

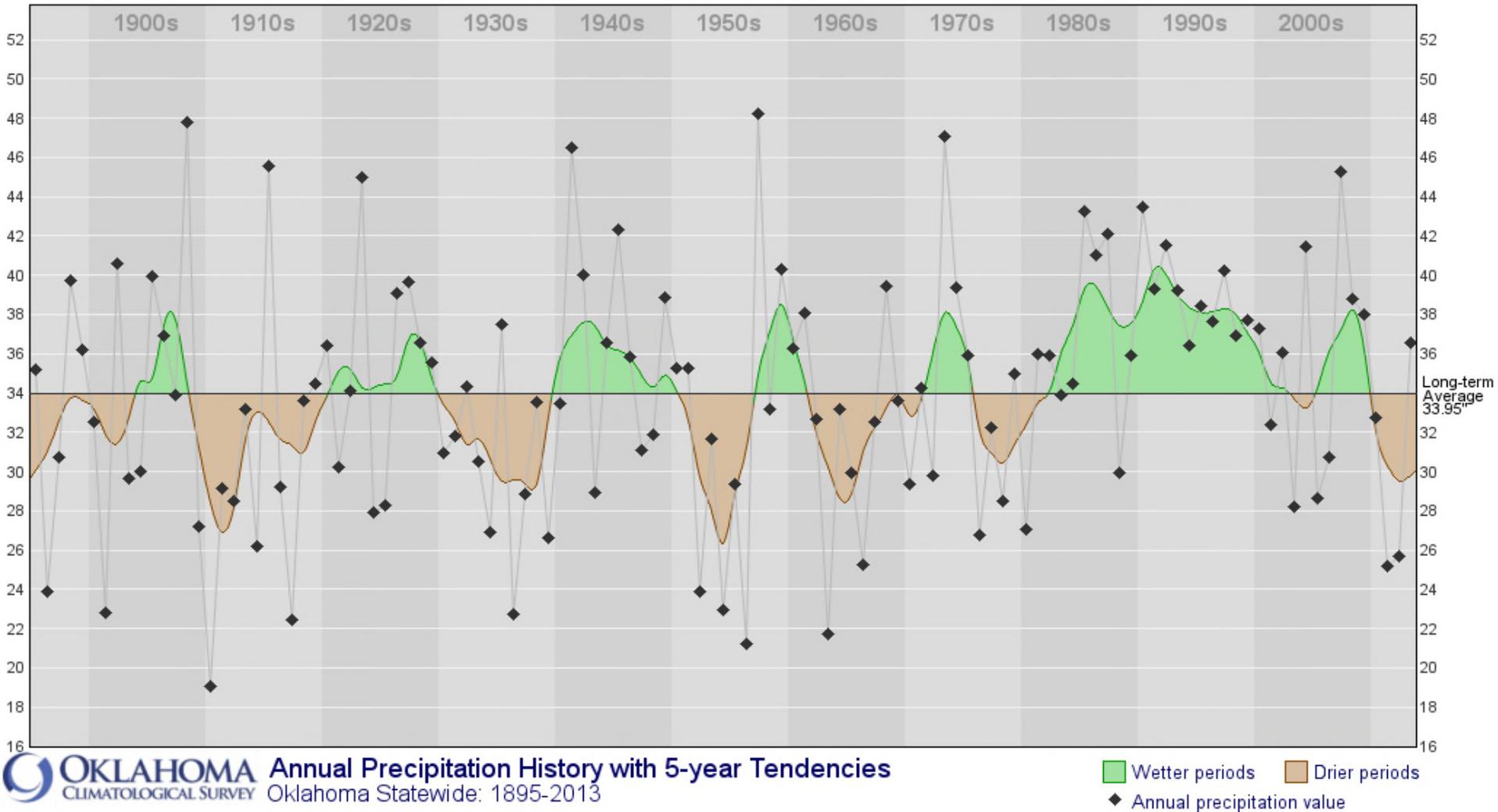
Effect of Drought

National Water Quality Monitoring Conference

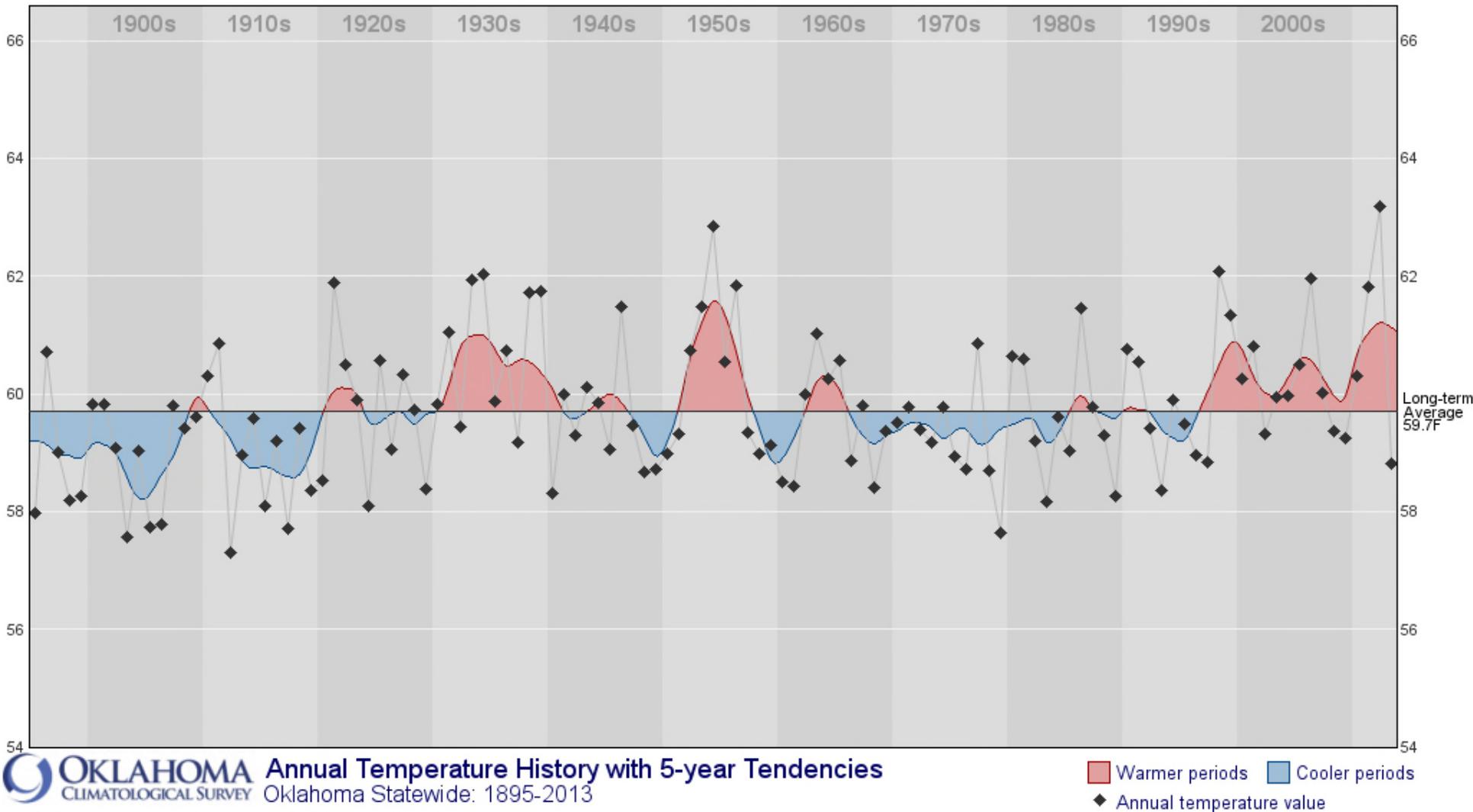
April 30, 2014, Cincinnati, OH

Monty Porter, Technical and Quality Manager
OWRB Water Quality Programs Division

Oklahoma Annual Precipitation with 5-Year Tendencies



Oklahoma Annual Temperature with 5-Year Tendencies



Effects of Drought

- Representative Data (Quality)
- Chemical and Physical Characteristics
- Biological Characteristics
- Sampling Logistics

