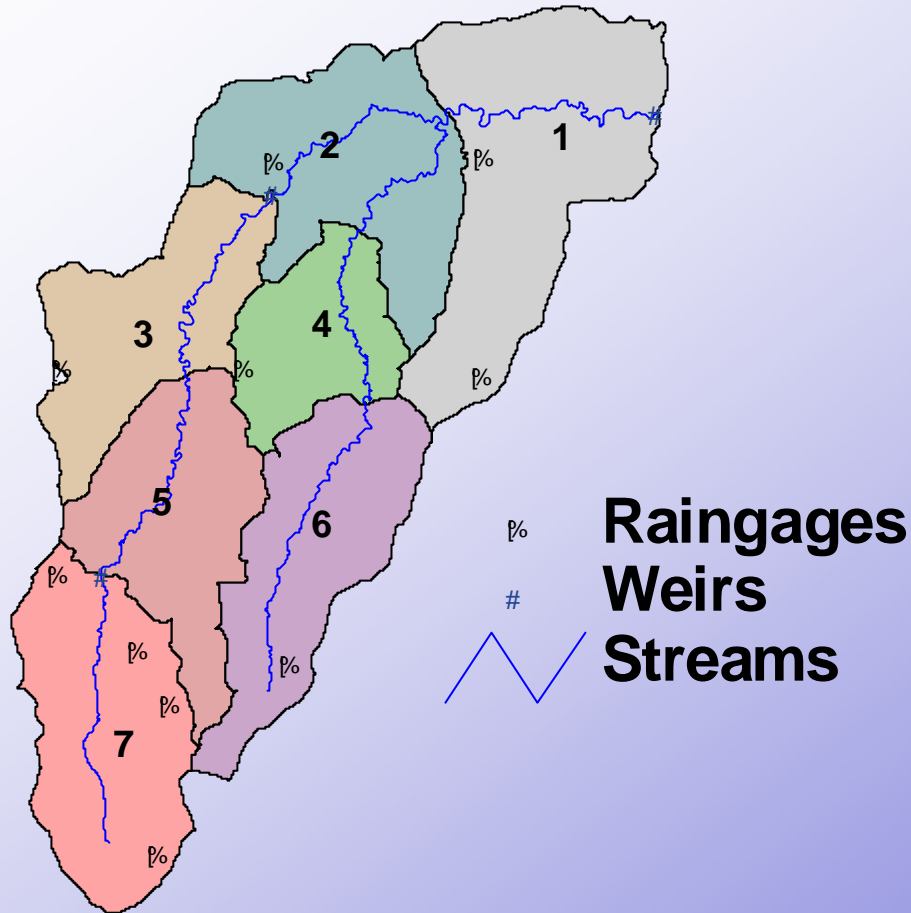
# Atrazine Monthly Flow Weighted Concentrations



