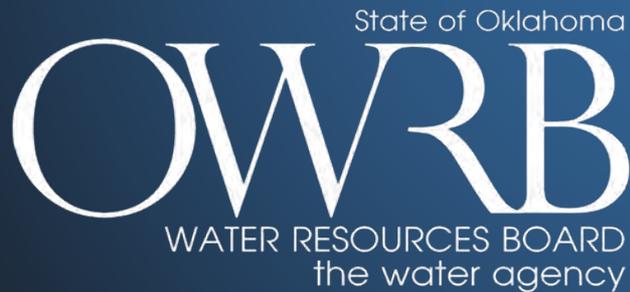


Planning for Oklahoma's Water Quality

Good Decisions Need Good Data



Derek Smithee, Chief
Water Quality Programs Division
Oklahoma Water Resources Board

Water Quality Programs and the Oklahoma Comprehensive Water Plan

*Partners in ensuring reliable
water supplies and chemical,
physical and biological
integrity of Oklahoma's waters*

*Addressing Oklahoma's
water needs is a "three-
legged stool" with a water
quality underpinning*

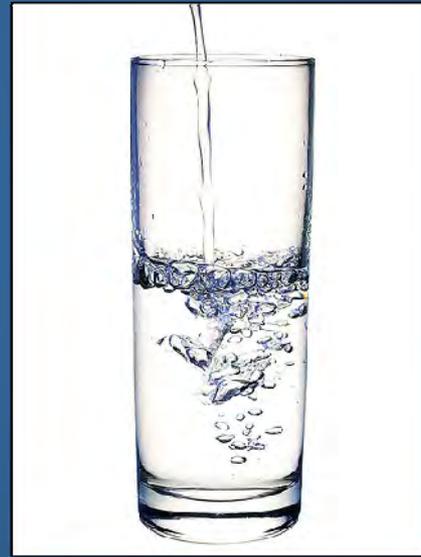
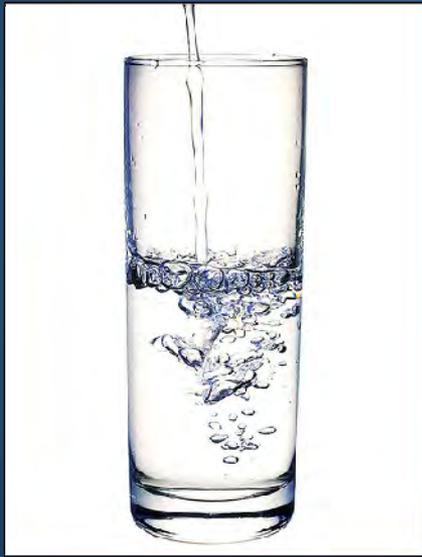


