

Water Quality and Urban Stormwater Pollution Basics

Green Country Stormwater Alliance

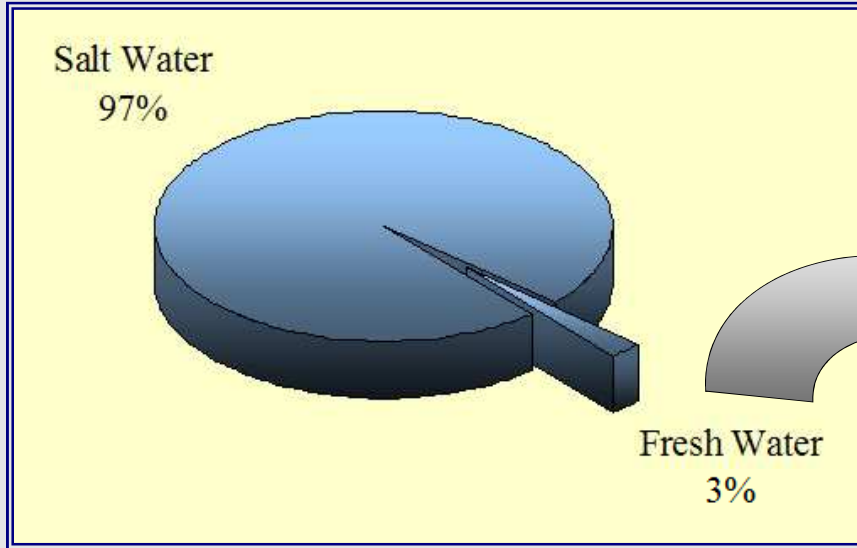
Employee Training Workshop

September 10, 2013

Tulsa Technology Center, Broken Arrow

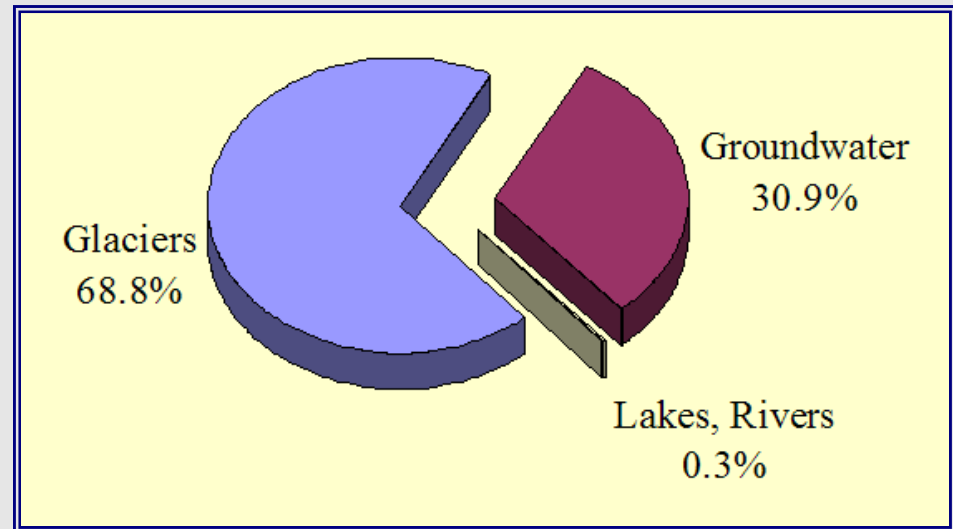


How much water do we have ?



Of all the water on the planet, only 3% is fresh water.

Of this 3%, only 0.3% is found in lakes and rivers.



Ohio's Cuyahoga River on Fire



1968 “Poster Child”
of the fledgling
environmental
movement.

Final recognition
that rampant
pollution must stop.