# **Effect Assessment**

## **SWAT Modeling**

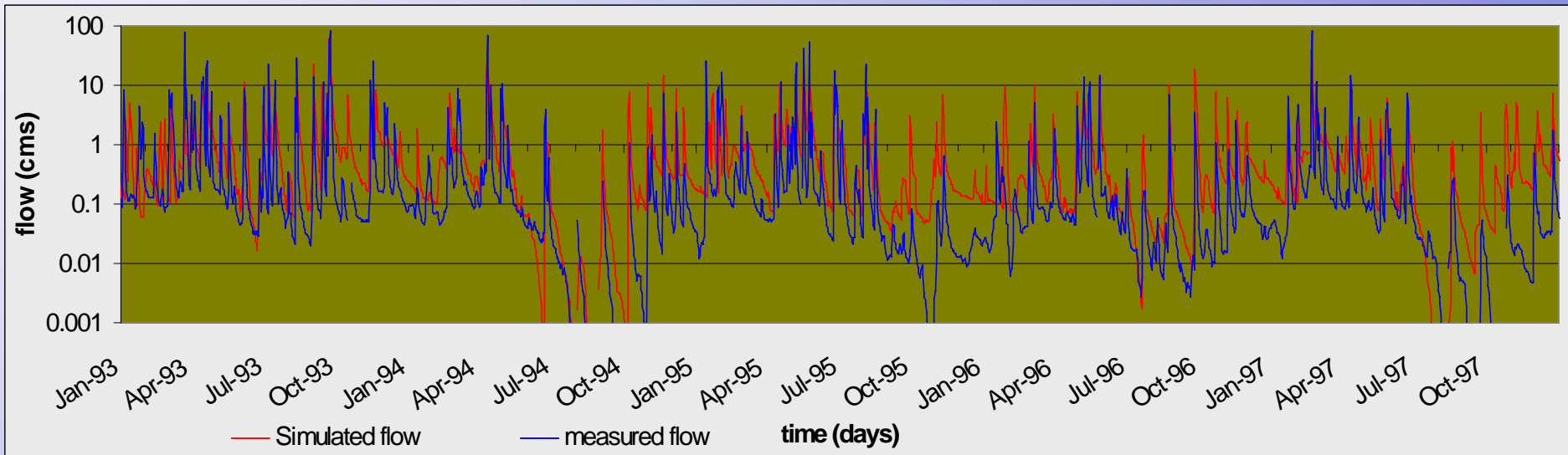
# SWAT Modeling



- ❖ 7 subbasins
- ❖ 7 cropping tillage systems including corn, soybeans, wheat, sorghum, grassland + residential
- ❖ Calibration 93-97
- ❖ Validation 98-03

# Flow Calibration

|                | $R^2$       | Nash-Sutcliffe |
|----------------|-------------|----------------|
| <b>Weir 1</b>  | <b>0.53</b> | <b>0.53</b>    |
| <b>Weir 9</b>  | <b>0.61</b> | <b>0.60</b>    |
| <b>Weir 11</b> | <b>0.65</b> | <b>0.59</b>    |