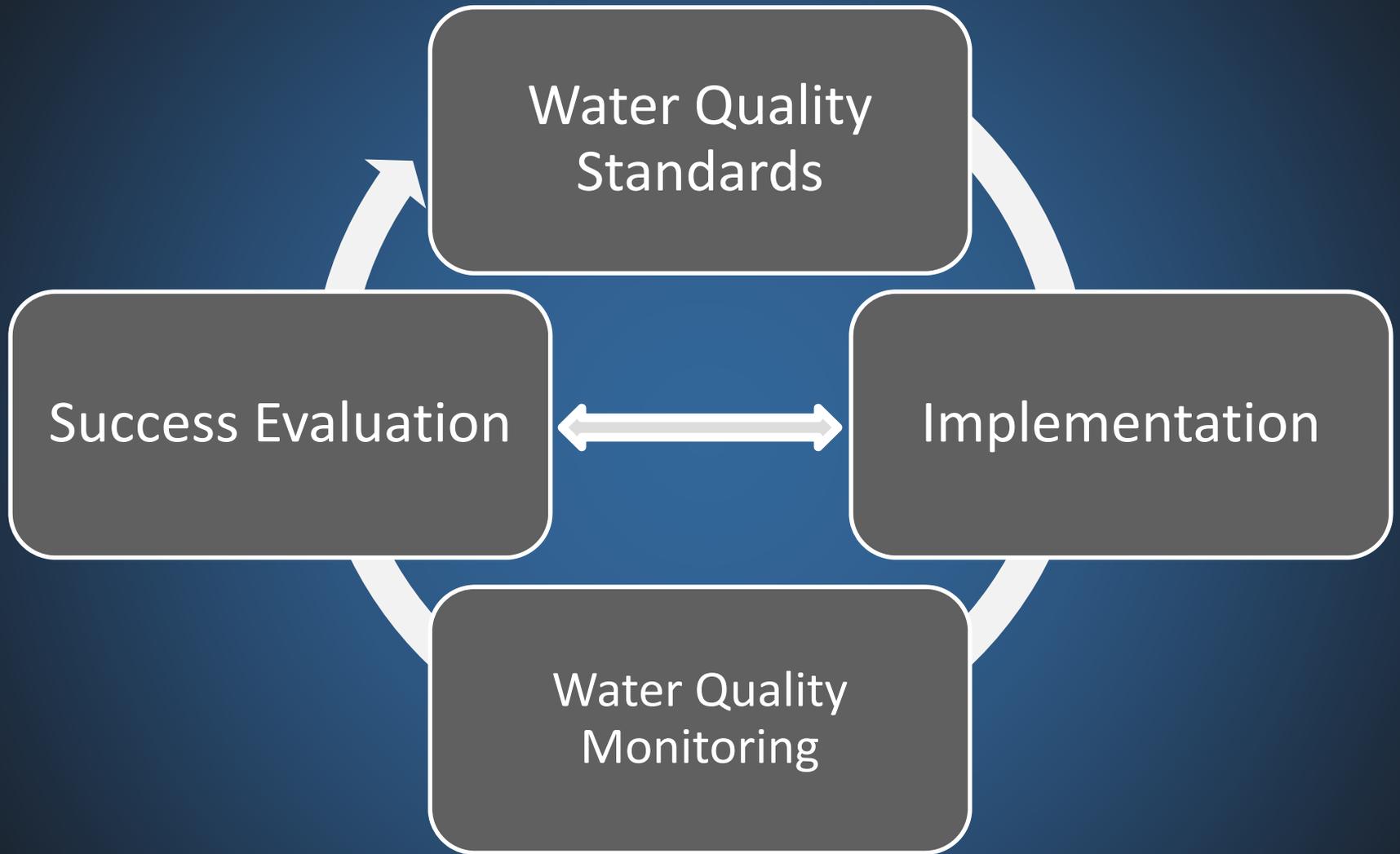
Two Cautionary Tales



Dream Home

Two Cautionary Tales





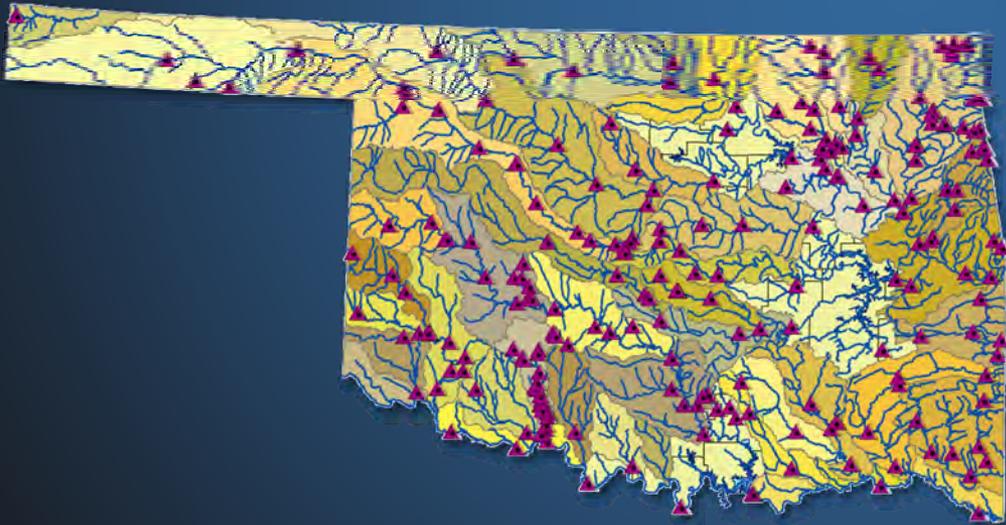
OCWP and Water Quality Activities

- **Conducting a study looking at trends in water quality for Oklahoma's lakes and streams. Knowledge of this nature is vital to ensure that time and resources are devoted to the most critical needs.**
- **Working on the water quality component of the OCWP that will include a gaps analysis to ensure that critical and planned water resources are adequately protected through all of the current state and federal programs.**
- **Forming a working group and conducting a series of input meetings. Now is the time to get involved.**

