Water Quality

Implementation of Water Quality Standards

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http://waterquality.okstate.edu

Overview

- Pollutants of concern
- Sources of Pollution
  - Point Source
  - Nonpoint Source
- The Picture of Oklahoma
- Agency jurisdictions – OWRB, ODEQ, OCC, CorpCom, ODAFF, ODWC, ODM, others
- How do we deal with pollutants?
  - NPDES, CAFOs, and Stormwater
  - Nonpoint Source Voluntary Programs
  - TMDLs

Background

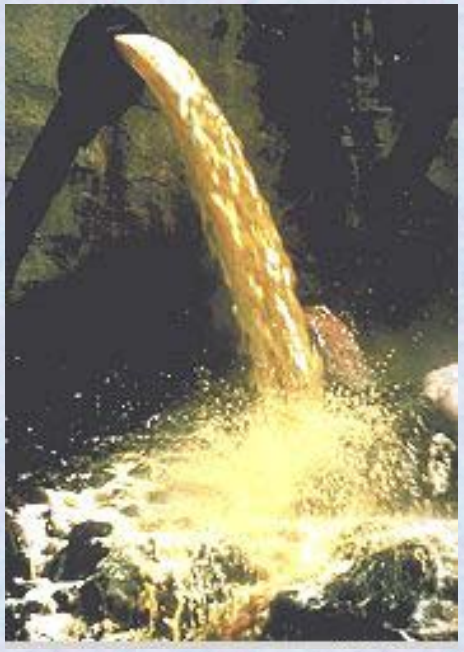
- **The Objective of the Federal Clean Water Act (since 1972)**
  - "…to restore the chemical, physical, and biological integrity of our Nation's waters."
- **Pollution is**
  - Degradation of the chemical, physical, or biological integrity of water (*due to man's activities*)

Point Sources and Nonpoint Sources

- **Point Sources –** any discharge from a manmade conveyance (a pipe or channel).
  - Sewage Treatment plant
  - Industrial outfall
- **Nonpoint Source –** any source that does not pass through a manmade conveyance.
  - Cropland runoff
  - Runoff from lawns and gardens

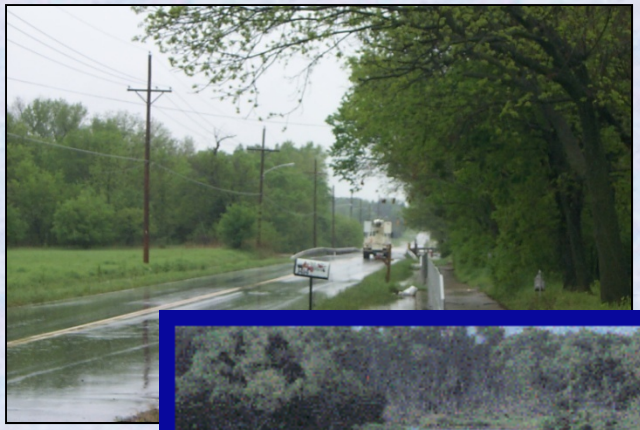
Sources of Pollution defined in the Clean Water Act:

- **Point source - discharge from a pipe or man-made conveyance.**
- **Nonpoint source – everything else.**



