



# U.S. Geological Survey Surface Water & Stream Gaging

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Oklahoma Comprehensive Water Plan

**“Basic Water Science Seminar”**

# Organization

USGS was established in 1879

Department of the Interior



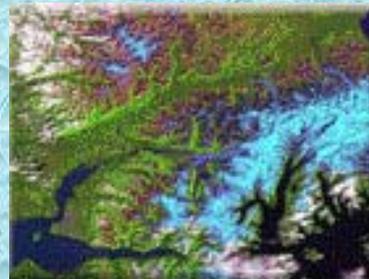
Biology



Geology



Mapping/Geog.



Water



# USGS Mission

**The USGS serves the Nation by providing reliable scientific information to:**

- describe and understand the Earth;
- minimize loss of life and property from natural disasters;
- manage water, biological, energy, and mineral resources; and
- enhance and protect our quality of life.

# Not in our Mission

- Regulatory authority
  - Permitting
- 

- Objective data
  - Useful for trans-boundary water quantity and quality concerns
  - Data that may be needed for litigation

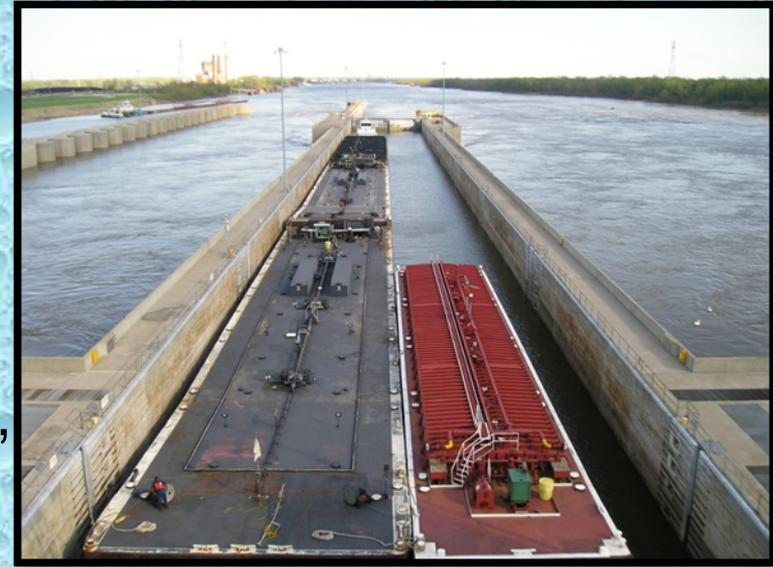
# Surface Water

- Streamflow quantity = discharge, cubic ft/sec
- How data are used?
- What is a streamgage?
- How we collect data?
- How are gages funded?



# How Surface Water Data are Used: 9 categories

- 1– Planning, designing, operating Nation’s multipurpose water management systems**
  - Reservoirs, hydropower, flood protection, in-stream flow requirements, recreation, navigation, managing irrigation supplies, public and industrial supplies
- 2 – Issuing flood warning (protect lives and reduce property damage)**
  - USGS gage data (real time) + National Weather Service flood warning program provides lead time for emergency response



# How Surface Water Data are Used: 9 categories

## 3 Designing highways and bridges

- Federal State and Local consulting design engineers use historical peak flow frequency curves to design bridges and culverts, analyze bridge scour and evaluate stream stability.