Representative Data

A landscape photograph of a wide, sandy beach. The foreground is dominated by light-colored sand with some darker, wet patches. In the middle ground, a dense line of green bushes and small trees stretches across the horizon. The sky is filled with large, dark, grey clouds, with a patch of lighter blue sky visible on the right side. The text "Representative Data" is overlaid in the center of the image in a large, bold, black font.

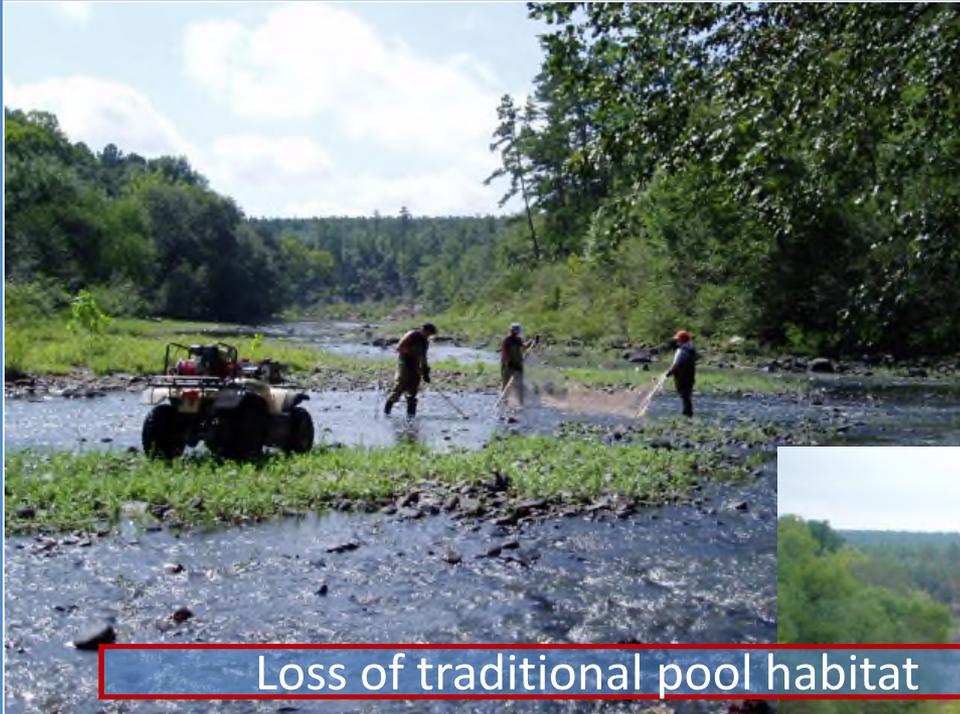
Representative Data??