Surface Water Quality Monitoring

United States Geological Survey/Oklahoma Water Resources Board Cooperative Stream Gaging Program

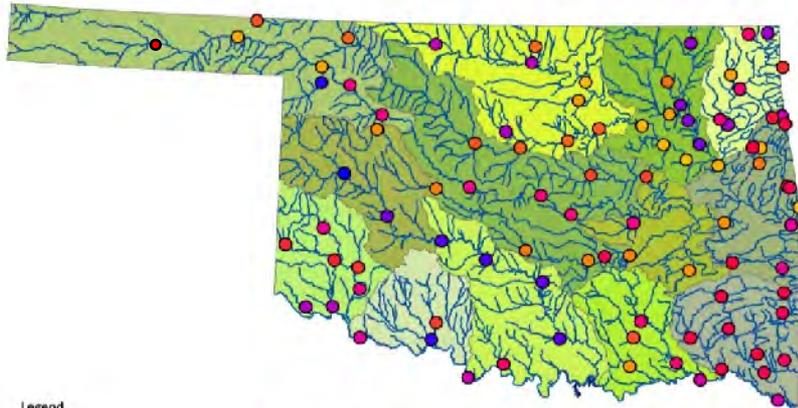
United States Geological Survey (USGS)/OWRB Cooperative Stream Gage Program 2009



- Purpose of the program is to gage stream flow at critical streams across Oklahoma. Costs are shared between the federal government and state cooperators.
- For state fiscal year 2010 the program is funded at a \$1.06 million dollars with state cooperators contributing approximately 60% of the funds and the federal government 40%.