Defined in 1972 Clean Water Act

Nonpoint sources: cropland, lawns, highways, parking lots…

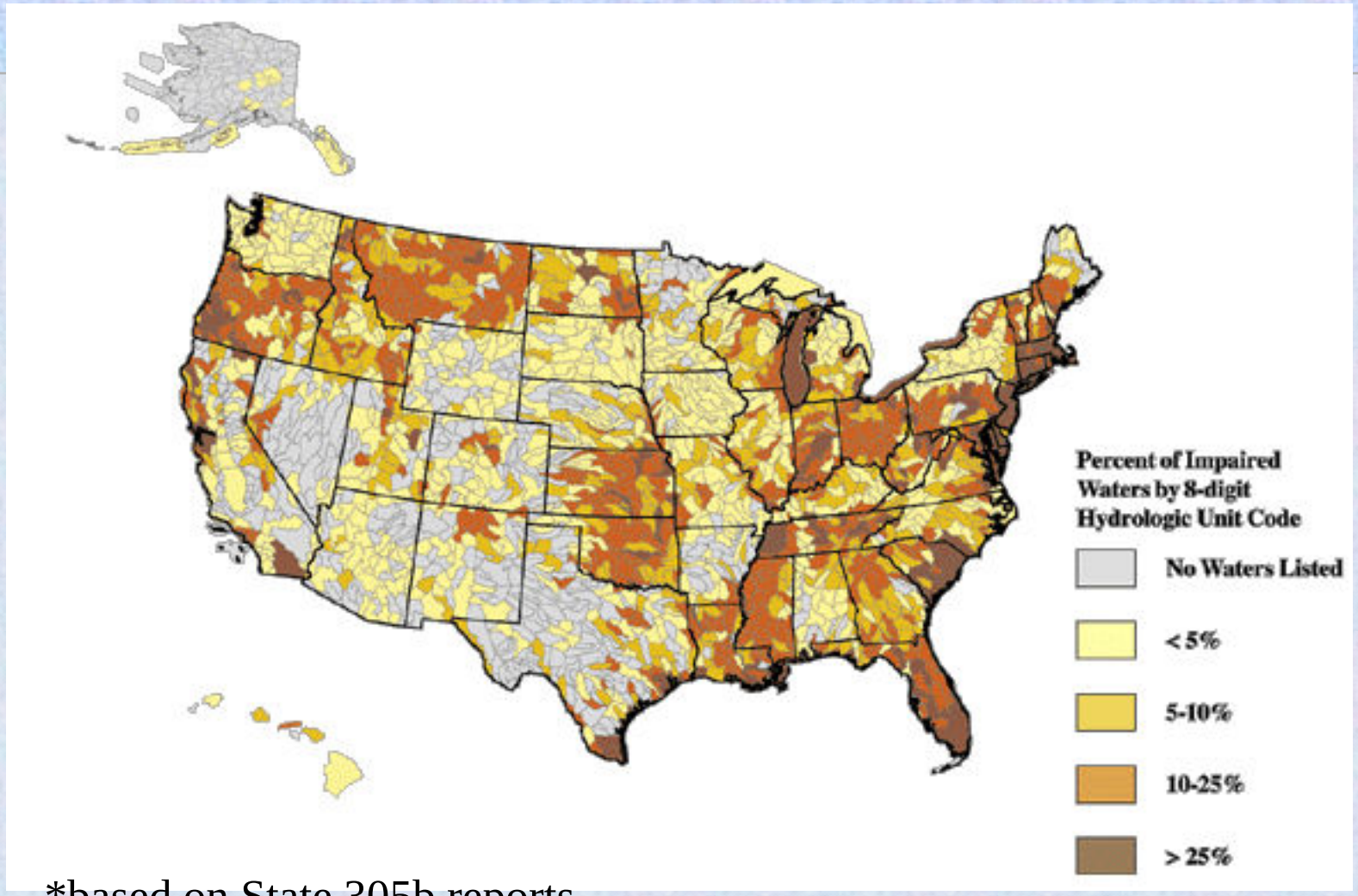


Diffuse sources, not easily traced

Stormwater is point source

Nonpoint source becomes point source when it enters a pipe or man-made conveyance

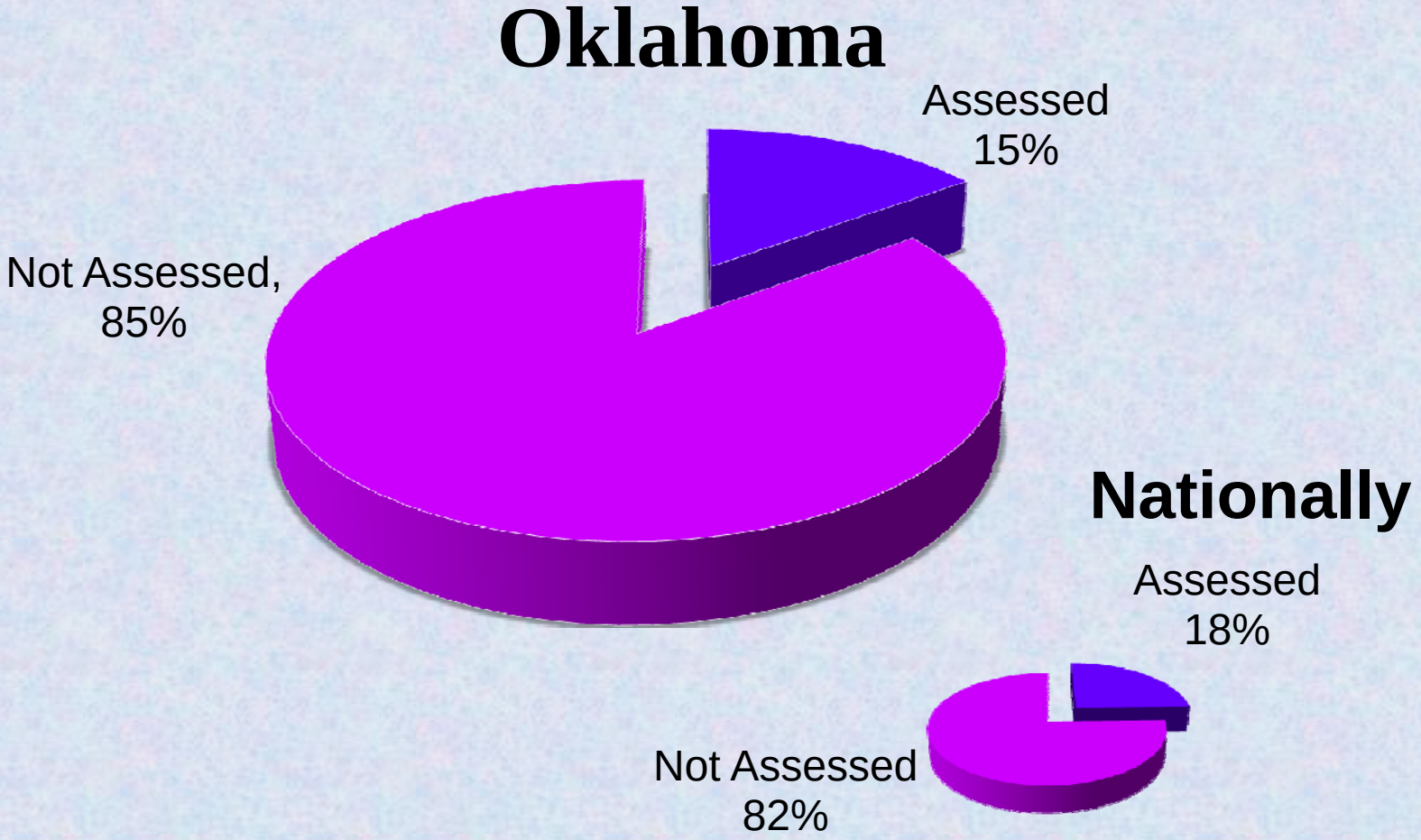
What does Oklahoma's Water Quality Look Like?