What is Perennial



Loss of Habitat



- This is a reference site
- Typically Wetted

Loss of traditional pool habitat

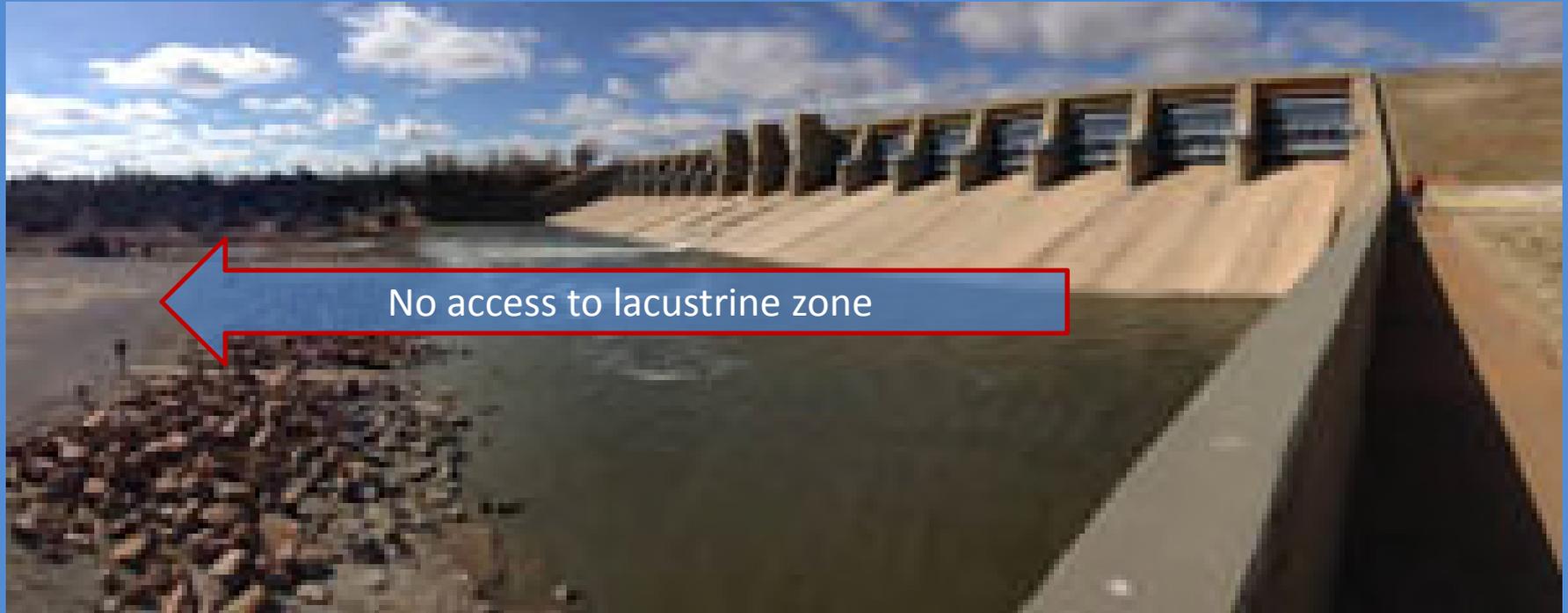


Loss of sampleable streamside habitat

Riffle habitat non-existent



Sample Locations Gone



No access to lacustrine zone

Watershed Disconnected



Deployed Instruments



- Loss of fidelity
- Sensors out of water
- Sedimentation

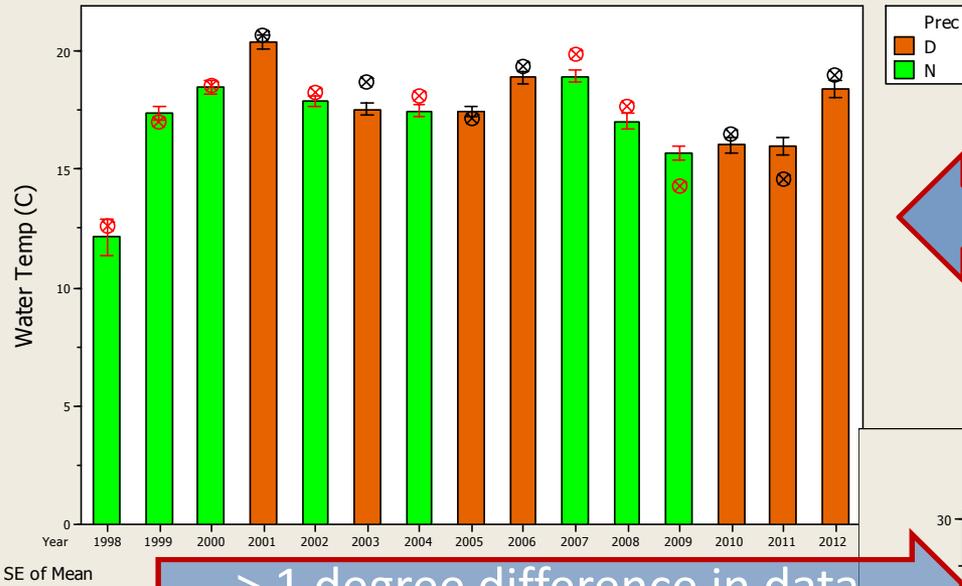


Chemical and Physical Characteristics