Surface Water Quality Monitoring

Beneficial Use Monitoring Program (BUMP) Stream Sample Sites



Legend

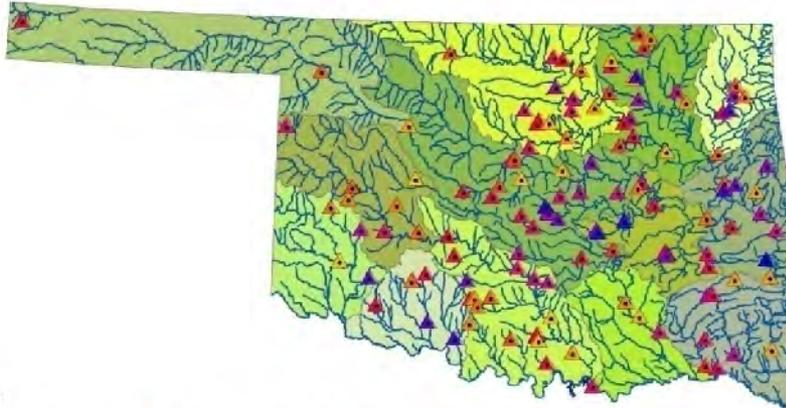
- | | | |
|---|---|---|
| ● ARKANSAS RIVER, OFF US 64, MOFFETT | ● DEEP FORK RIVER, US 377, STROUD | ● NORTH CANADIAN RIVER, US 275, WETUMKA |
| ● ARKANSAS RIVER, SH 104, HASKELL | ● EAST CACHE CREEK, SH 53, WALTERS | ● NORTH CANADIAN RIVER, US 82, EL RENO |
| ● ARKANSAS RIVER, SH 18, RALSTON | ● ELK CREEK, OFF SH 19, NEAR ROOSEVELT | ● NORTH FORK OF RED RIVER, US 62, HEADRICK |
| ● ARKANSAS RIVER, SH 97, SAND SPRINGS | ● ELK RIVER, SH 42, TIFF CITY (MO) | ● NORTH FORK OF THE RED RIVER, S 134, CARTER |
| ● ARKANSAS RIVER, US 62, MUSKOGEE | ● ELM FORK of the RED RIVER, SH 30, near CARL | ● POTEAU RIVER, OFF SH 112, POCOLA |
| ● ARKANSAS RIVER, US 64, BIXBY | ● ELM FORK of the RED RIVER, SH 6, near GRANITE | ● POTEAU RIVER, US 59, HEAVENER |
| ● BARREN FORK, SH 51, ELDON | ● FLINT CREEK, US 432, FLINT | ● RED RIVER, US 183, DAVIDSON |
| ● BEAVER RIVER, SH 23, BEAVER | ● FOURCHE-MALINE CREEK, OFF US 270, RED OAK | ● RED RIVER, US 259, HARRIS |
| ● BEAVER RIVER, US 183, FORT SUPPLY | ● GLOVER RIVER, SH 6, GLOVER | ● RED RIVER, US 271, HUGO |
| ● BIG CABIN CREEK, OFF US 69, BIG CABIN | ● ILLINOIS RIVER, US 56, WATTS | ● RED RIVER, US 81, TERRAL |
| ● BIRD CREEK, SH 266, PORT OF CATOOSA | ● ILLINOIS RIVER, US 62, RIBAUDUM | ● SAGER CREEK, OFF US 412, WEST SILDAM SPRINGS |
| ● BLACK BEAR CREEK, SH 18, PAWNEE | ● KIAMICHI RIVER, OFF US 271, TUSKAHOMA | ● SALT FORK OF THE ARKANSAS RIVER, SH 38, INGERSOLL |
| ● BLUE RIVER, US 70, DURANT | ● KIAMICHI RIVER, SH 109, FORT TOWSON | ● SALT FORK OF THE ARKANSAS RIVER, US 77, TONKAWA |
| ● BRUSHY CREEK, SH 63, near HARKLEVILLE | ● KIAMICHI RIVER, SH 63, BIG CEDAR | ● SALT FORK OF THE RED RIVER, OFF US 283, ELMER |
| ● CANADIAN RIVER, SH 2, WHITE ELD | ● KIAMICHI RIVER, US 271, ANTIERS | ● SANDY CREEK, SH 6, ELDORADO |
| ● CANADIAN RIVER, US 183, TALOGA | ● LITTLE LEE CREEK, SH 102, near SHORT | ● SKELETON CREEK, SH 74, near LOVELL |
| ● CANADIAN RIVER, US 270, CALVIN | ● LITTLE RIVER, OFF SH 3, CLOUDY | ● SPRING CREEK, OFF US 412, MURPHY |
| ● CANADIAN RIVER, US 377, KONAWA | ● LITTLE RIVER, SH 56, SASKAWA | ● SPRING RIVER, OFF SH 124, QUAPAW |
| ● CANADIAN RIVER, US 56, BRIDGEPORT | ● LITTLE RIVER, OFF US 70, near HOLLY CREEK | ● VERDIGRIS RIVER, SH 30, LENEPAH |
| ● CANADIAN RIVER, US 77, PURCELL | ● Lee Creek, SH 101, near Short | ● VERDIGRIS RIVER, SH 20, KEETONVILLE |
| ● CANEY CREEK, OFF SH 100, BARBER | ● MOUNTAIN FORK RIVER, SH 4, SMITHVILLE | ● VERDIGRIS RIVER, US 412, INOLA |
| ● CANEY RIVER, OFF US 75, RAMONA | ● MOUNTAIN FORK RIVER, US 70, EASTLETOWN | ● VERDIGRIS RIVER, US 51, MADISON |
| ● CHICKASKIA RIVER, US 177, BLACKWELL | ● MUD CREEK, SH 32, COURTNEY | ● WASHITA RIVER, SH 152, CORDELL |
| ● CIMARRON RIVER, SH 32, BIPLEY | ● MUDGY BOGGY CREEK, US 70, UNGER | ● WASHITA RIVER, SH 19, PARKS VALLEY |
| ● CIMARRON RIVER, SH 31, BUFFALO | ● MUDGY BOGGY RIVER, US 68, AIKRA | ● WASHITA RIVER, US 177, DURWOOD |
| ● CIMARRON RIVER, US 77, GUTHRIE | ● NEOSHO RIVER, OFF US 66, COMMERCE | ● WASHITA RIVER, US 203, ANADARKO |
| ● CIMARRON RIVER, off SH 99, CLIXON | ● NEOSHO RIVER, SH 82, LANGLEY | ● WASHITA RIVER, off SH 19, near ALEX |
| ● CIMARRON RIVER, OFF US 64, MOCANIE | ● NEOSHO RIVER, US 432, CHOUTEAU | ● WEST CACHE CREEK, SH 38, TAYLOR |
| ● CIMARRON RIVER, US 81, DOVER | ● NORTH CANADIAN RIVER, OFF US 62, HAYENAH | ● WOLF CREEK, OFF US 270, FORT SUPPLY |
| ● CLEAR BOGGY CREEK, OFF US 68, CANEY | ● NORTH CANADIAN RIVER, SH 35, SHAWNEE | ● WASHITA RIVER, OFF SH 33, near MILLURE |
| ● DEEP FORK RIVER, OFF SH 16, BEGGS | ● NORTH CANADIAN RIVER, US 281, SELING | |
| | ● NORTH CANADIAN RIVER, US 412, WOODWARD | |