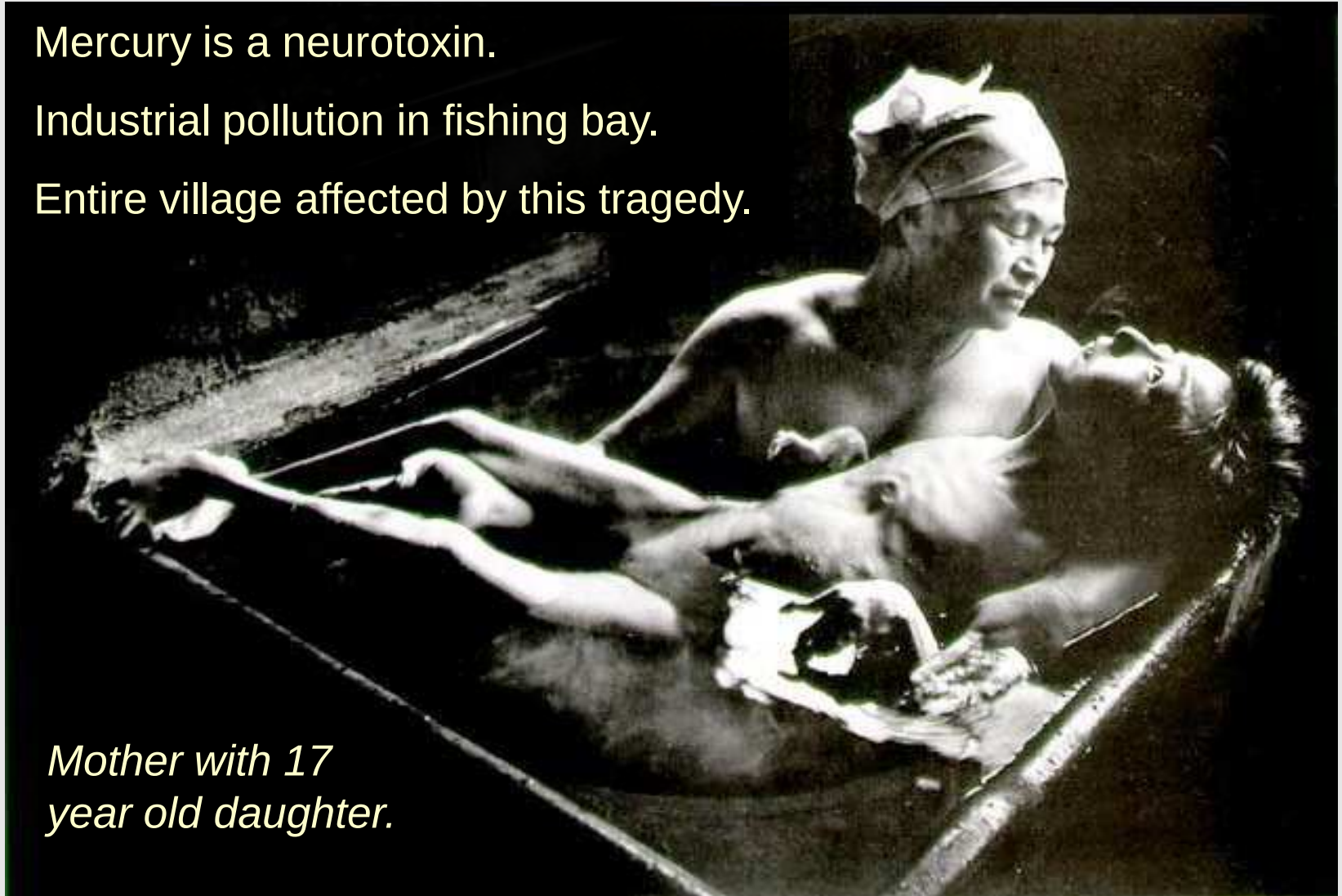
Led to the 1970-72
“Clean Water Act”

Water Pollution Tragedy – Methylmercury Effects Minamata Bay, Japan - ca 1968

Mercury is a neurotoxin.

Industrial pollution in fishing bay.

Entire village affected by this tragedy.



*Mother with 17
year old daughter.*

Oklahoma Historical Superfund Sites



Low pH.

Heavy metal toxicity.

Extremely costly and difficult to solve.