Water Temperature

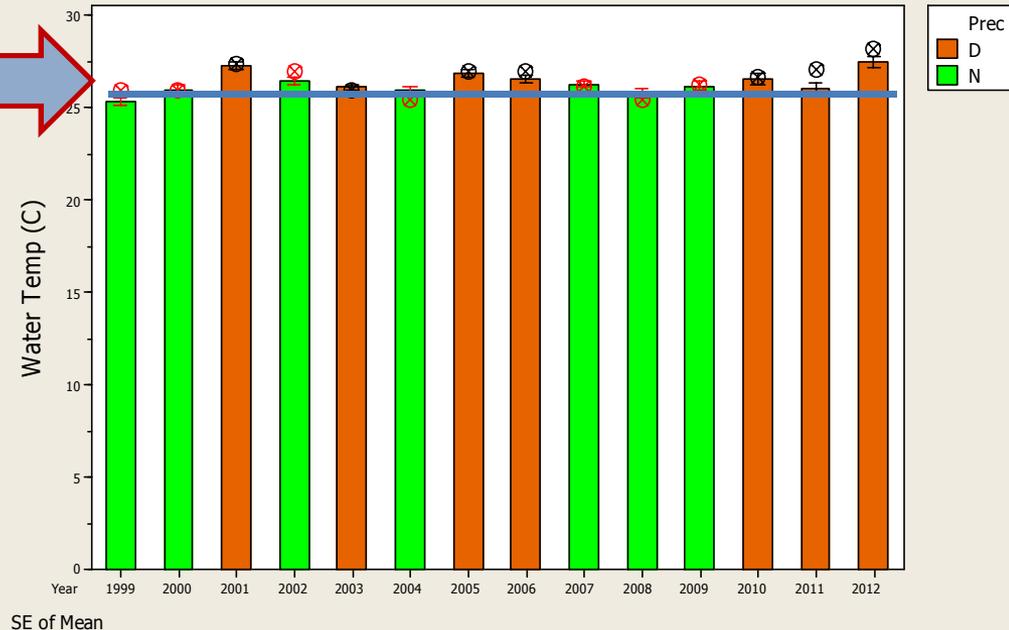
Annual Mean and Median Water Temperature in Oklahoma Streams



Potential signals in 2001 and 2012

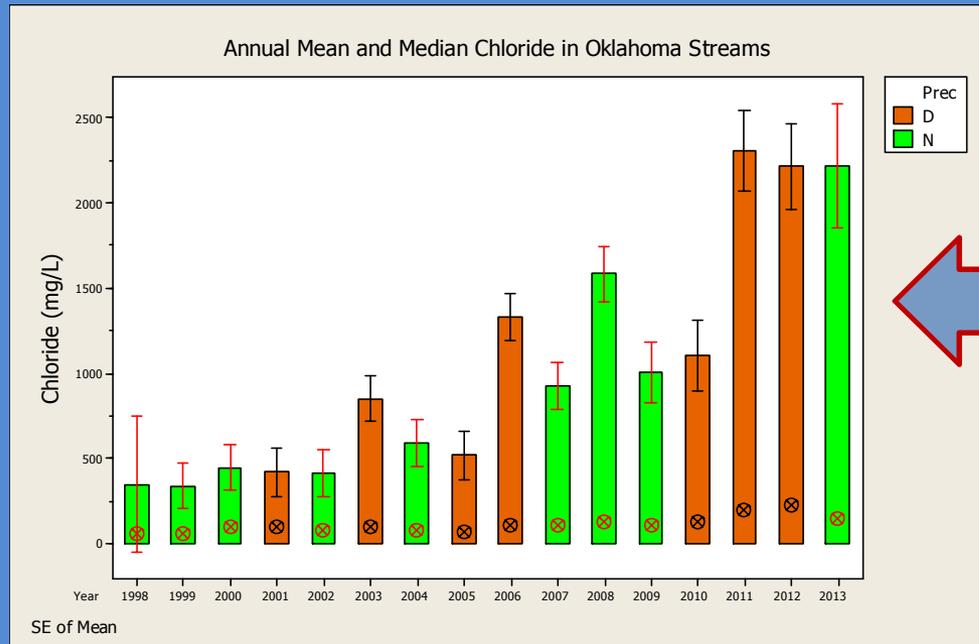
> 1 degree difference in data

Summer Mean and Median Water Temperature in Oklahoma Streams



- Messy signal in annual data
- Summer data shows potential relationship to drought

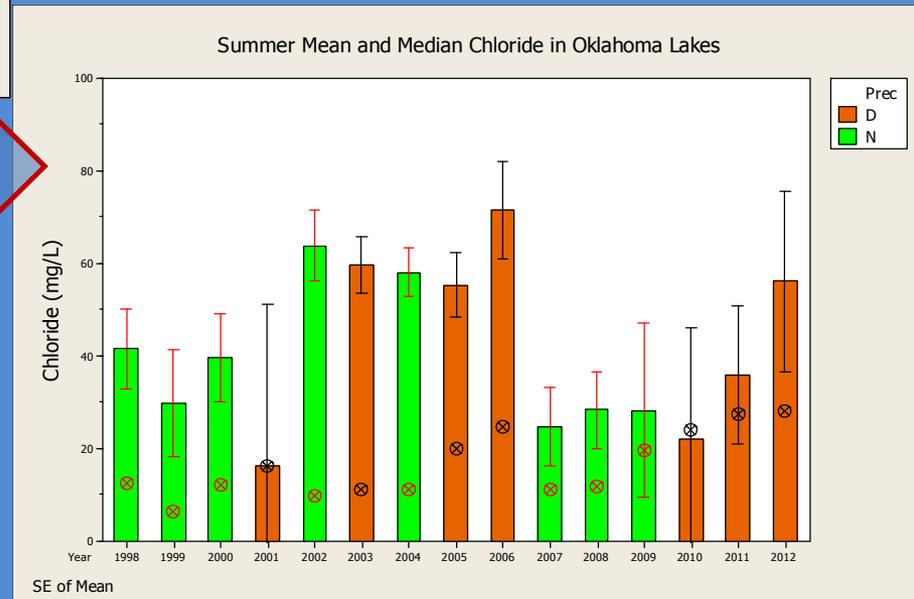
Conductivity



Steady upward trend—drought??