Beneficial Use Monitoring Program (BUMP)

- Program is designed to sample lakes and streams across Oklahoma to assess their beneficial use support status.
- Numerous chemical, physical and biological parameters are collected to accomplish this goal.
- The BUMP has collected sufficient information to begin to look at trends in water quality. With the continued collection of data the OCWP can continue to be updated so that our water resources can be managed effectively and efficiently. As the OCWP is implemented water quantity and quality monitoring will be essential to assessing effectiveness.

Surface Water Quality Monitoring

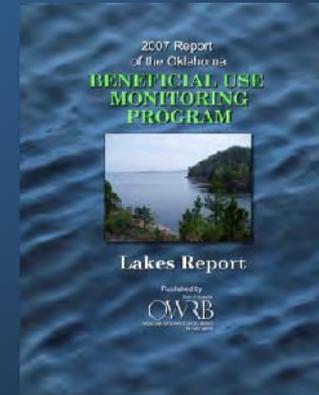
Beneficial Use Monitoring Program (BUMP) Sample Lakes



Legend

▲ Altus Reservoir	▲ Cushing Municipal Lake	▲ John Wells Lake	▲ Lake Texoma	▲ Sardis Lake
▲ American Horse Lake	▲ Dripping Springs Lake	▲ Kaw Lake	▲ Lake Thunderbird	▲ Shawnee Twin #1 Lake
▲ Arbuckle Reservoir	▲ Duncan Lake	▲ Keystone Lake	▲ Lake Vanderwork	▲ Shawnee Twin #2 Lake
▲ Arcadia Lake	▲ Elk City Lake	▲ Lake Carl Blackwell	▲ Lake Vincent	▲ Shell Lake
▲ Ardmore City Lake	▲ Elmer Thomas Lake	▲ Lake Chickasha	▲ Lake Wayne Wallace	▲ Skiatook Lake
▲ Atoka Lake	▲ Eucha Lake	▲ Lake El Reno	▲ Langston Lake	▲ Sooner Reservoir
▲ Bellcow Lake	▲ Eufaula Lake	▲ Lake Ellsworth	▲ Liberty Lake	▲ Spavinaw Lake
▲ Birch Lake	▲ Fairfax Lake	▲ Lake Etling	▲ Lloyd Church	▲ Sportsman Lake
▲ Bixhoma Lake	▲ Fort Cobb Reservoir	▲ Lake Frederick	▲ Lone Chimney Lake	▲ Stillwell City Lake
▲ Bluestem Lake	▲ Fort Gibson Lake	▲ Lake Henryetta	▲ Maysville Lake	▲ Stroud Lake
▲ Boomer Lake	▲ Fort Supply Lake	▲ Lake Hudson	▲ McGee Creek Reservoir	▲ Talawanda Lake #1