*based on State 305b reports

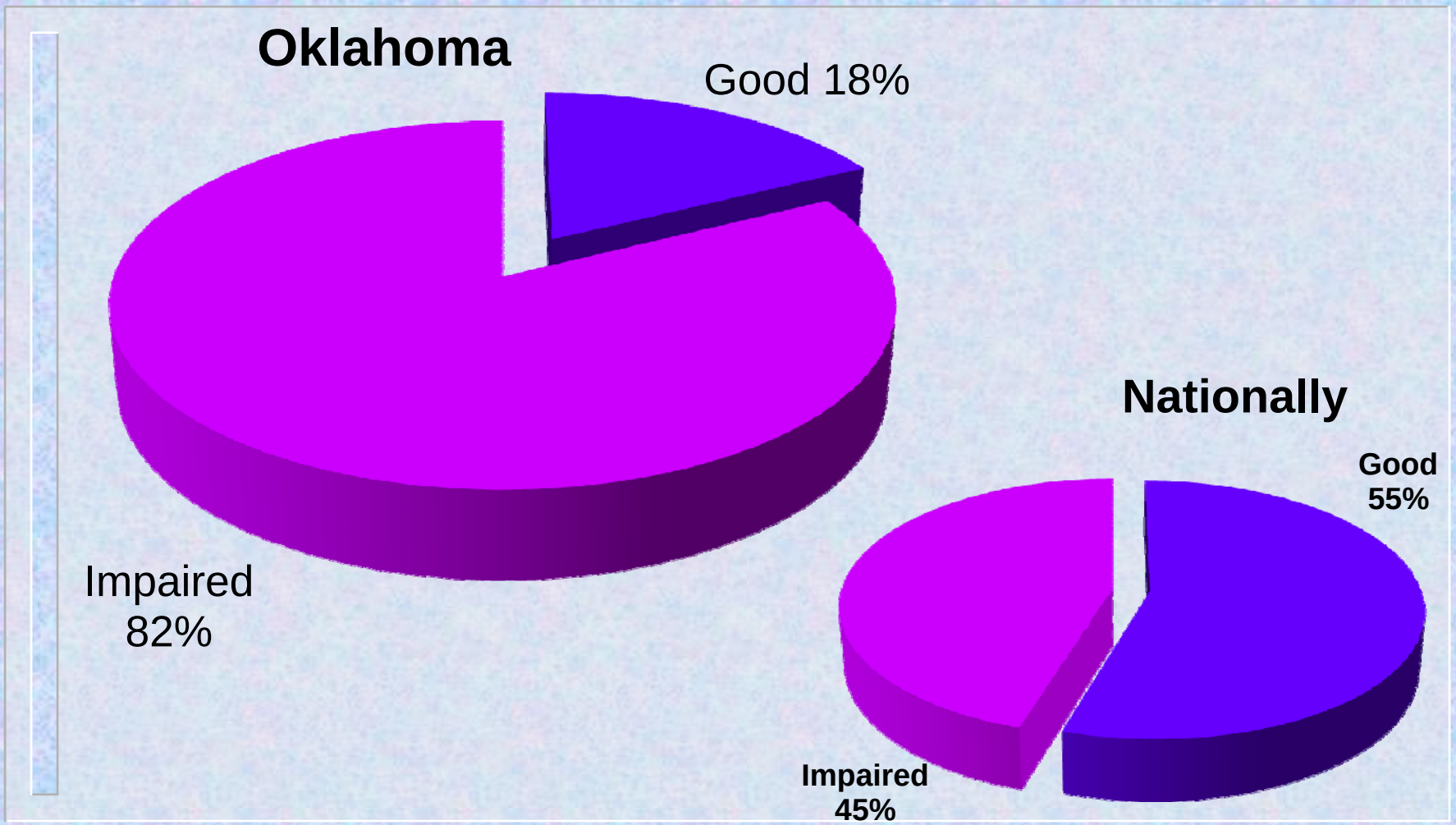
Stream Miles Assessed

(from 305b reports)



Source: http://iaspub.epa.gov/waters10/attains_index.control?p_area=OK

Status of Assessed Rivers and Streams



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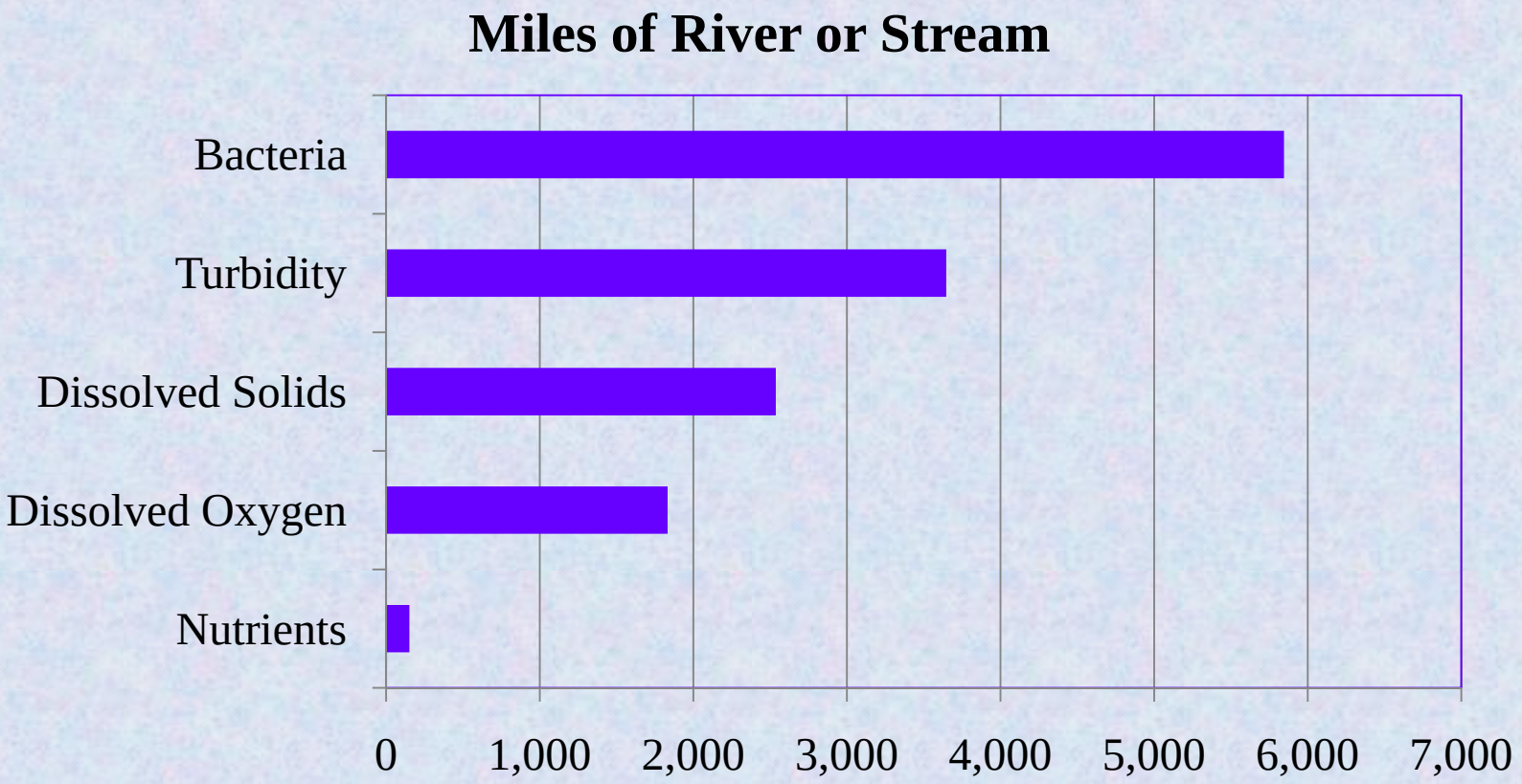
Causes of River and Stream Impairment in Oklahoma