Oklahoma's Oil Boom Legacy

Many oil and gas production sites are now abandoned.

- *Petroleum*
- *Salts*
- *Heavy Metals*
- *Contaminated soils and water*

OERB has aggressive cleanup program in Oklahoma.



“Hypoxia” in the Gulf of Mexico



A Nation-Wide Concern

Over-fertilization of
streams and rivers

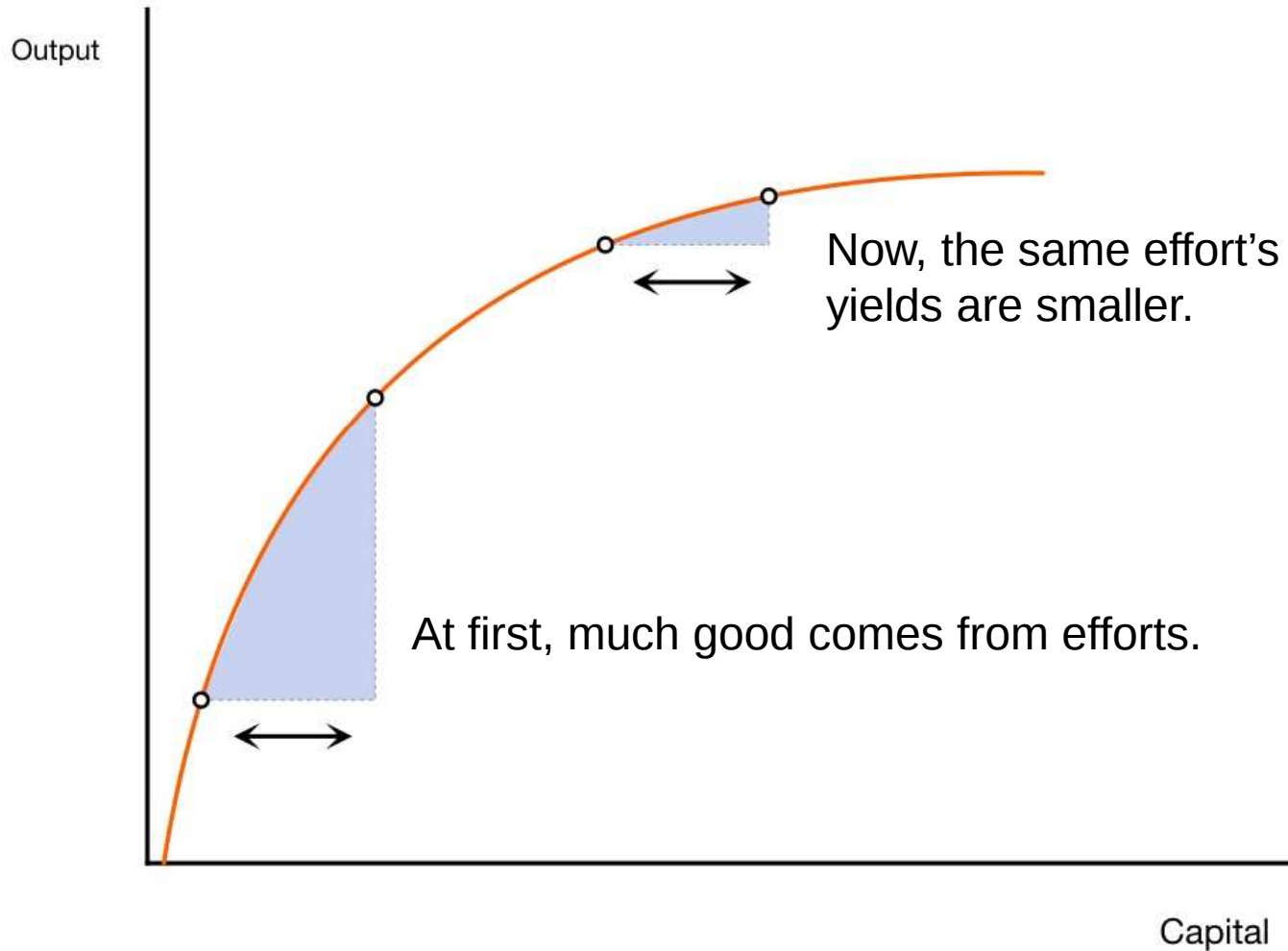
Nitrogen and Phosphorus

Point Sources and
Nonpoint Sources

Should we in Oklahoma
share responsibility?