▲ Broken Bow Lake	▲ Foss Reservoir	▲ Lake Jean Neustadt	▲ Meeke Lake	▲ Talawanda Lake #2
▲ Brushy Creek Reservoir	▲ Fuqua Lake	▲ Lake Konawa	▲ New Spiro Lake	▲ Taylor (Marlow) Lake
▲ Canton Lake	▲ Grand Lake	▲ Lake Lawtonka	▲ Okemah Lake	▲ Tecumseh Lake
▲ Carl Albert Lake	▲ Great Salt Plains Lake	▲ Lake Louis Burtshi	▲ Okmulgee Lake	▲ Tenkiller Ferry Lake
▲ Carter Lake	▲ Greenleaf Lake	▲ Lake McAlester	▲ Oolagah Lake	▲ Tom Steed Reservoir
▲ Cedar (Mena) Lake	▲ Guthrie Lake	▲ Lake McMurtry	▲ Pauls Valley City Lake	▲ WR Holloway
▲ Chandler Lake	▲ Healdton Lake	▲ Lake Murray	▲ Pawnee Lake	▲ Walters (Dave Boyer) Lake
▲ Claremore	▲ Heffner Lake	▲ Lake Nanah Waiya	▲ Perry Lake	▲ Waurika Lake
▲ Clear Creek Lake	▲ Heyburn Lake	▲ Lake Overholser	▲ Pine Creek Lake	▲ Waxhoma Lake
▲ Cleveland City Lake	▲ Holdenville Lake	▲ Lake Ozzie Cobb	▲ Prague City Lake	▲ Webbers Falls Reservoir
▲ Clinton Lake	▲ Hominy Lake	▲ Lake Pawhuska	▲ Purcell Lake	▲ Wes Watkins Reservoir
▲ Coalgate City Lake	▲ Hudson Lake	▲ Lake Ponca	▲ RC Longmire Lake	▲ Wetumka Lake
▲ Comanche Lake	▲ Hugo Lake	▲ Lake Raymond Gary	▲ Robert S. Kerr Reservoir	▲ Wevoka Lake
▲ Copan Lake	▲ Hulah Lake	▲ Lake Sahoma	▲ Rock Creek Reservoir	▲ Wister Lake
▲ Crowder Lake	▲ Humphreys Lake	▲ Lake Stanley Draper	▲ Rocky Lake	

- The BUMP has established an ambient monitoring network of 91 active permanent stations on streams.
- Approximately 129 lakes are monitored in a three (3) year rotational sampling methodology.
- Thirty to forty lakes are sampled quarterly every year.
- Sampling results are reported in a BUMP Report on lakes and streams and can be found at: www.owrb.ok.gov/quality/monitoring/bump.php

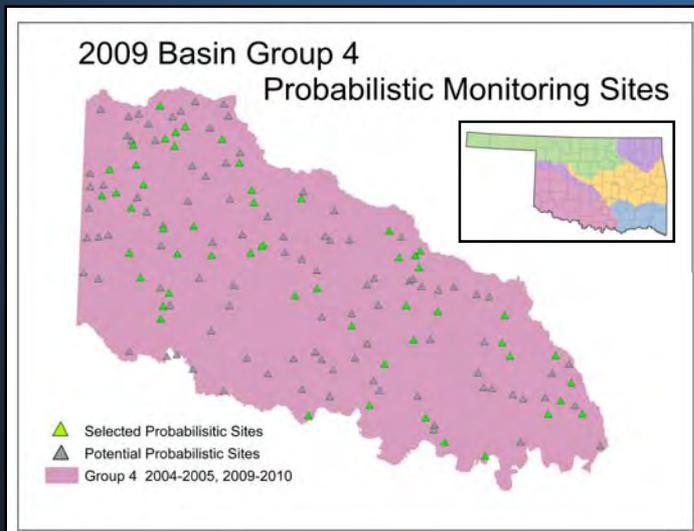
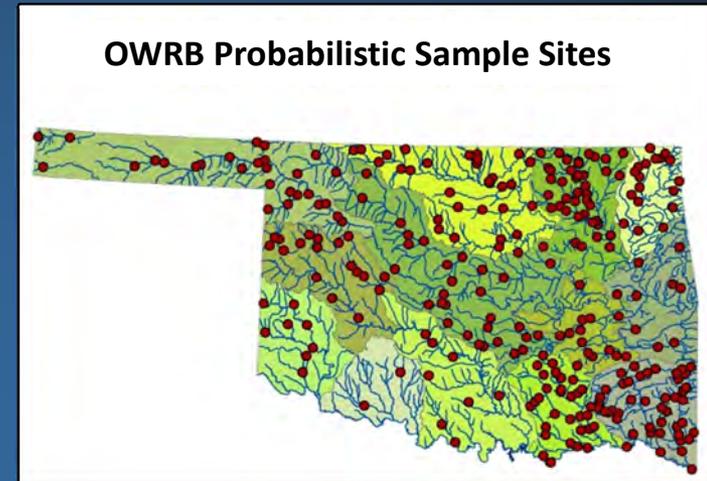


