

# Evaluation of BMPs Using Statistical and SWAT Modeling

## Goodwater Creek Watershed North Central Missouri

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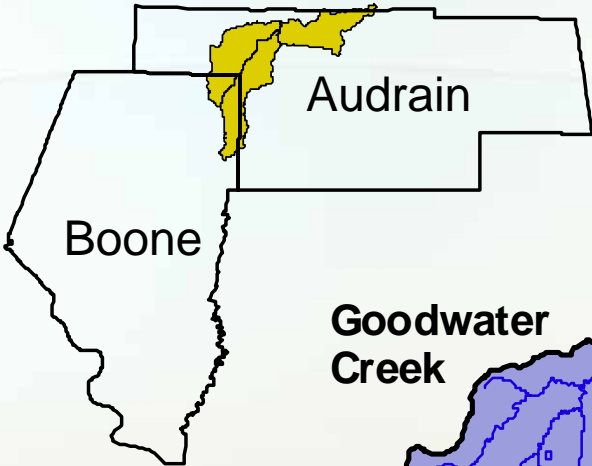
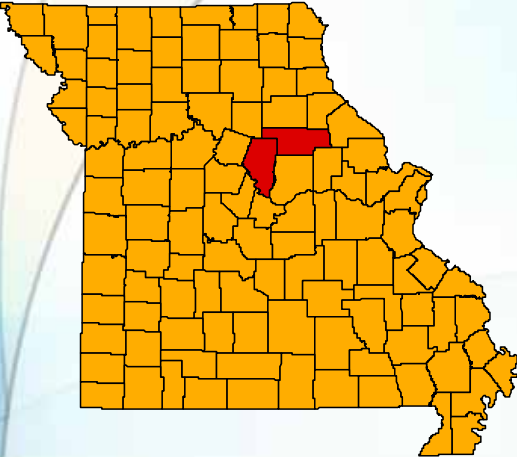
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FAPRI

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Systems & Water Quality, ARS

# Objectives

- **Use statistical regression to determine relationships among weather, runoff, water quality, and BMP implementation**
- **Use SWAT model to estimate the impact of different factors on atrazine**