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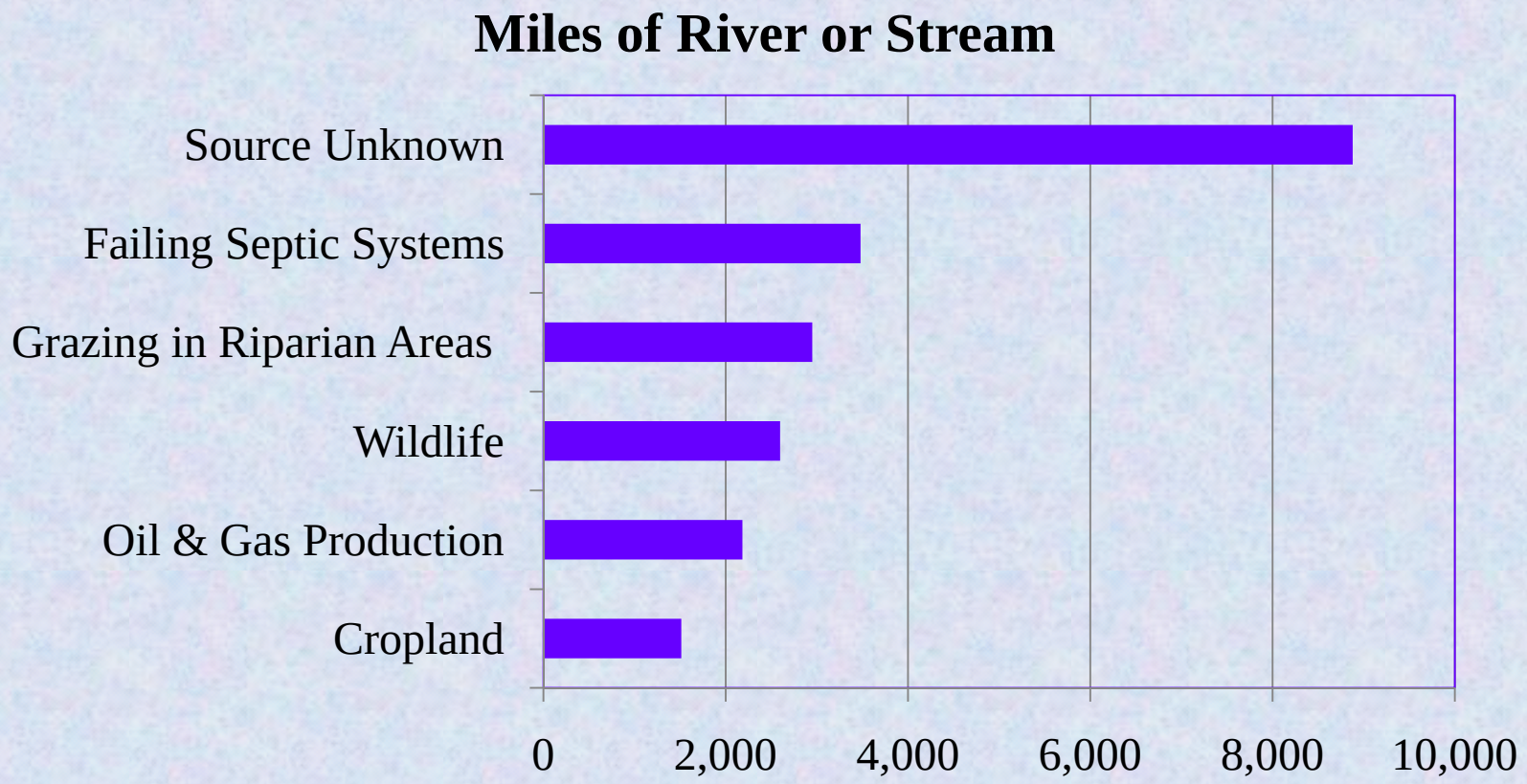
Probable Sources of Impairment Rivers and Streams in Oklahoma



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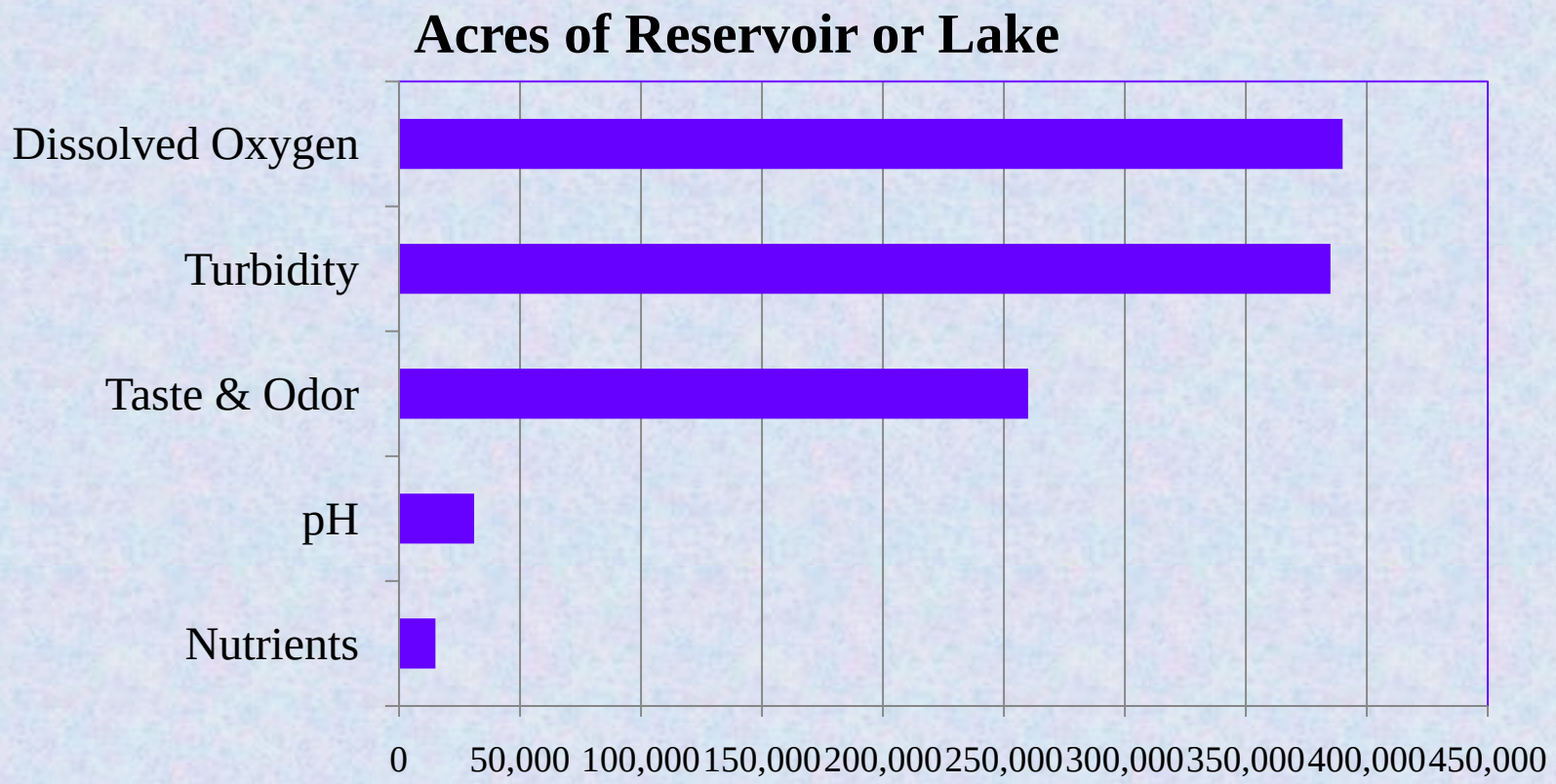
Causes of Impairment in Reservoirs and Lakes in Oklahoma