## 4 Mapping floodplains

- FEMA uses these to establish “risk” zones for flood insurance and future land development



# How Surface Water Data are Used: 9 categories

## 5 – Monitor environmental conditions & protect aquatic habitat

- Evaluation of hydropower operations, transport systems, develop in-stream flow guidance, also temperature, DO for organisms, water for fish migration



## 6- Protect water quality & regulate pollutant discharge

- Streamflow essential for making water quality assessment of chemical and biological constituents, (silt, chemicals, metals, nutrients loads)



# How Surface Water Data are Used: 9 categories

## 7 – Managing water rights and transboundary water issues

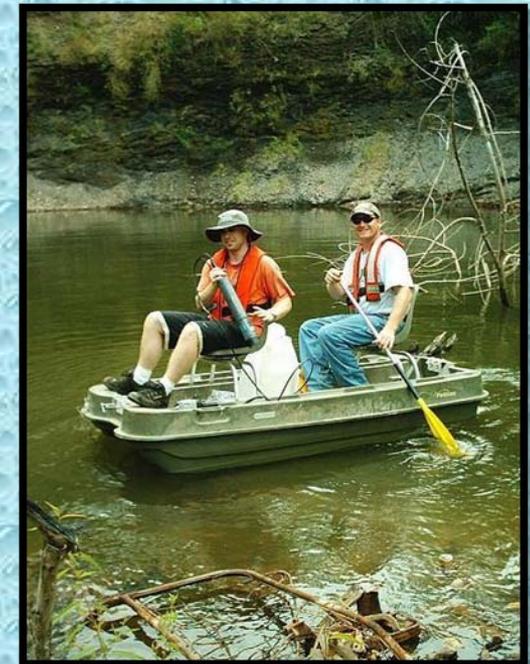
- Gage data critical for water allocation; unbiased, consistent methods (watershed, state, tribes, interstate compacts)

## 8 – Education and research

- Primary requirement for further understanding of hydrologic systems,

## 9 Recreational Uses –

- Real-time data (will you carry your canoe or ride in it??)



# Stream Gaging



# Stream Gaging



# ADCP

(Acoustic Doppler Current Profiler)



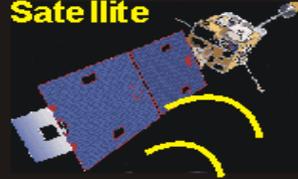
# We've come a long way!!

- First stream gage started in 1889
- Currently > 7,400 stream gages nationwide



# Real-time Streamflow Data

GOES Satellite



USGS Stream Gage



Antenna to Satellite

Data Collection Platform

Battery

Air Compressor/Pressure Transducer

Orifice

Anchor

Flexible Tube



USGS NWS-Web Database



USGS Real-time Streamflow Data

# Stream Gaging Network

- The agency has monitored the quality and flow of our nation's streams since its inception in 1879. Currently, the agency monitors continuous stream flow at more than 7,400 sites across the Nation. The large USGS database on surface water flow and water-quality conditions and other information is publicly available and can be readily accessed at