Law of Diminishing Returns



Water Quality Standards

Why You Are Here

Water Quality Standards



- 1972 – Federal Water Pollution Control Act (“Clean Water Act”)
- Oklahoma Water Resources Board sets WQS for Oklahoma
- Three Components:
 - *Assignment of Beneficial Uses*
 - *Narrative and numerical criteria to protect BUs*
 - *Antidegradation Policy*



Oklahoma WQS Beneficial Uses

- Public and Private Water Supply
- Emergency Water Supply
- Fish and Wildlife Propagation
 - *Habitat Limited Aquatic Community*
 - *Warm Water Aquatic Community*
 - *Cool Water Aquatic Community*
 - *Trout Fishery (put and take)*
- Recreation (*Primary and Secondary Body Contact*)
- Agriculture
- Aesthetics
- Navigation
- Human Consumption (water and fish)
- Culturally Significant



BU combinations are designated for every waterbody in the State.

Biocriteria WQS ~new

- Address Biota of Streams:
 - *Macroinvertebrates*
 - *Fish*
- Reference streams set the standard
- Set by Ecoregions
- “Metrics” – statistics that evaluate biological community health
- Biocriteria are used to determine “impairment” (303d List)



Nutrients – Uncertain Adoption

Types:

Nitrogen and phosphorus are of primary concern.

Each is found in many forms (NO_3 , NH_3 , ORN, PO_4 , cells, etc.).

Sources:

Rural and urban animal wastes.

Sewage (treated and bypasses).

Rural and urban fertilizers.

Naturally occurring in soils and water.



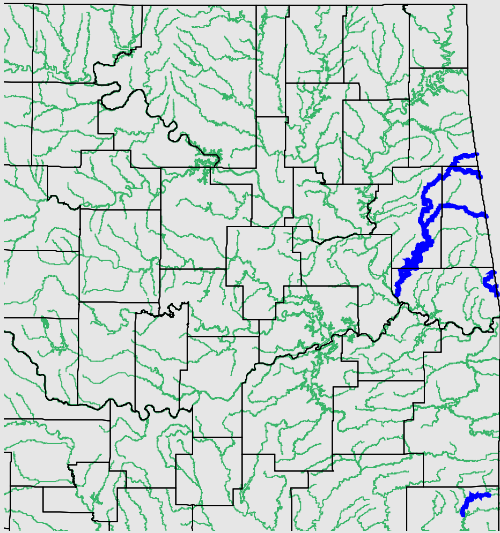
Impacts:

Most forms of N and P are not toxic to fish or animals, but...

Nuisance algae – low oxygen, aesthetics, taste and odor in drinking water, fish kills, toxic algal blooms.

Nutrient Criteria for Oklahoma Scenic Rivers

The first nutrient numerical criteria in Oklahoma



- Six rivers designated “Scenic” by the Oklahoma legislature, not a federal designation.
- Illinois River is most noteworthy.
- Oklahoma claims excess loads of phosphorus from Arkansas agriculture (mostly poultry).
- OWRB adopted numerical standard for TP of 0.037 mg/L for all Oklahoma Scenic Rivers.

Urban Pollution

Point Source vs. Nonpoint Source



Point Sources

Treated wastewater - has NPDES discharge permits with penalty provisions and enforcement.

Technology-driven pollution reduction.



Nonpoint Sources

Untreated runoff - has no * discharge permits and no penalty provisions.

Voluntary pollution reduction.

* Exceptions: urban stormwater, CAFOs.