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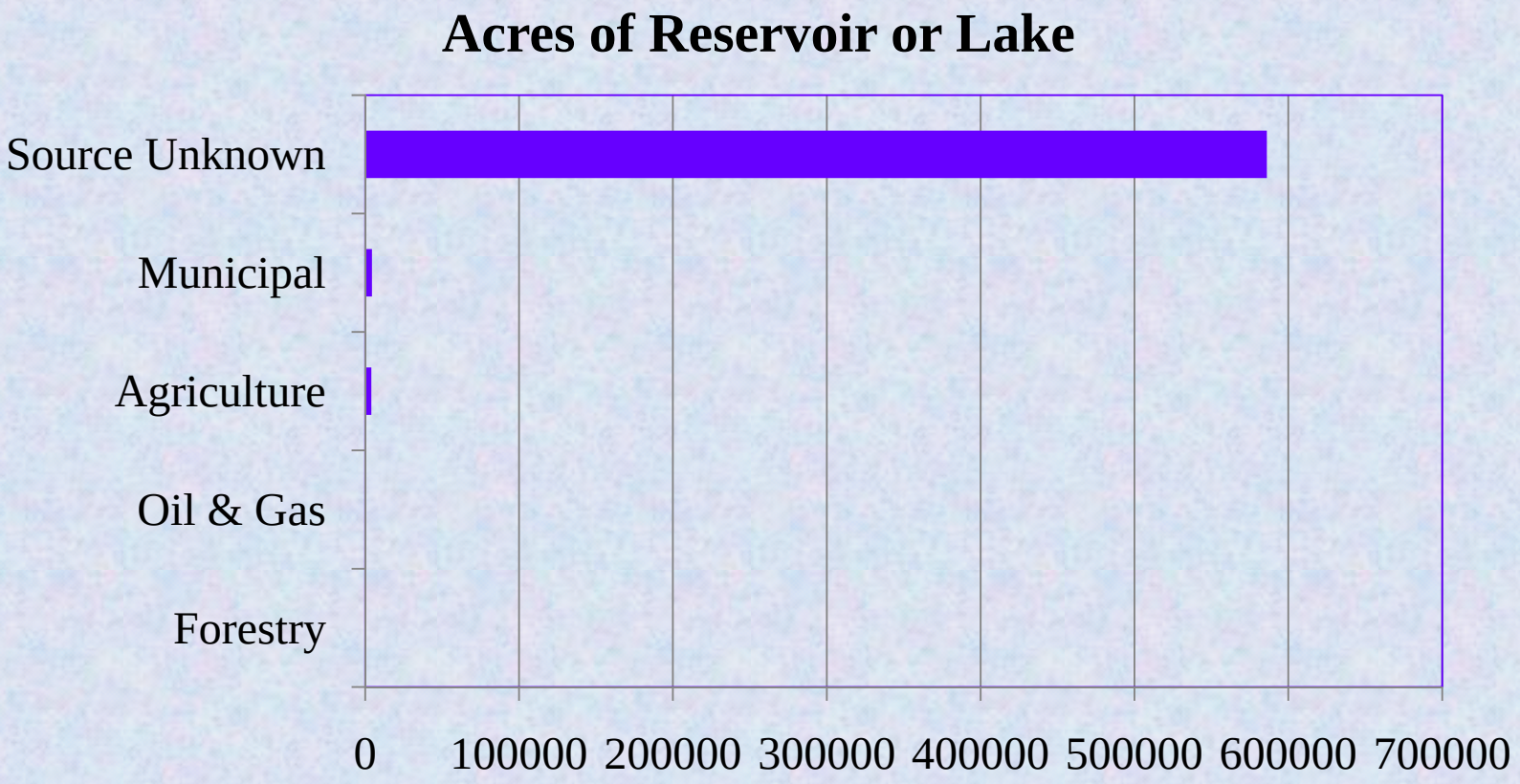
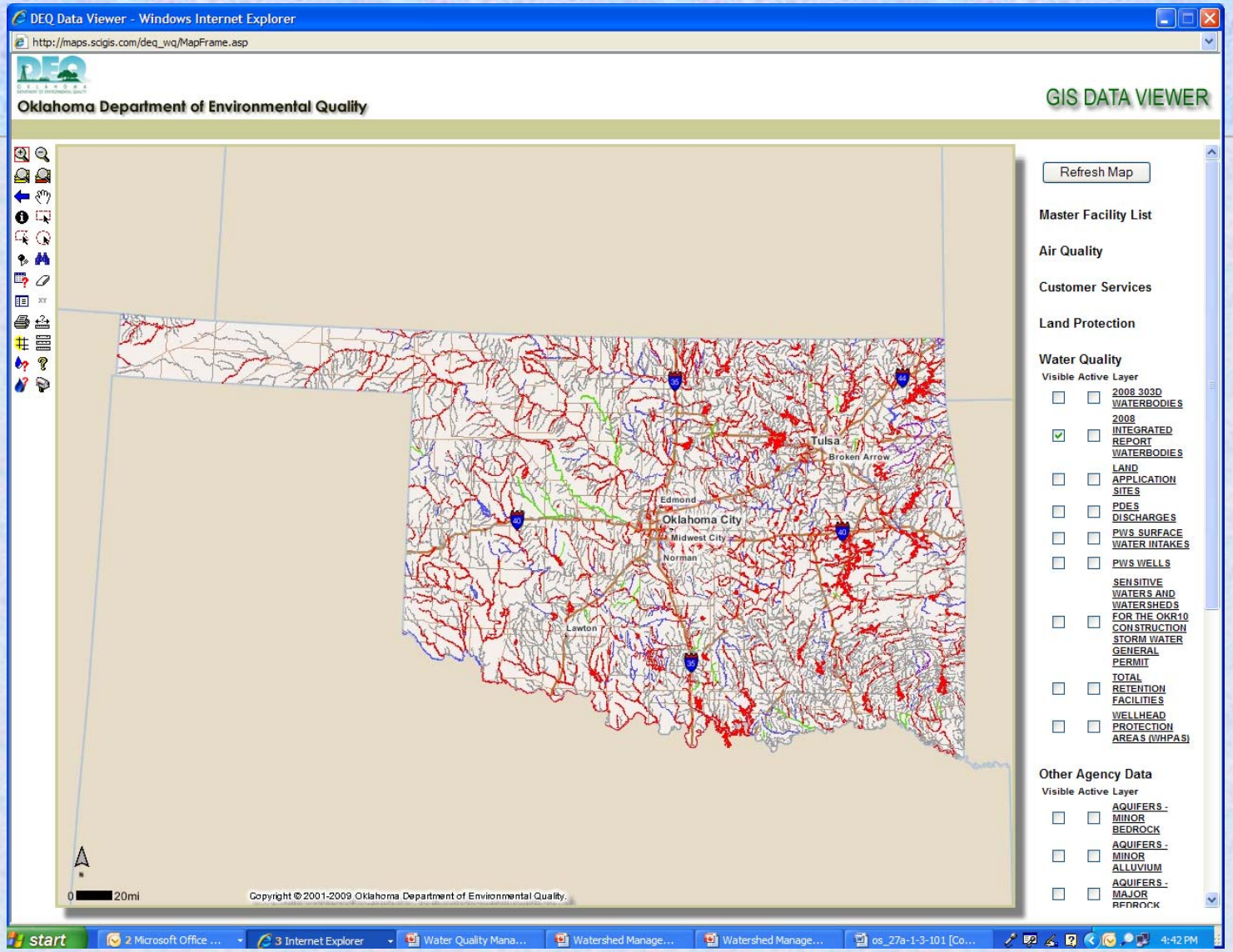
Probable Sources of Impairment Reservoirs and Lakes in Oklahoma