# Scenarios on Atrazine Losses

## ❖ Temporary results

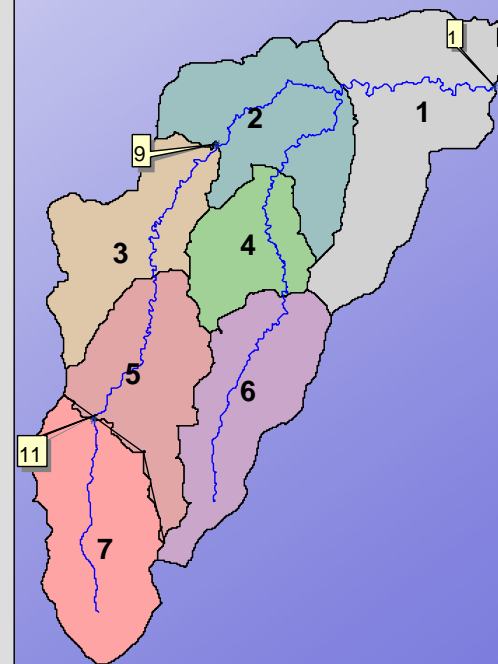
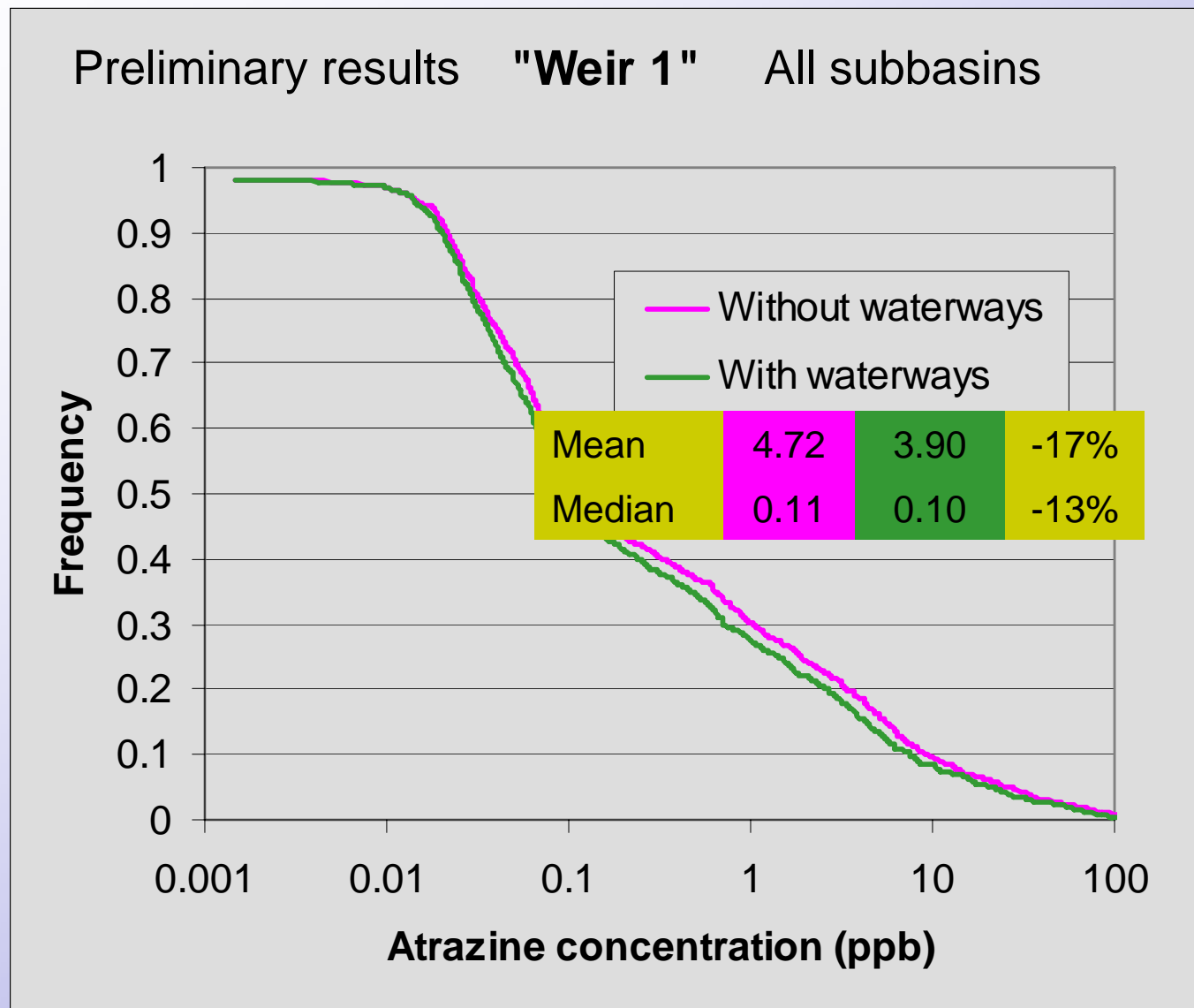
## ❖ 2 scenarios: with and without grassed Waterways

- 338 ha (15% ) of watershed protected
- Divided between the tillage systems and the 7 subbasins.
- Assumed all applied to corn acreage