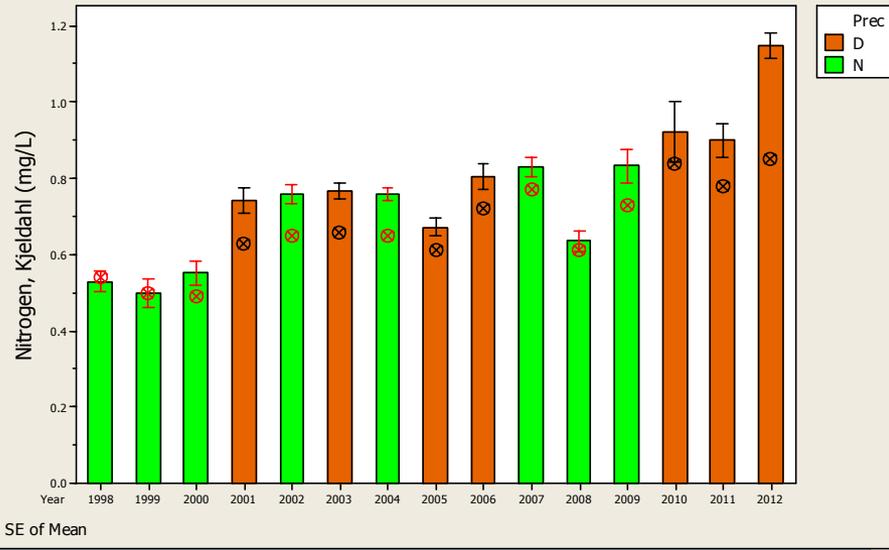
Data variances lag behind signals

- Not as clearly defined as temperature
- Separating from other factors such as water depletion becomes iffy

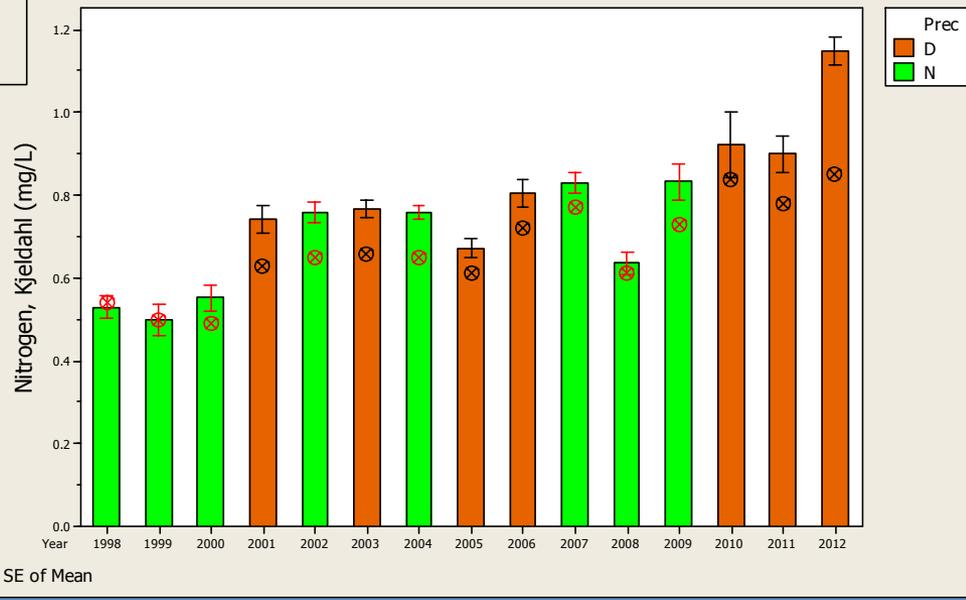


Nitrogen (Lakes)

Summer Mean and Median Nitrogen in Oklahoma Lakes



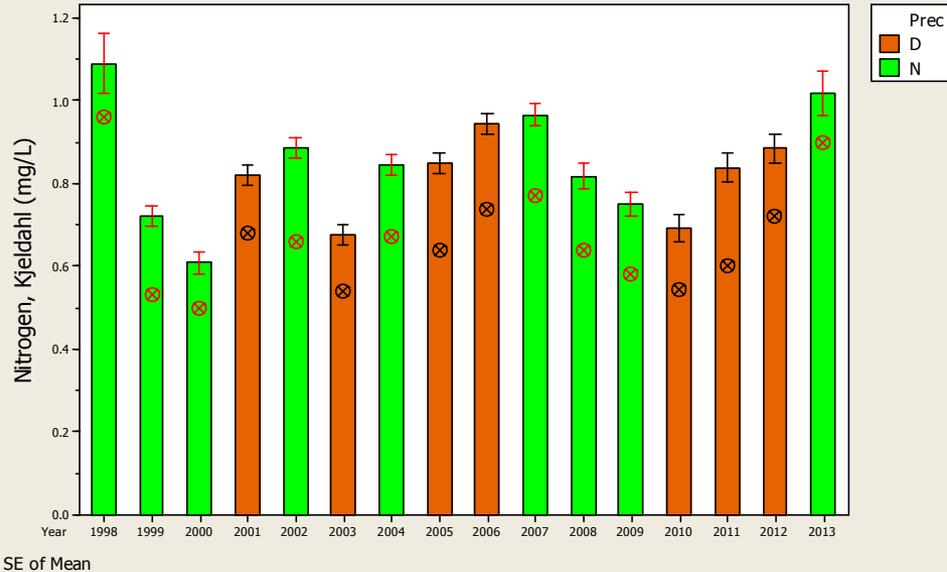
Summer Mean and Median Nitrogen in Oklahoma Lakes