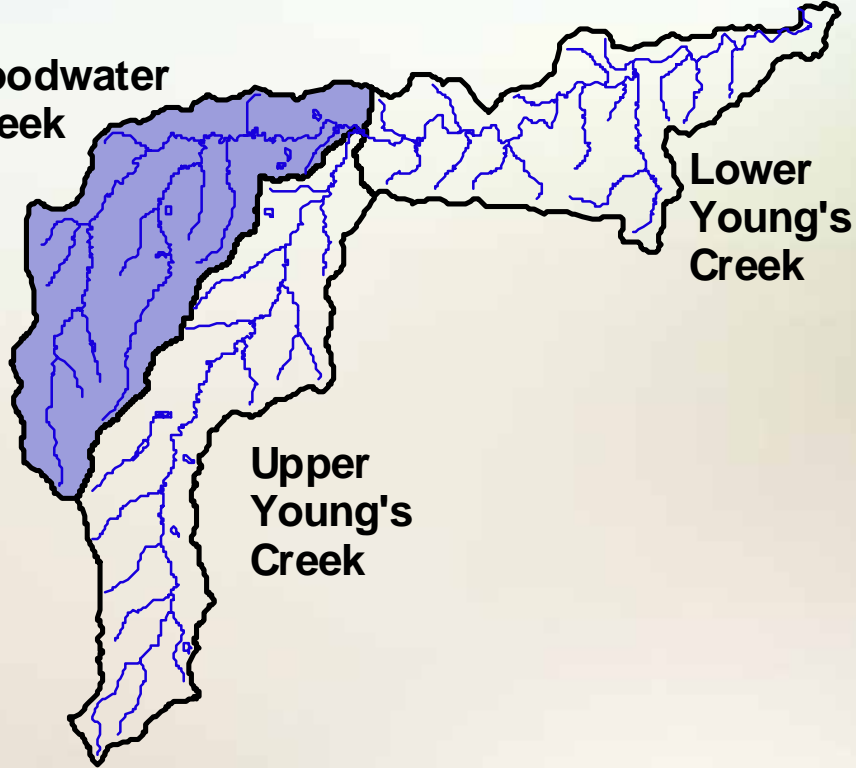
# Goodwater Creek Watershed



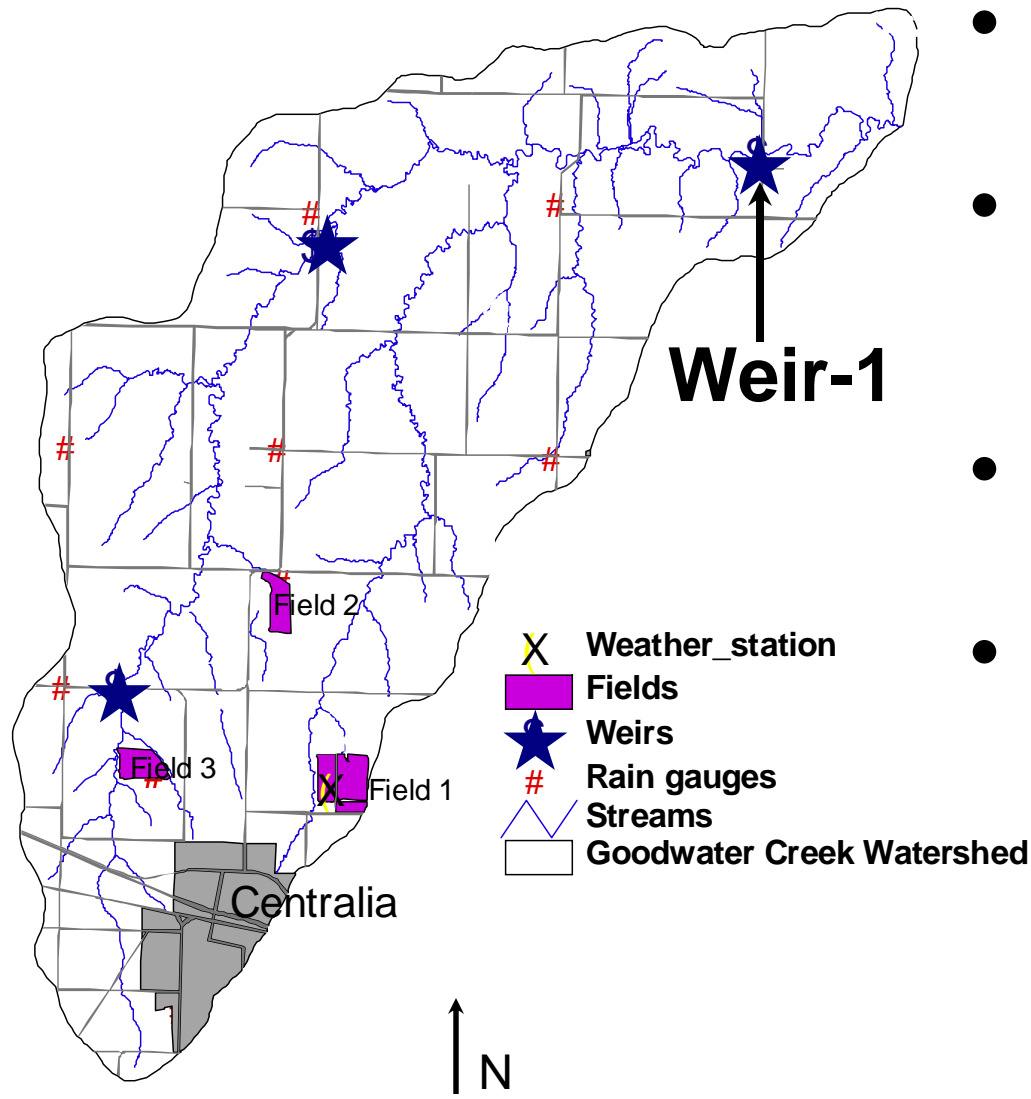
**Goodwater  
Creek**

**Lower  
Young's  
Creek**

**Upper  
Young's  
Creek**



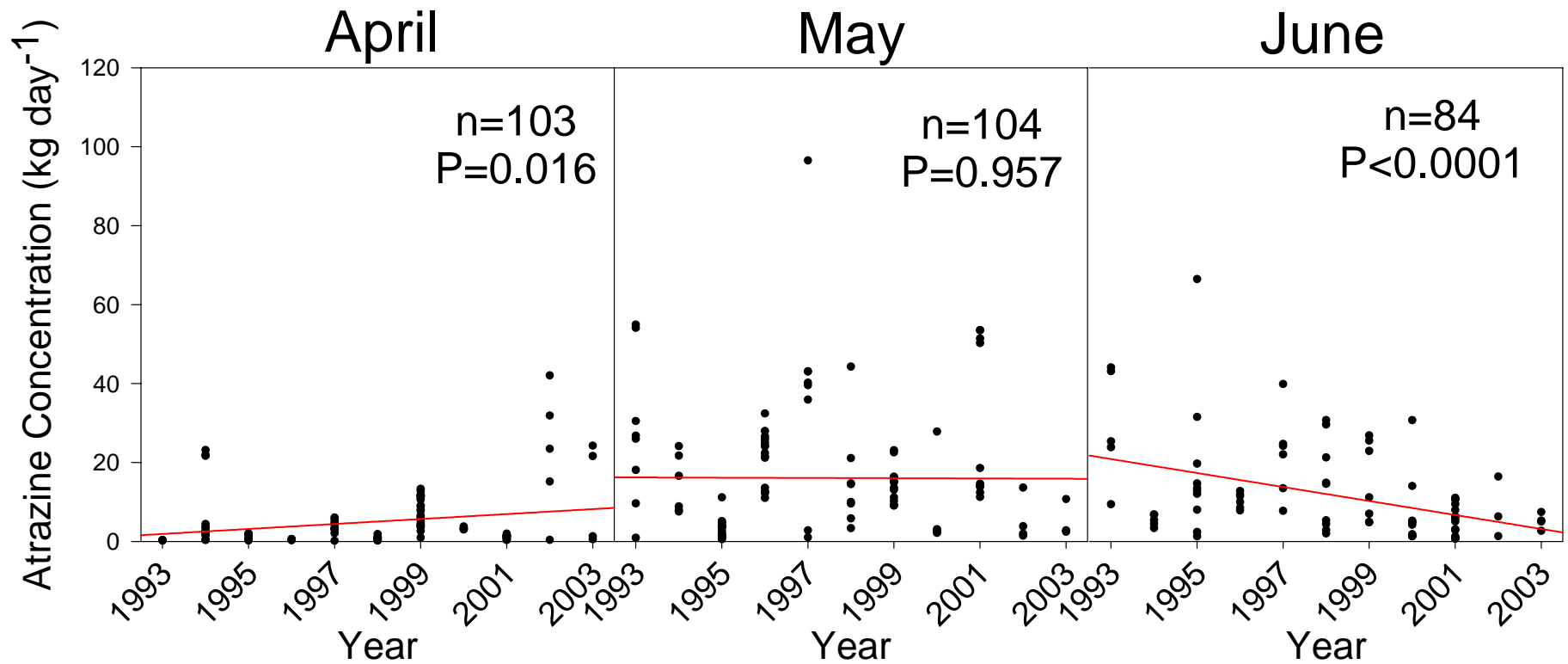
# Goodwater Creek Watershed



- **7,250 ha**
- **Claypan 13 to 46 cm below surface**
- **0-3% slopes**
- **Land use**
  - **70% Row Crops**
  - **10% Woodland**
  - **10% Grassland**
  - **10% Urban**