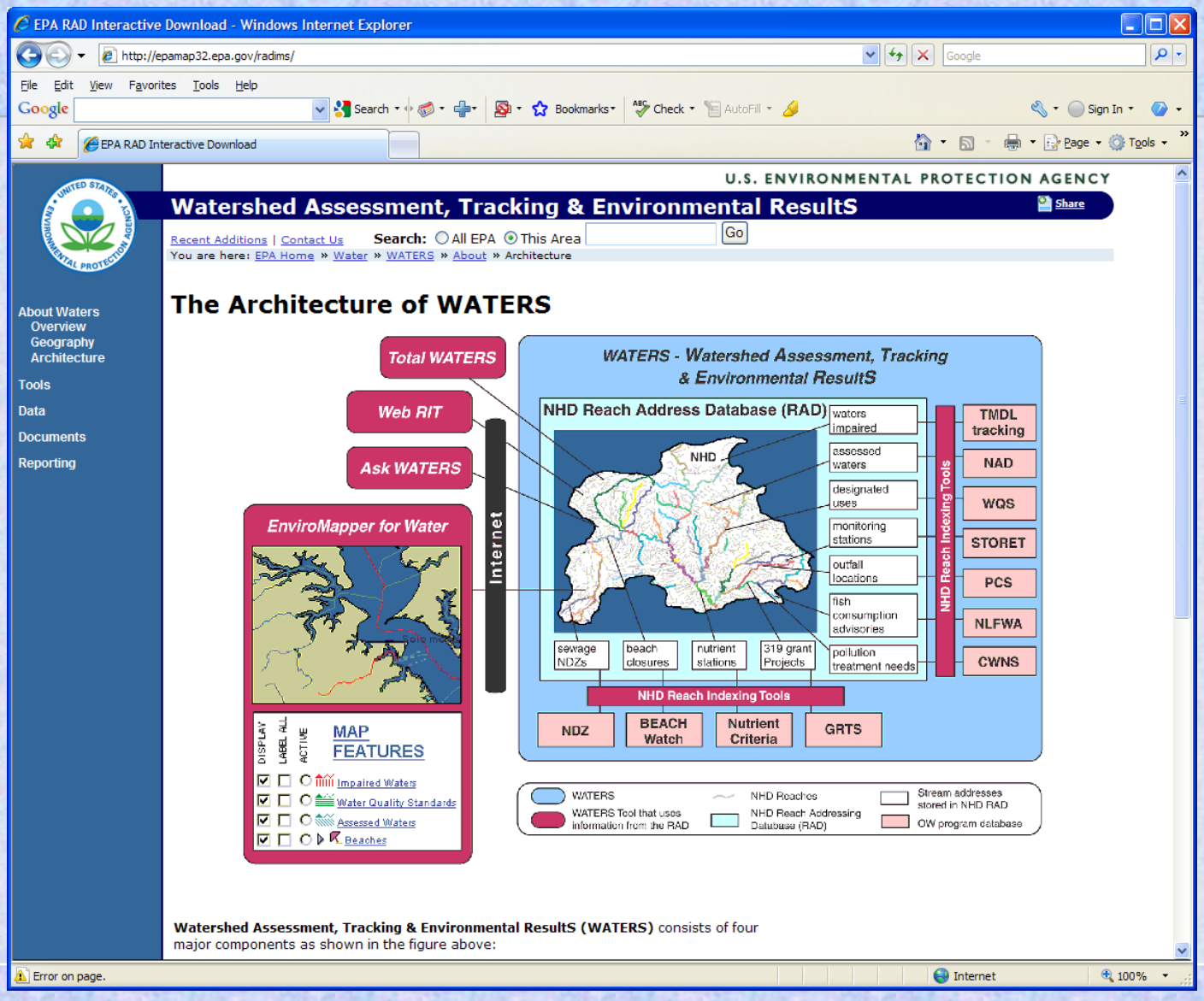


Waterbodies of Oklahoma



DEQ Data Viewer http://maps.scigis.com/deq_wq/

EPA's WATERS Data Viewer



http://epamap32.epa.gov/radims/

Pollutants

- **Toxics, Metals**
- **Oil & grease**
- **Synthetic organics, pesticides**
- **Brines**
- **Plant nutrients – Nitrogen and Phosphorus**
- **BOD = Biochemical Oxygen Demand**
- **Sediment, turbidity**
- **Pathogens**

Biochemical Oxygen Demand BOD_5

$$C + 0_2 \rightarrow CO_2$$

Stabilizing wastes consumes Oxygen.

BOD5 is the amount of Oxygen consumed in 5 days when a degradable waste is present.

5-day Biochemical Oxygen Demand (BOD_5)

	BOD_5 mg/L
Milk	80,000 – 100,000
Poultry Manure	42,000 – 80,000
Hog Manure	16,000 – 30,000
Dairy Cattle Manure	17,000 - 29,000
Lagoon Liquid	600 – 3,000

Manure from one dairy cow can consume all the Oxygen in 1 million gallons of water!

Plant Nutrients

- Nitrogen and Phosphorus stimulate algae growth
- Algae both produce and consume Dissolved Oxygen
- Algae die and become organic matter (BOD)
- Bluegreen Algae cause taste and odor (and toxicity) problems

Bacteria

- Indicator bacteria (not the real concern)
  - Fecal Coliforms
  - E. coli
  - Enterococci
- Pathogens – the real concern
- Sources – grazing animals, wildlife, water fowl, human waste

Turbidity - Eroded soil particles that make the water cloudy

- Cropland
- Rangeland
- Rural roads
- Construction sites
- Mining (oil and gas)
- Silviculture (forestry)
- Stream channels and bank erosion
- Sediment

Sources of Pollutants: BOD and Organic Matter

- Animal wastes
- Yard wastes, trash, vegetative residues
- Algae
- Industrial wastes
- Municipal wastes
- Septic tanks and other treatment systems

Sources of Pollutants: Nitrogen and Phosphorus

- Fertilizer (farm and home)
- Animal wastes
- Municipal waste
- Septic Systems
- Industrial wastes
- Yard trimmings, trash, pet wastes
- Home detergents

Sources of Pollutants: Pesticides

- Cropland
- Yards/gardens/home foundations
- Disposal from homes/Industry
- Killing fleas and ticks on pets

Sources of Pollutants: Bacteria and pathogens

- **Human waste**
  - **E. coli 0111, Cholera, Typhus, Salmonella**