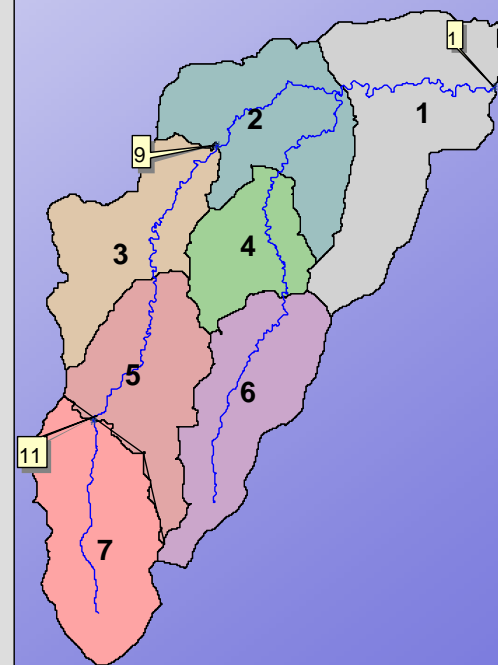
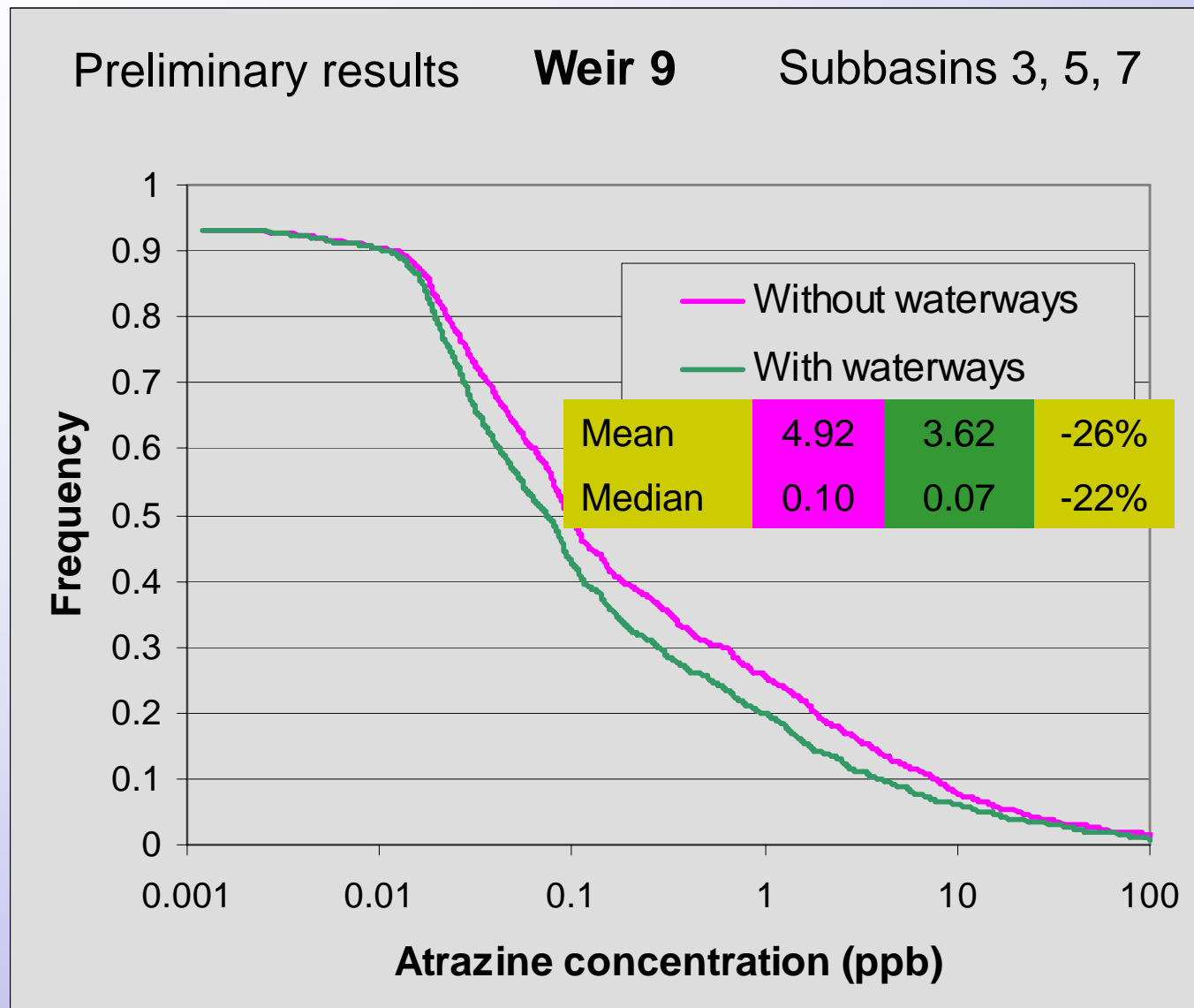
# Impact of Waterways at Weir 1