Pollutants in Urban Stormwater

- Sediment
- Nutrients
- Oxygen-Demanding Substances
- Pathogens
- Trash
- Road Salts
- Oil and Grease
- Heavy Metals
- Heat
- Petroleum
- Pesticides
- Other organics



Pollutants from Local Businesses



*What most people think
are the greatest sources
of pollution.*



*Industrial and
Commercial Sites*



Large and Small businesses

Pollutants from Homes

Paints and solvents



Fertilizers and pesticides



*Pet waste
(pathogens)*



Oils and antifreeze



*Yard waste: grass
clippings, leaves*



*Swimming pool drain
water with chlorine*



Toxics
Nutrients
Sediment
pH
Oils
Bacteria
Trash

Construction Site Runoff



From Site...



To Stormdrain...



To Local Creek

*Sediment Clogs Stormdrains;
Harms Stream Habitat*

Urban / Suburban Bacteria Sources

Controllable



Partly Controllable



Uncontrollables



Impaired Waterbodies and TMDLs

303(d) Impairment

A stream or lake can be listed for any combination of parameters:

Dissolved oxygen, nutrients

Toxics (metals, organics, pesticides, “unknown”)

Sediment, suspended solids, turbidity

Pathogens (bacteria)

Biological (fish, macroinvertebrates)