- **Animal waste (including pets)**
- **Wildlife**
  - **Cryptosporidium**
  - **Giardia**

Management of Water Quality
in Oklahoma

- OWRB sets the Water Quality Standards
- ALL Environmental Agencies are required by law to develop ***implementation plans*** for their areas of jurisdiction.
  - **OWRB**
    - Floodplain management
    - State Water/wastewater Loan Program
    - Classification of waters
    - Beneficial use monitoring program (BUMP)

Water Quality Implementation Plans (continued)

- **Oklahoma Department of Environmental Quality (ODEQ) –** all point source discharges (except those regulated by other agencies)
  - Manufacturing
  - Municipal wastewater
  - On-site waste treatment (septic tanks)
  - Slaughter houses but not feeding operations
- **Department of Agriculture (ODAFF)**
  - Animal Feeding Operations (CAFOs), Poultry, Hogs
  - Forestry and Nurseries
  - Fertilizer and Pesticides

Water Quality Implementation Plans (continued)

- **Oklahoma Corporation Commission (CorpCom)**
  - Oil and Gas exploration and drilling
  - Reclamation of production sites
  - Point sources related to oil and gas facilities (brine, hydrocarbons, etc.)
- **Oklahoma Conservation Commission (OCC)**
  - nonpoint source programs (assessment and implementation)
  - conservation programs
  - Wetlands
  - Abandoned mine reclamation

Water Quality Implementation Plans (continued)

- Other Agencies
  - Oklahoma Department of Wildlife Conservation (ODWC)
  - Oklahoma Department of Mines
  - Oklahoma Department of Emergency Management
  - Oklahoma Department of Labor
  - Oklahoma Department of Public Safety

"Each Agency is Responsible for Implementation within its jurisdictional area." -Title 27A Section 1-1-202

- Statute creates a ***WQ Standards Advisory Committee*** consisting of the agency representatives and the Secretary of Environment. OWRB serves as Chari.
- Advisory Committee evaluates how well the implementation plans are being met and reports to Speaker of the House and Senate Pro Temporare

The Total Maximum Daily Load (TMDL)
ODEQ Responsibility

A Management Strategy for addressing surface water impairment.