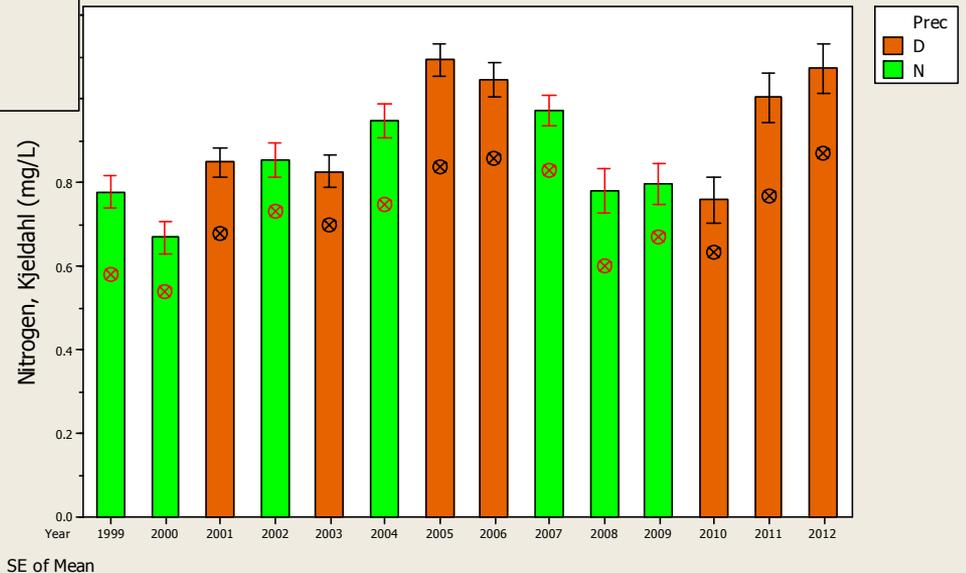
- Notable relationship to drought
- Definite upward trend

Nitrogen (Streams)

Annual Mean and Median Nitrogen in Oklahoma Streams



Summer Mean and Median Nitrogen in Oklahoma Streams



- Annual relationship noisy
- Summer seasonal data demonstrate definite signal

Extent of Perennial Stream Miles in Poor Condition Comparing Large/Small and Sample Periods Stressor Results

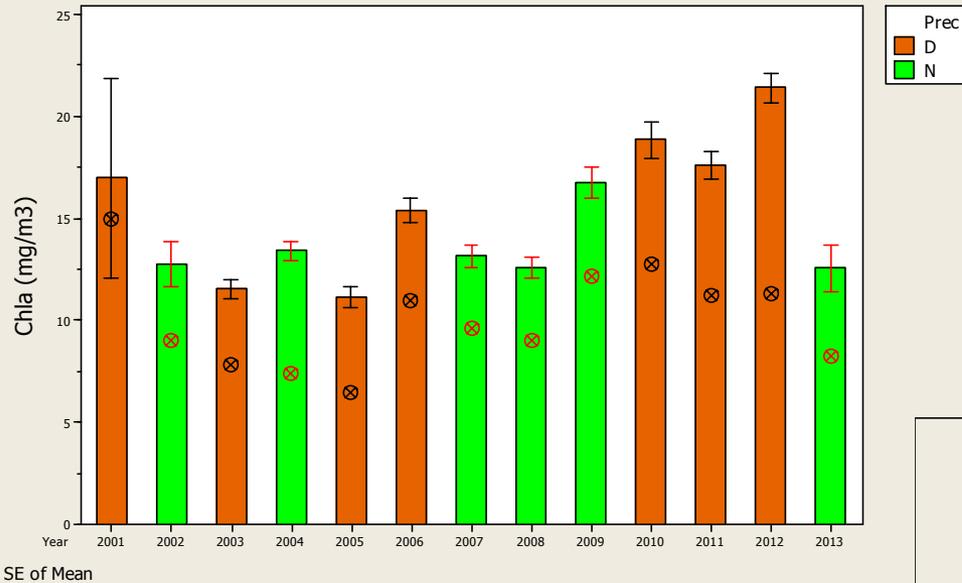
Indicator/Stressor	2008-09 %Poor	2010-11 %Poor	Trend	Large %Poor	Small %Poor	Change
Conductivity_ECO	10.6%	21.4%	↑	38.5%	5.5%	**
Conductivity_NRSA	16.7%	22.7%	↑	55.0%	5.1%	**
TN_ECO	23.4%	37.5%	↑	40.3%	24.1%	**
TN_NRSA	12.2%	22.3%	↑	31.3%	10.1%	**
TP_ECO	40.7%	36.9%	↓	73.8%	26.2%	**
TP_NRSA	31.0%	40.1%	↑	76.4%	18.3%	**
Turbidity_ECO	11.5%	26.6%	↑**	36.9%	9.5%	**
Sediment	15.8%	51.3%	↑**	34.9%	26.2%	NS