pH

Oil & grease

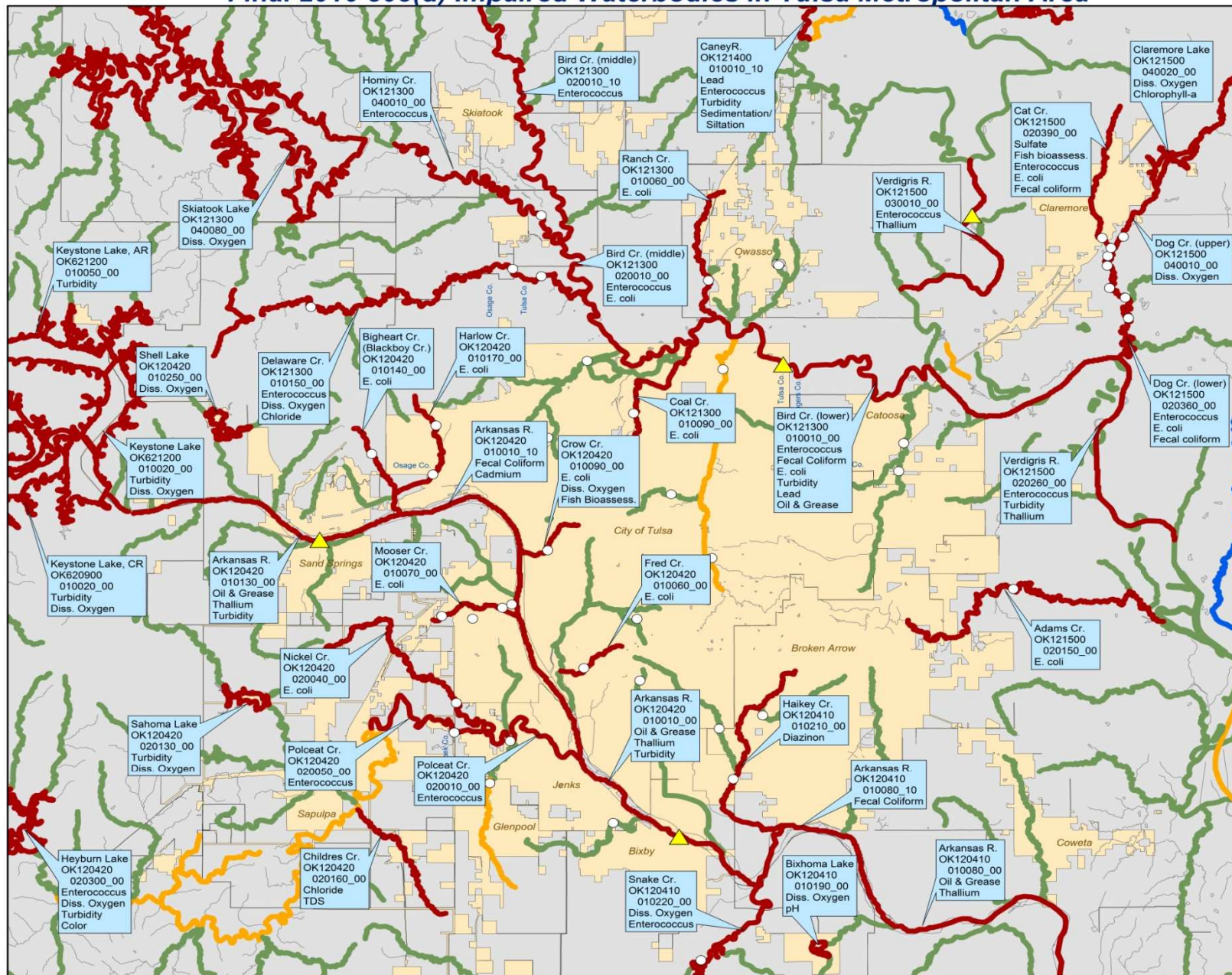
Chloride, sulfate, TDS



303(d) = Category 5 ~”TMDL List”

- Bi-annual “Oklahoma Integrated Water Quality Assessment Report” (2010 and 2012)
- Listed segments require a TMDL.
- Many segments have changed between 2010 and 2012.
- Latest changes reflect new trends in water quality concerns:
 - *away from D.O. and “metals”*
 - *now bacteria, dissolved solids and biological.*

Final 2010 303(d) Impaired Waterbodies in Tulsa Metropolitan Area



CATEGORIES FROM Final 2010 ODEQ INTEGRATED REPORT

Category 2 = Some beneficial uses attained, insufficient data for remaining uses.

Category 3 = Insufficient data to determine any beneficial use.

Category 4a = TMDL has been completed.

Category 5a = Impaired, TMDL is underway or will be scheduled.

Category 5b = Water quality standards review is required before TMDL will be scheduled.

Category 5c = More data will be collected before a TMDL or standards review is scheduled.



What is a TMDL ?

“Total Maximum Daily Load”

Calculates the maximum allowable pollutant loading for a waterbody.

All point source loads (**WLAs**) + all nonpoint source loads (**LAs**) + a margin of safety (**MOS**).

Special WLA just for stormwater permittees: “**WLA_MS4**”

$$\text{TMDL} = \Sigma \text{WLA} + \Sigma \text{LA} + \text{Background} + \text{MOS}$$

TMDL Appendix F for Stormwater

“Compliance with the following provisions will constitute compliance with the requirements of this TMDL”.

- 1. Develop A Bacteria Reduction Plan*
- 2. Develop Or Participate In A Bacteria Monitoring Program*
- 3. Annual Reporting*

Some TMDLs do not have Stormwater Permit requirements (e.g., Turbidity TMDLs)

Existing Water Quality Data

Trend Monitoring in Oklahoma

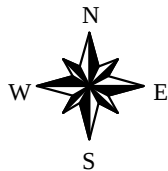
- Beneficial Use Monitoring Program (BUMP)
 - *Oklahoma Water Resources Board*
- Rotating Basin Monitoring Program (“RBMP”)
 - *Oklahoma Conservation Commission*
- Biotrend & Toxics in Fish Monitoring Programs
 - *Oklahoma Department of Environmental Quality*
- USGS Stream Monitoring Program
 - *U.S. Geological Survey*