Surface Water Quality Monitoring

OCC and OWRB Probabilistic Monitoring

OWRB Program

- Random stations provide comprehensive statewide view every 2-3 years
- Develop stronger relationships between indicators and stressors
- Excellent source of positive and negative reference condition

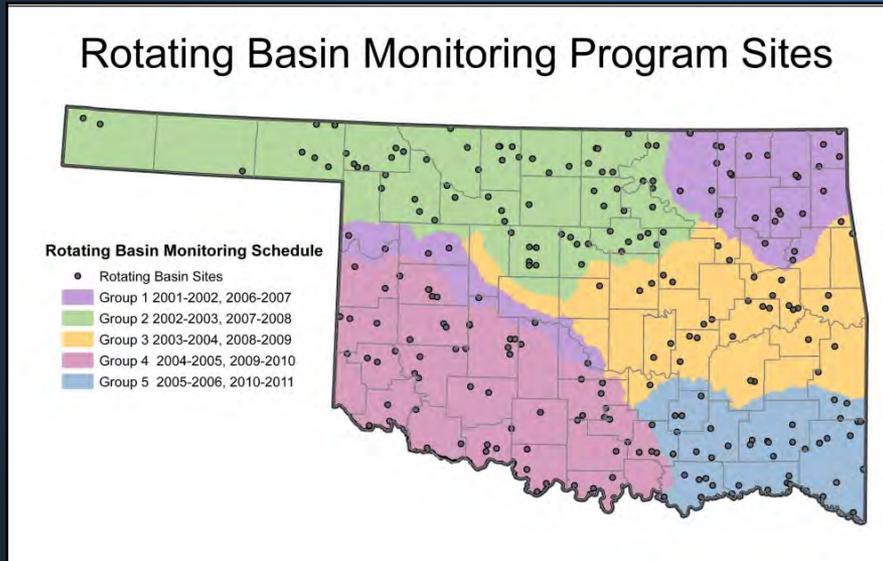


OCC Program

- Probabilistic monitoring component added in 2008 to provide data necessary for extrapolation of stream assessments from a system to basin scale
- Fifty sites are randomly chosen for one-time collection of chemical, physical, and biological data for each basin group
- A total of 250 probabilistic sites visited during the five year rotation

Surface Water Quality Monitoring

Oklahoma Conservation Commission Rotating Basin Monitoring Program



- All complete eleven digit watersheds across the state are monitored in a five year rotation by basin, comprising a fixed station network of 245 total sites.
- During the five year cycle, sites are sampled every five weeks for two consecutive years for water quality, aquatic habitat, and biological community health.