| <b>Simulated Atrazine concentration</b> | <b>April, May, and June, 30 years</b> |                        |                   |
|---|---------------------------------------|------------------------|-------------------|
|   | <b>Baseline</b>                       | <b>Added waterways</b> | <b>Difference</b> |
| <b>Mean (ppb)</b>                       | <b>2.76</b>                           | <b>2.24</b>            | <b>- 19%</b>      |
| <b>Variance</b>                         | <b>310</b>                            | <b>199</b>             | <b>- 36%</b>      |
| <b>Seasonal load (kg)</b>               | <b>23.7</b>                           | <b>19.3</b>            | <b>-18%</b>       |

# Impact of Waterways 1993-2003

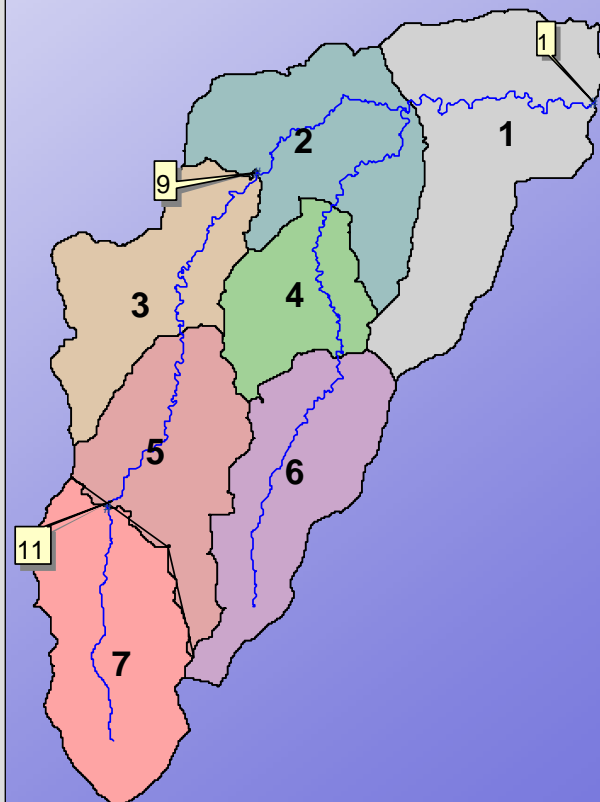
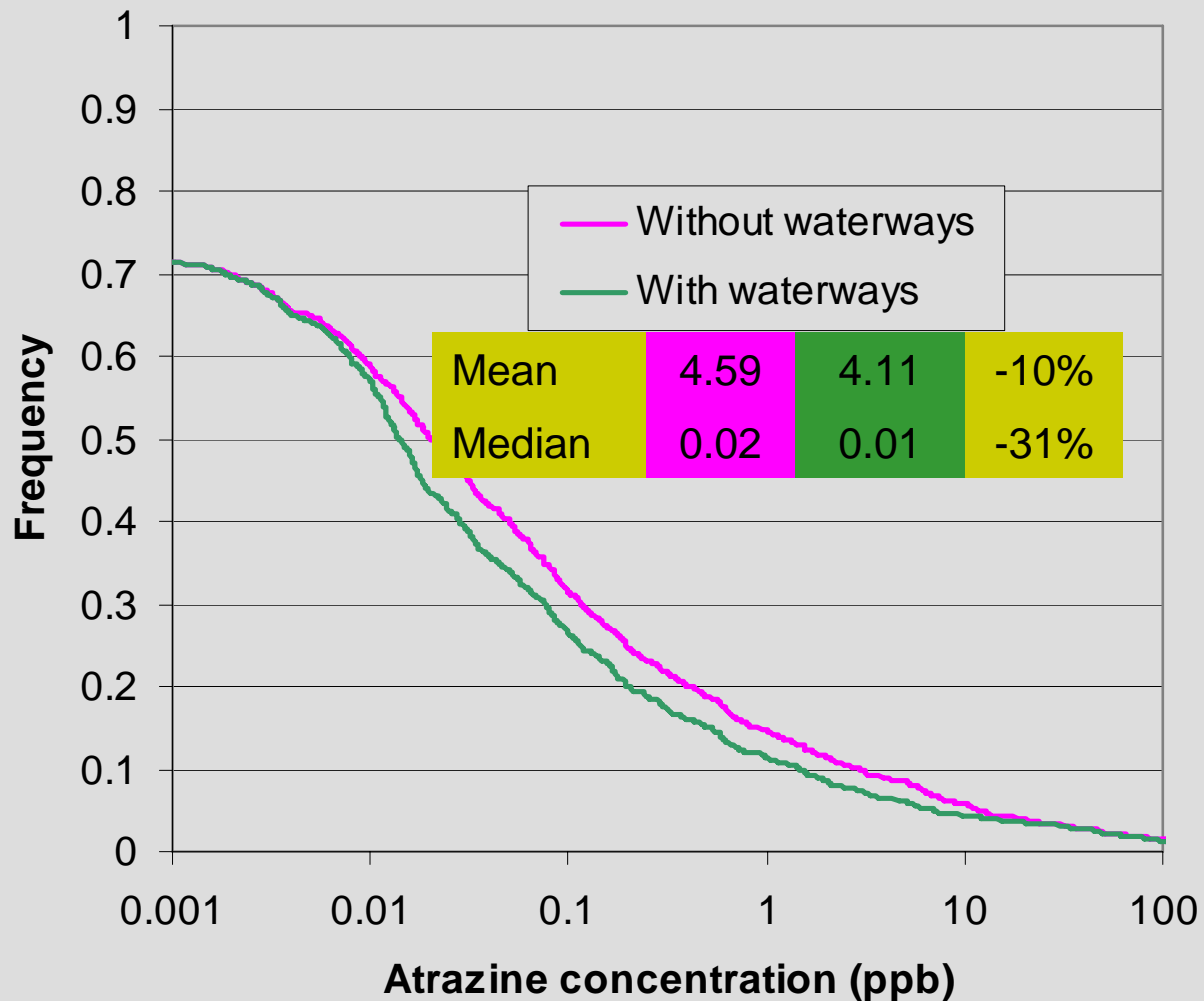