TMDL = LA + WLA + MOS

TMDL is Maximum Daily Pollutant Load allowable for a water body (based on the Water Quality Standard)

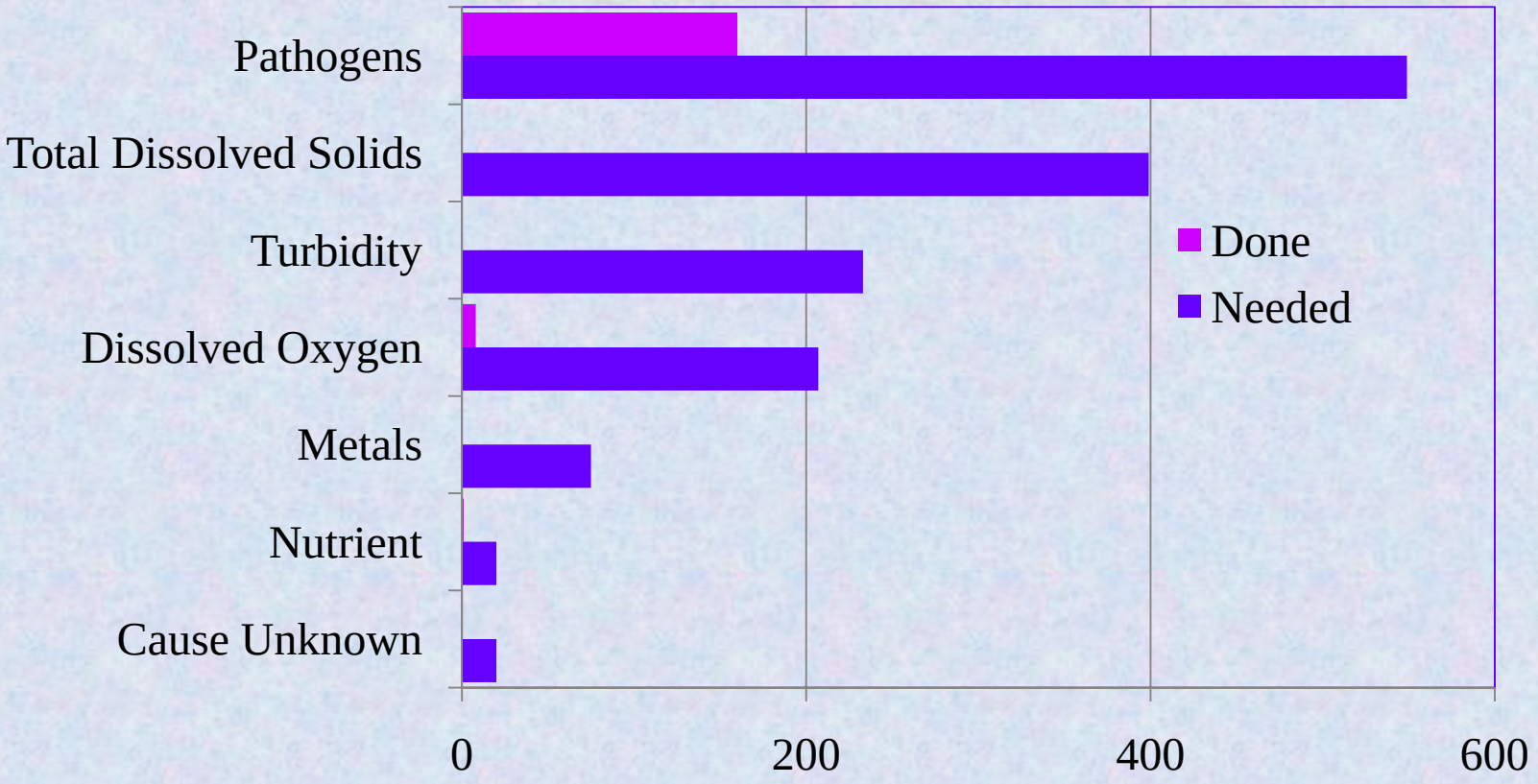
LA	load allocation to permitted sources
WLA	nonpoint source and background load
MOS	margin of safety

NOT AS SIMPLE AS IT SEEMS

Control of LA and WLA

- LA (pt sources) - controlled by permits
- WLA is controlled, to the extent possible, by voluntary BMPs and education.
  - Background cannot be controlled.
  - A margin of safety (MOS) has uncertainty
- If the TMDL doesn't work in 10 -15 years, the controls will be increased.

Status of TMDLs



Tools for Implementing a TMDL

- Regulatory Programs
- Voluntary Programs
- Education

Tools for Implementing a TMDL

- Permitting
  - Municipal and Industrial Discharge Permits (ODEQ)
  - Stormwater Permits for construction sites, industrial sites, and MS4s (ODEQ)
  - Concentrated Animal Feeding Operations (CAFOs)
  - Poultry litter application to farmland (ODAFF)
  - Municipal sludge application to farmland (ODEQ)
- Controls without Permitting
  - Discharge from water craft
  - Discharge from oil/gas sites (CorpCom)
  - Runoff from waste animal application sites
  - Fertilizer application to cropland
  - Grazing and watering in stream bottoms

Stormwater programs (regulatory)

- General permits for cities and other entities that control storm sewers.
  - 46 permits in Oklahoma (MS4s)
  - Construction sites 1-acre or larger
- Permits require education, public involvement, and voluntary BMPs.

CAFO – Concentrated Animal Feeding Operations (Regulatory)

- EPA CAFO permit – Region 6 EPA
- Oklahoma CAFO permit- Oklahoma Department of Agriculture Food and Forestry ODAFF
- Certified Poultry Operations – ODAFF
- Licensed Animal Feeding Operations (Hogs) - ODAFF

Voluntary Programs and Watershed Plans (Voluntary)

- Agricultural Nonpoint Source (OCC and NRCS)
  - 319 Nonpoint Source Demonstration Projects (Watershed Plans and Best Management Practices)
  - Soil Conservation Programs
  - Conservation Reserve Enhancement Program
  - Education Programs – Blue Thumb (OCC), Poultry Operator Education (OCES)

Voluntary Programs

- Urban Nonpoint Source
  - Low Impact Development
  - Integrated Pest Management
  - Pesticide Education Programs
  - Nongovernment Organizations – Sustainability Network
  - Master Gardeners, Water Watch Volunteer Monitoring (OWRB), others

Best Management Practice (BMPs): Urban/Suburban

- **Erosion and sediment control**
- **Storm water detention**
- **Zoning: limit development density**
- **Regional sewage treatment**
- **Septic tank maintenance**
- **Street sweeping**
- **Prevent dumping of oil, detergent, pesticides, pet wastes, etc.**
- **Trash collection and disposal in landfills**

Summary

- Water Quality Management is driven by the Water Quality Standards to protect beneficial uses.
- Water Quality in Oklahoma is currently viewed as poor – this is largely due to bacteria, turbidity, and nutrients.
- Authority for control of pollutant dischargers and causes of pollution is distributed among environmental agencies

Summary

- The TMDL process is operating slowly with few tools for implementation.
- Voluntary programs are operating throughout the state.
- Educational programs are the mainstay of the largest part of the management picture.

Questions?

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