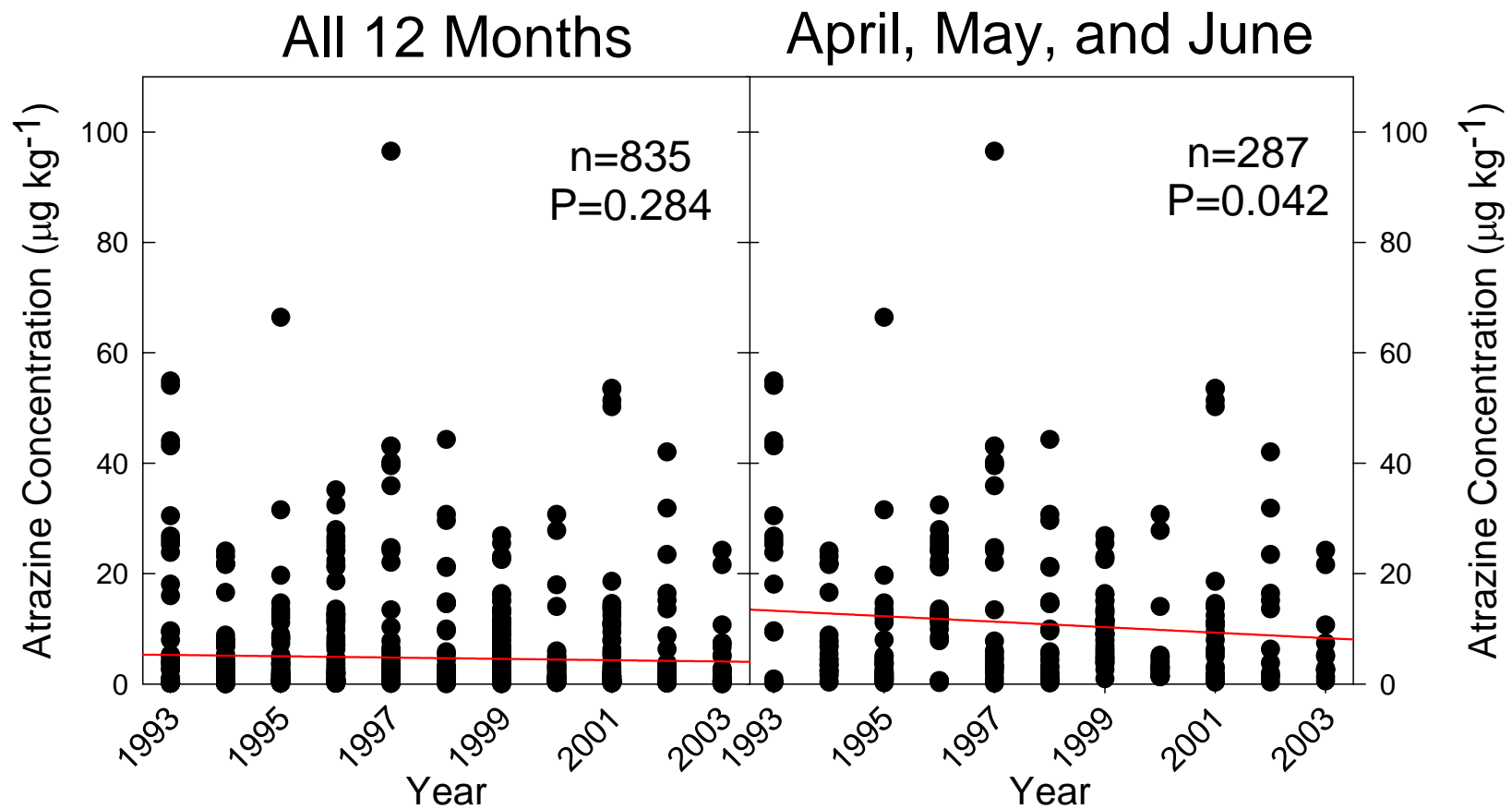
# Trends in Data

## Atrazine Concentration



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## Atrazine Concentration

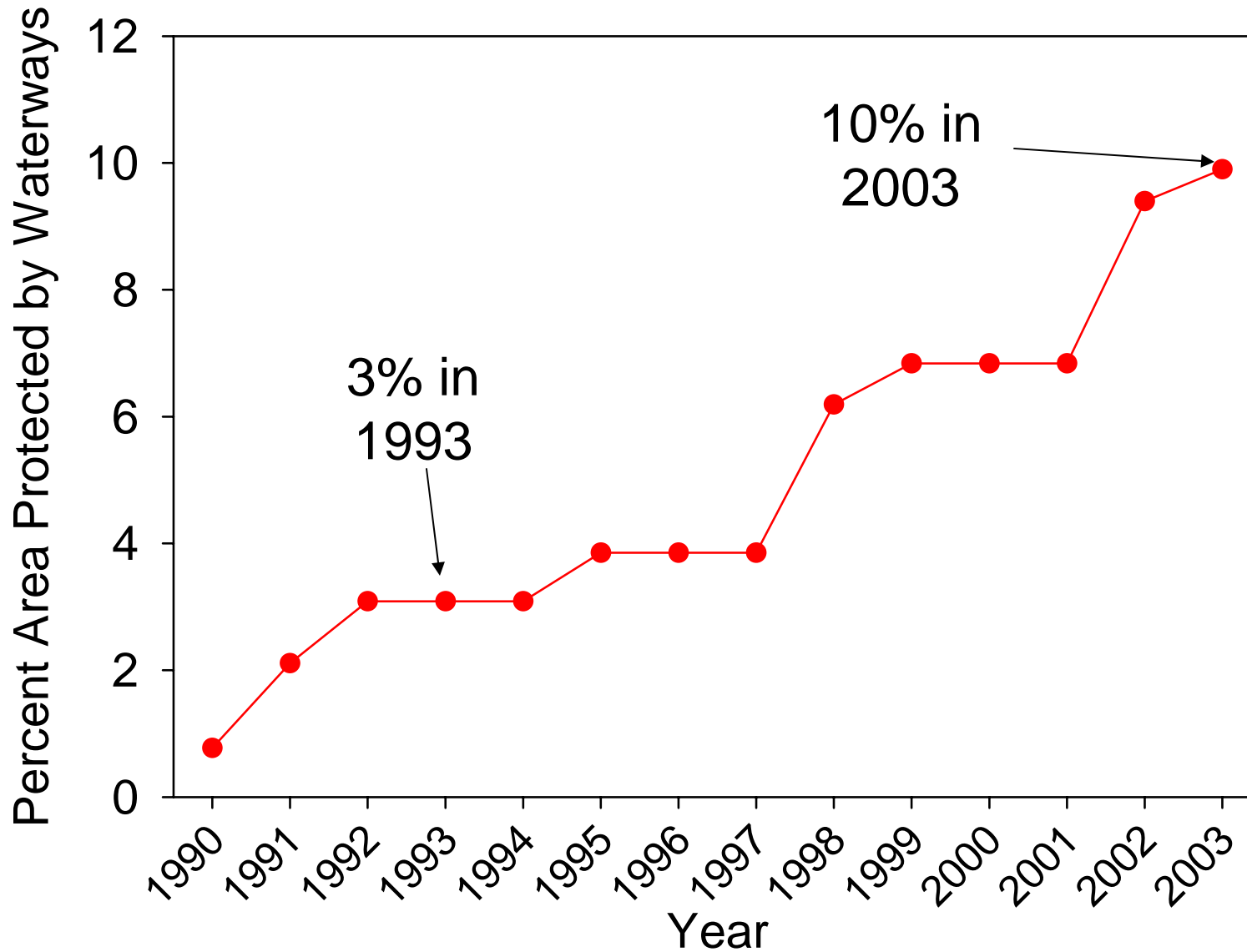


# Weather and Runoff Trends

- **Increases in Temperature**
  - Warmer in April ( $T_{\max}$   $P < 0.001$ ,  $T_{\min}$   $P < 0.001$ )
  - Warmer for all 12 months  
( $T_{\max}$   $P = 0.003$ ,  $T_{\min}$   $P = 0.108$ )
- **Decreases in Precipitation**
  - Drier in April ( $P = 0.117$ )
  - Earlier planting
- **Decrease in Runoff**
  - Less Runoff in April ( $P = 0.134$ )
  - Less Runoff for all 12 months ( $P = 0.132$ )