# Impact of Waterways 1993-2003



# Impact of Waterways 1993-2003

Preliminary results Weir 11 Subbasin 7



# **How can we do better?**

**What drives producer's choice?**

**How do they decide?**

**Where do they get their information?**

**Why do they change their behavior?**

# Herbicide Choice

What was listed in the top three factors that affect choice of herbicides

➤ **1992**

- 1. Cost**  
**64% (16)**
- 2. Performance**  
**48% (12)**
- 3. Recommendation**  
**24% (6)**

➤ **2006**

- 1. Cost**  
**100% (18)**
- 2. Performance**  
**92% (13)**
- 3. Weed type –  
Problem severity**  
**69% (9)**

# How do farmers decide?

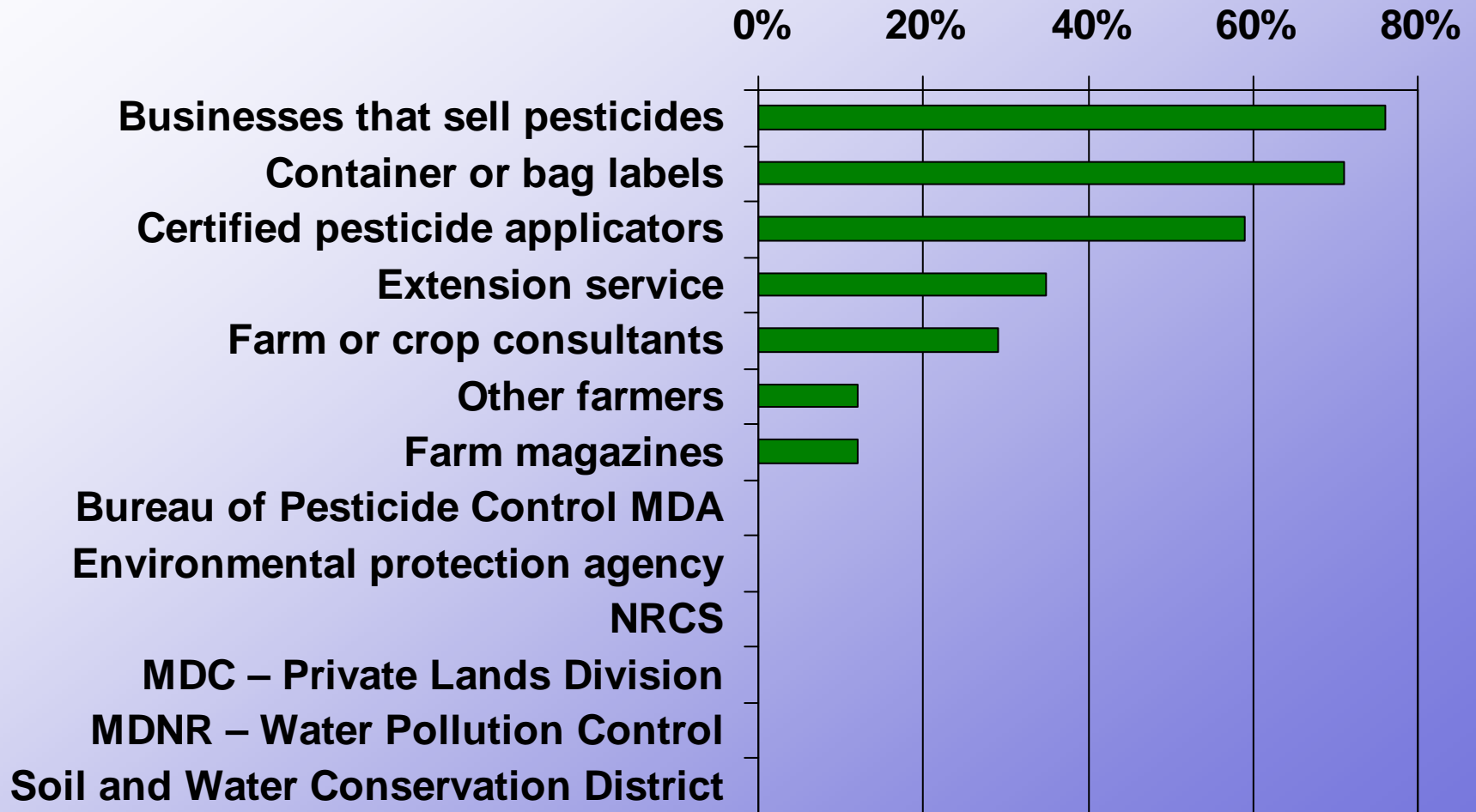
## ▶ **Bio-physical factors key in deciding:**

- Which herbicides (especially performance)

## ▶ **External factors key in deciding:**

- Herbicides rates (label)
- Timing / method of herbicide application (esp. weather)