Biological Characteristics

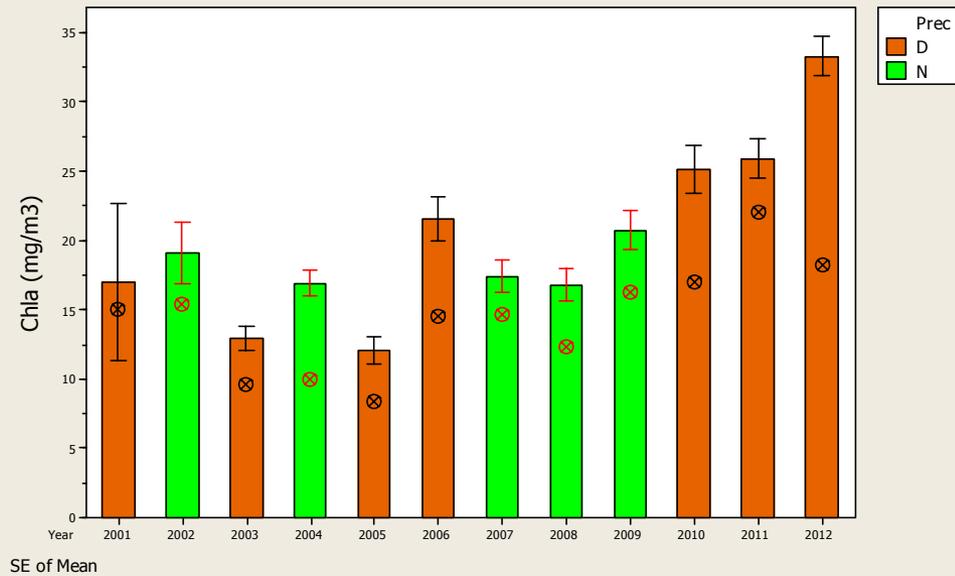


Chlorophyll-a (Lakes)

Annual Mean and Median Chlorophyll-a in Oklahoma Lakes



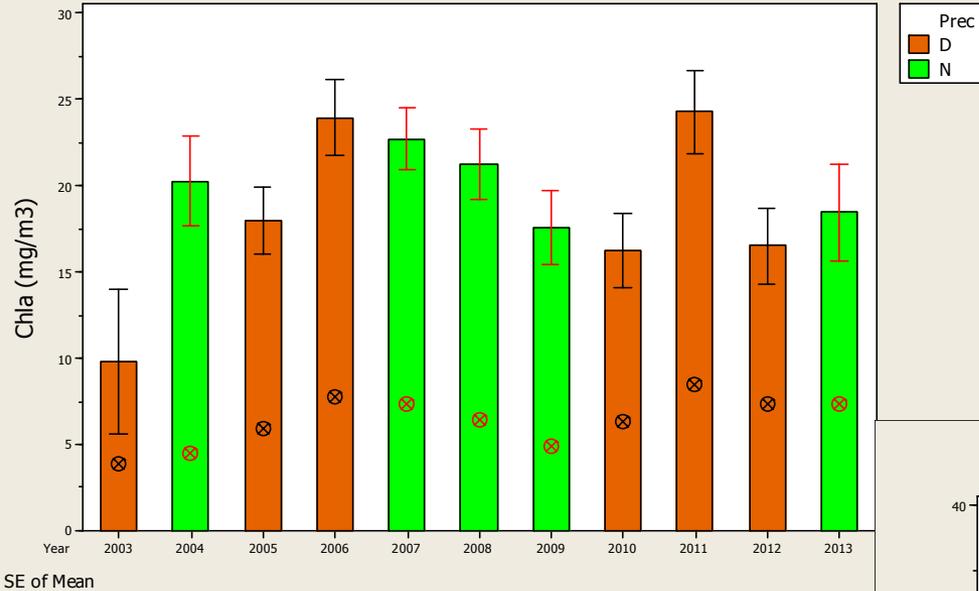
Summer Mean and Median Chlorophyll-a in Oklahoma Lakes



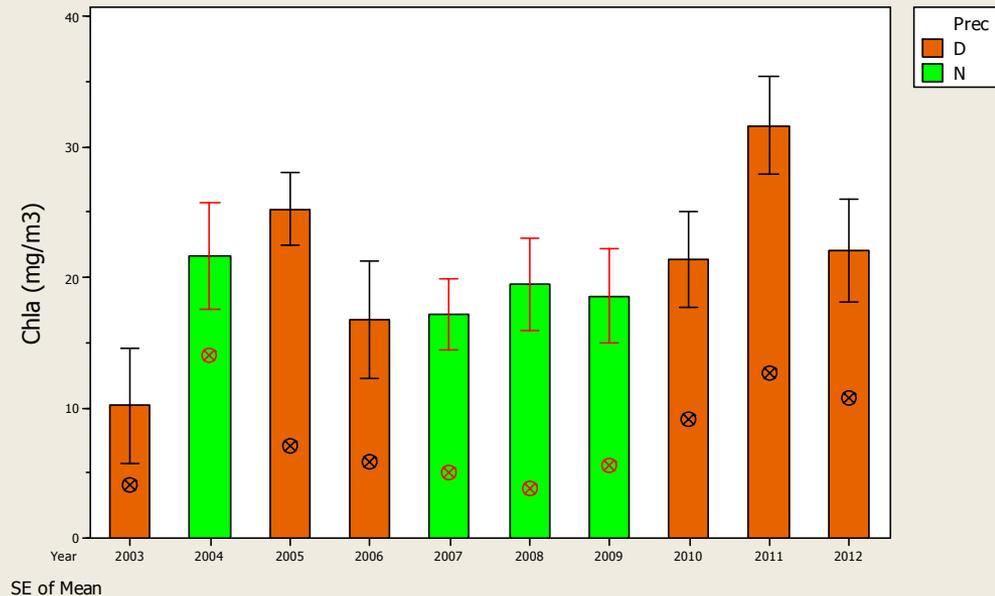
- Very strong signal with lakes annual data
- For summer data, show strong definite drought signal after 2005