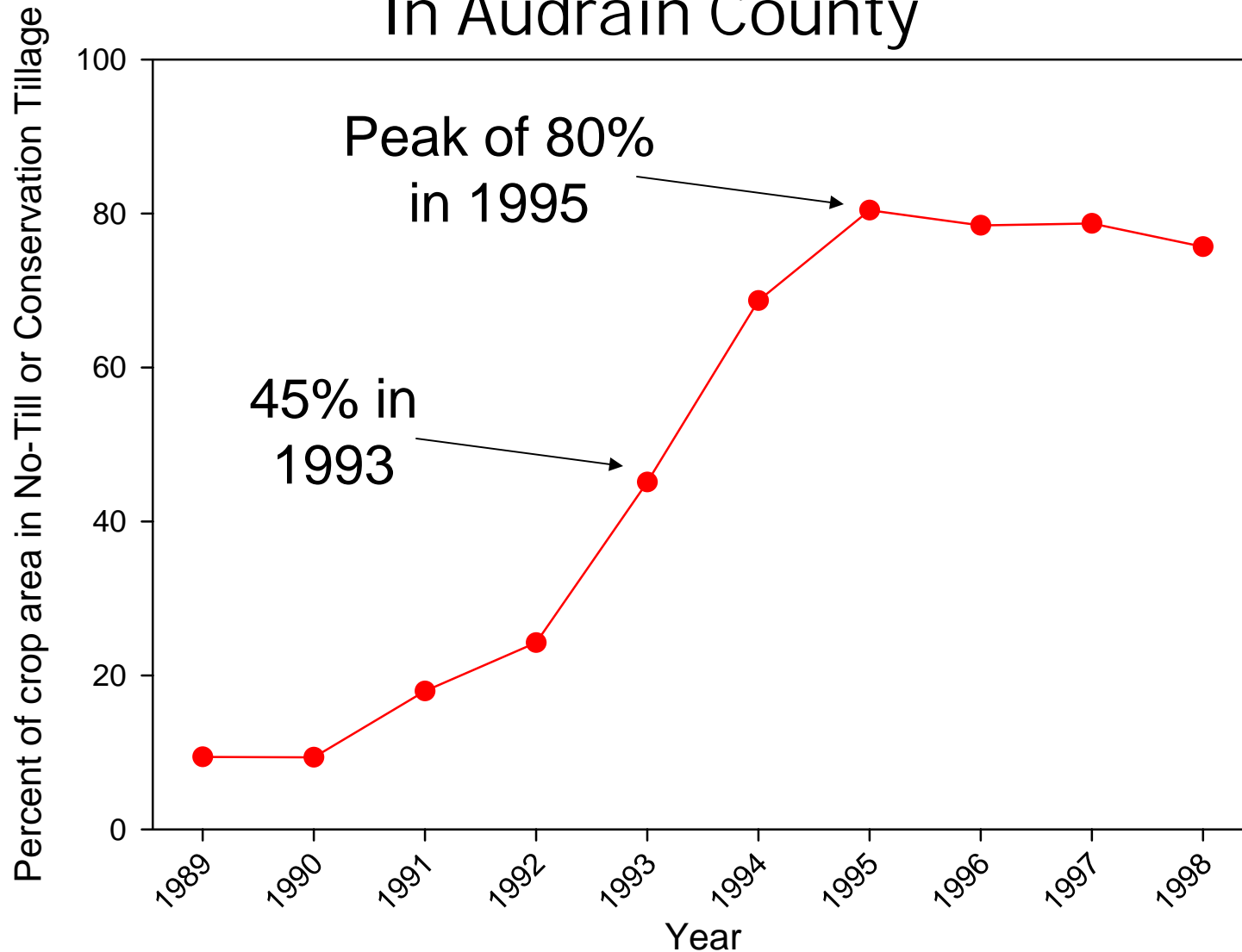
# Grassed Waterways

Percent Area Protected by Waterways



# Conservation Tillage

## Percent Crop Area in No-Till and Conservation Tillage In Audrain County



# Baseline Model

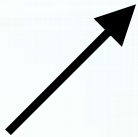

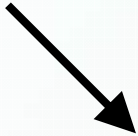
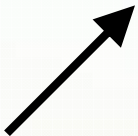






- **Flow calibrated**
- **Specific planting dates for each year**
- **Atrazine management dependent on tillage system**
- **Measured Atrazine half-life: 12 days**
- **Other pesticide parameters left at default**

# Scenarios

- **Grassed Waterways**
  - **5% (360 ha) of Corn acreage protected**
  - **Divided between the 3 tillage systems**
- **Tillage Distribution for Corn**

	<b>1993</b>	<b>1995</b>
<b>No Till</b>	<b>34%</b>	<b>43%</b>
<b>Conservation Tillage</b>	<b>23%</b>	<b>30%</b>
<b>Conventional Tillage</b>	<b>43%</b>	<b>27%</b>

# Results: Atrazine Trends Due to Weather

	<b>Data</b>	<b>SWAT</b>
<b>April</b>	 <b>P=0.016</b>	 <b>P=0.185</b>
<b>May</b>	 <b>P=0.957</b>	 <b>P=0.493</b>
<b>June</b>	 <b>P&lt;0.0001</b>	 <b>P=0.003</b>
<b>April, May &amp; June</b>	 <b>P=0.042</b>	 <b>P=0.150</b>
<b>All Months</b>	 <b>P=0.284</b>	 <b>P=0.265</b>

# Results: Treatment Effects

- **Added grassed waterways decreased the mean and variance compared to Baseline**
- **Tillage systems (1993) were not significantly different from the Baseline**
- **Increased conservation and no till (1995) increased the mean but had no effect on variance**

# Conclusions

- **Atrazine transport and degradation are highly influenced by weather and management.**
- **SWAT can reproduce trends seen in observed data.**
- **SWAT output is sensitive to small amounts of BMPs in the watershed.**

Thank you