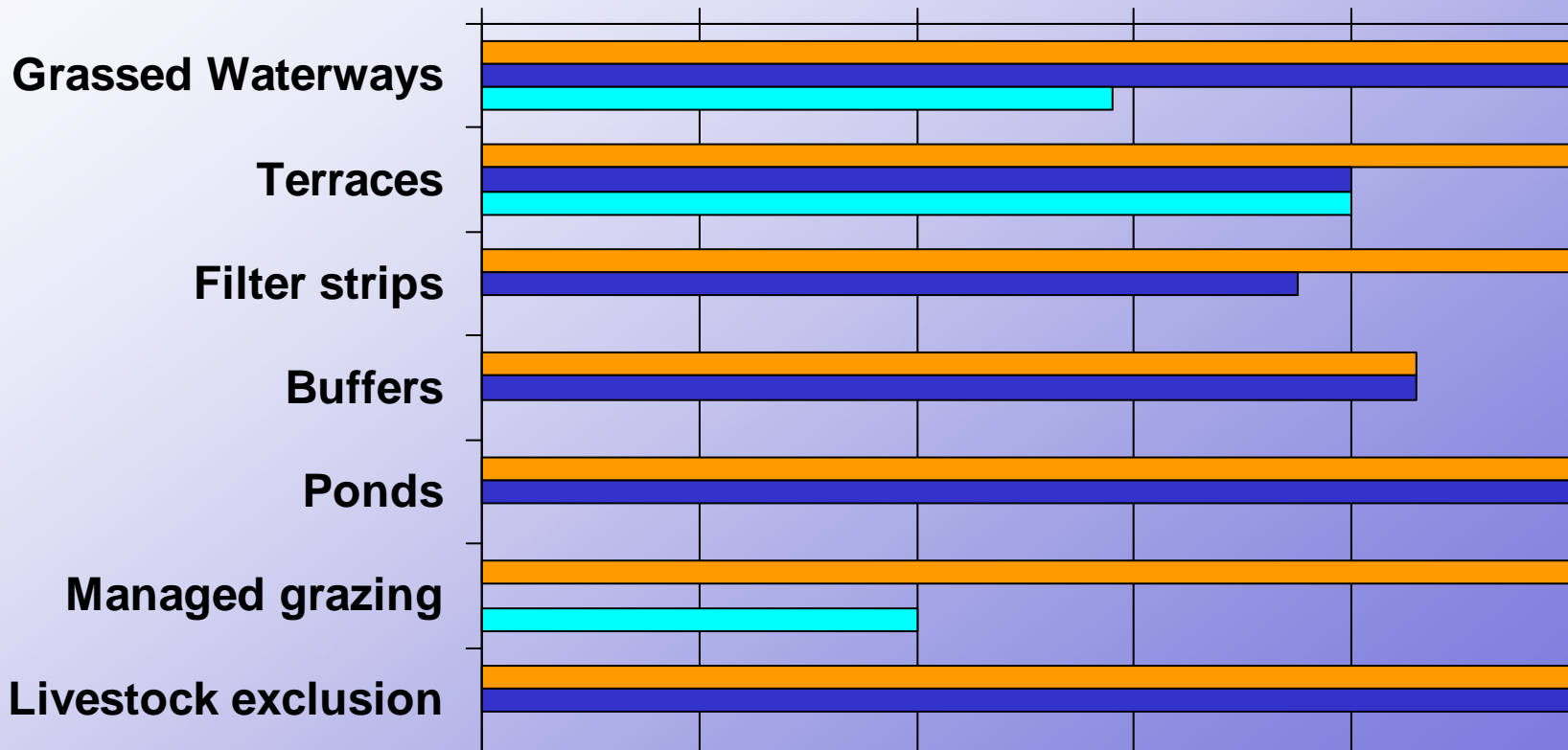
# Who do they list in the top 3 reliable sources of information?



# What were the decisive factors?

% respondents for which it was a significant factor

0% 20% 40% 60% 80% 100%



right thing to do evidence of degradation financial incentive

# Conclusions

- ❖ **Difficult to see a clear trend due to past efforts, either using water quality data analysis or modeling.**
- ❖ **An important factor for implementing a BMP was the evidence of degradation**
  - Need self-evaluation tools for farmers
- ❖ **Need to develop a watershed management plan.**
  - Definition of an objective
  - Define the number of acres to be protected