Chlorophyll-a (Streams)

Annual Mean and Median Chlorophyll-a in Oklahoma Streams



Summer Mean and Median Chlorophyll-a in Oklahoma Streams

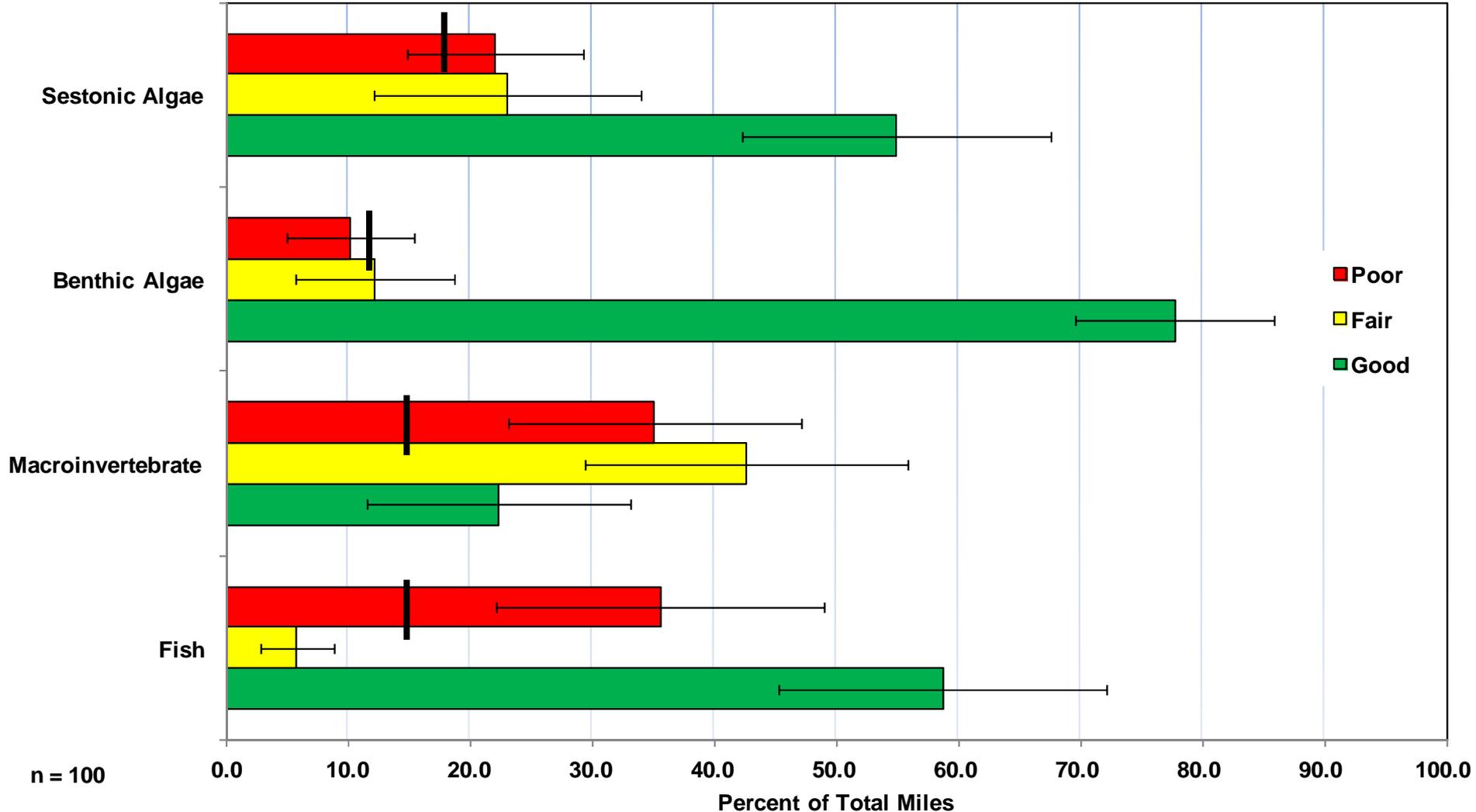


- Weak annual signal
- For summer data, show strong signal after 2008

Condition Extent for All Perennial Stream Miles

(Black line represents 2005-2007 study.)

Statewide Condition Extent for All Perennial Rivers and Streams (2008-2011)
Total Miles Assessed = 21,018



Extent of Perennial Stream Miles in Poor Condition Comparing Large/Small and Sample Periods Bio-indicator Results

Indicator/Stressor	2008-09 %Poor	2010-11 %Poor	Trend	Large %Poor	Small %Poor	Change
Fish	43.9%	21.7%	↓**	50.1%	30.4%	**
Macroinvertebrate	40.6%	25.7%	↓	62.3%	24.7%	**
Benthic Algae	3.7%	21.3%	↑**	21.7%	5.9%	**
Sestonic Algae	18.2%	28.3%	↑	60.6%	6.8%	**



Consumptive vs. Environmental Use





Sampling Logistics

Access



Record Interruption



Policy



Cabela's

Questions?



Discussion Topics

- What is Representative Data
- Motivation for monitoring extreme events
- Planning for worst, hoping for the best
- How do you interpret and use the data
- Program Issues—acute and long term issues