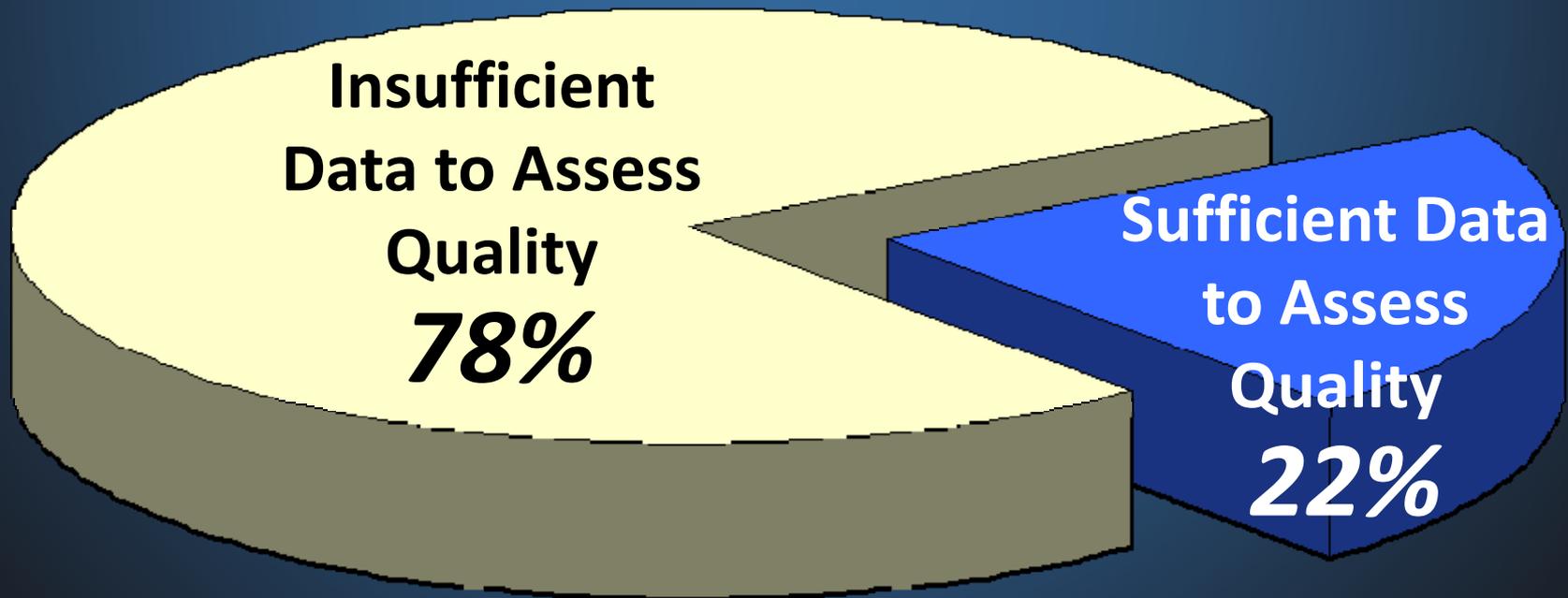
Status of Water Quality Monitoring in Oklahoma and the Oklahoma Monitoring Strategy Documents

Some of the recommendations from the report include:

- ✓ Establishing a robust groundwater monitoring network for Oklahoma. A holistic, systematic groundwater monitoring program does not currently exist in Oklahoma looking at both quantity and quality issues. Could be patterned after or in cooperation with the Oklahoma Mesonet.
- ✓ Biological monitoring (including implementation of probabilistic monitoring) needs to continue to be implemented in Oklahoma as well as further development of numerical biological criteria (biocriteria) .
- ✓ The suite of parameters sampled for needs to be expanded. Metals and organics sampling occurs on a very limited basis due to cost constraints. Dissolved oxygen monitoring needs to be expanded. New and emerging issues need to be addressed.
- ✓ The Cooperative Program for flow monitoring should continue to be a priority for Oklahoma. Flow information is critical to the successful completion and implementation of the OCWP.
- ✓ New and existing technologies need to be pursued to allow Oklahoma to monitor and manage our water resources effectively and efficiently.
- ✓ Improve coordination of monitoring programs and continue to pursue productive partnerships.

Surface Water Quality Monitoring in Oklahoma Rivers & Streams

*Total Perennial Stream Miles in Oklahoma
Available for Water Quality Assessment*



*Sound science
is the foundation
of good public policy*

Oklahoma Comprehensive Water Plan

OCWMP

OCWMP

www.ok.gov/ocwmp