Self-Monitoring by Permittees

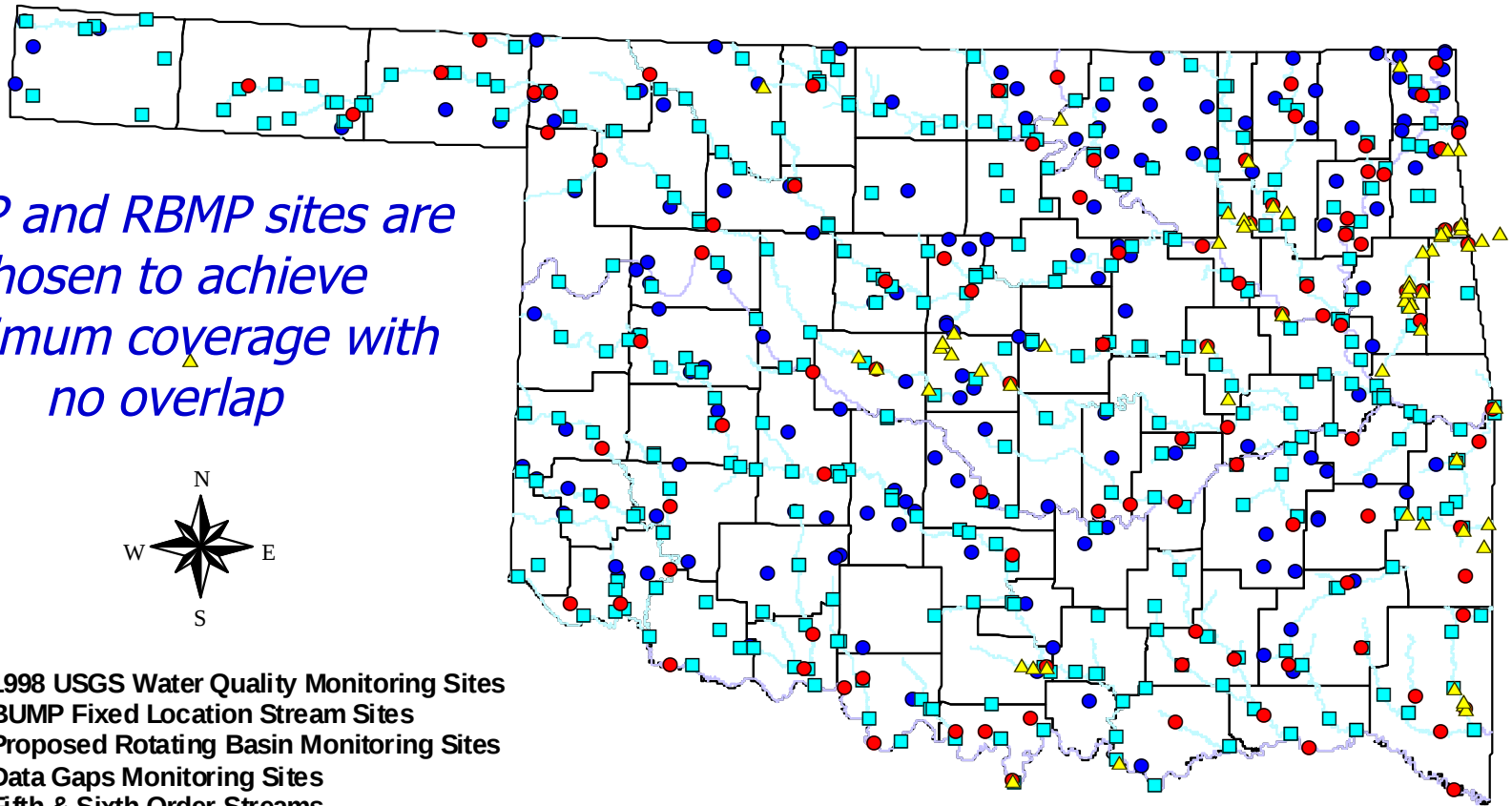
- OPDES and NPDES discharge permittees must perform monthly self-monitoring.
- Parameters relate to their permits.
- High quality of data is required.
- Inspected by ODEQ and EPA.
- Violations can lead to penalties.

Achieving Statewide Coverage Through Coordination

*BUMP and RBMP sites are
chosen to achieve
maximum coverage with
no overlap*



- ▲ 1998 USGS Water Quality Monitoring Sites
- BUMP Fixed Location Stream Sites
- Proposed Rotating Basin Monitoring Sites
- Data Gaps Monitoring Sites
- Fifth & Sixth Order Streams
- Seventh through Ninth Order Streams



Thank you – any questions ?