**<http://water.usgs.gov/nwis> or**

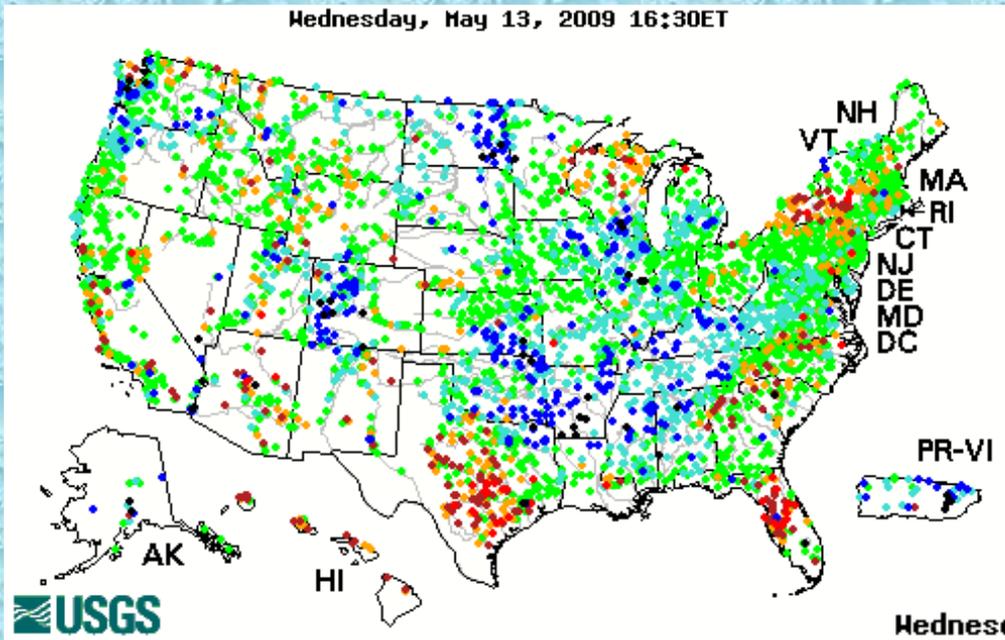
**<http://ok.water.usgs.gov/nwis>**

# **National Streamflow Information Program (NSIP)**

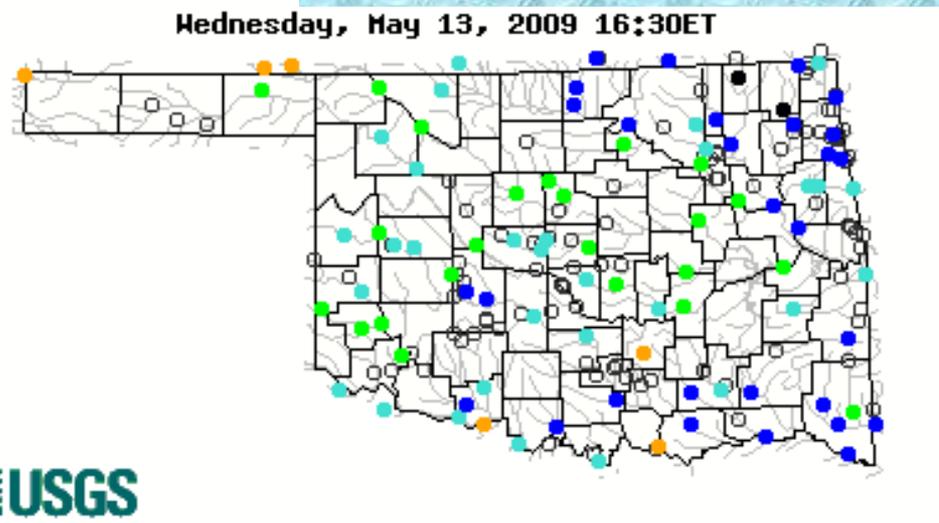
- **Federally funded**
- **Fill-in gaps in the network**
- **Ensure “period of record”**
- **Used to: monitor interstate water,  
river basin outflows & water quality**
- **Data are “objective” and comparable  
across state lines**

# Daily Streamflow Conditions – Real Time Data

Select a site to retrieve data and station information.



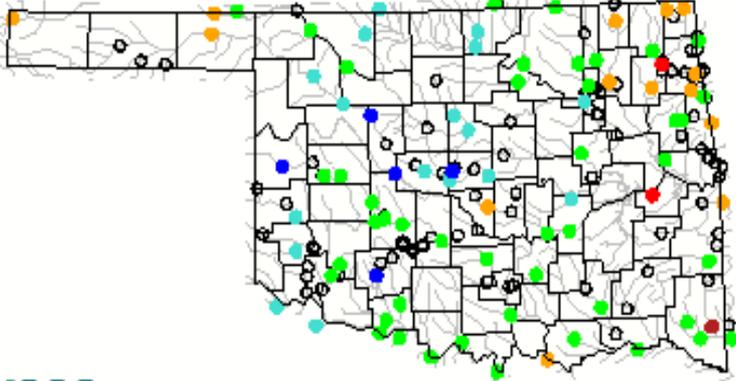
Historical data  
Trend analysis  
Peak analysis  
Daily, monthly,  
annual statistics  
Precipitation  
Continuous Water  
Quality (&  
statistics)



# Stream Gages in Oklahoma:

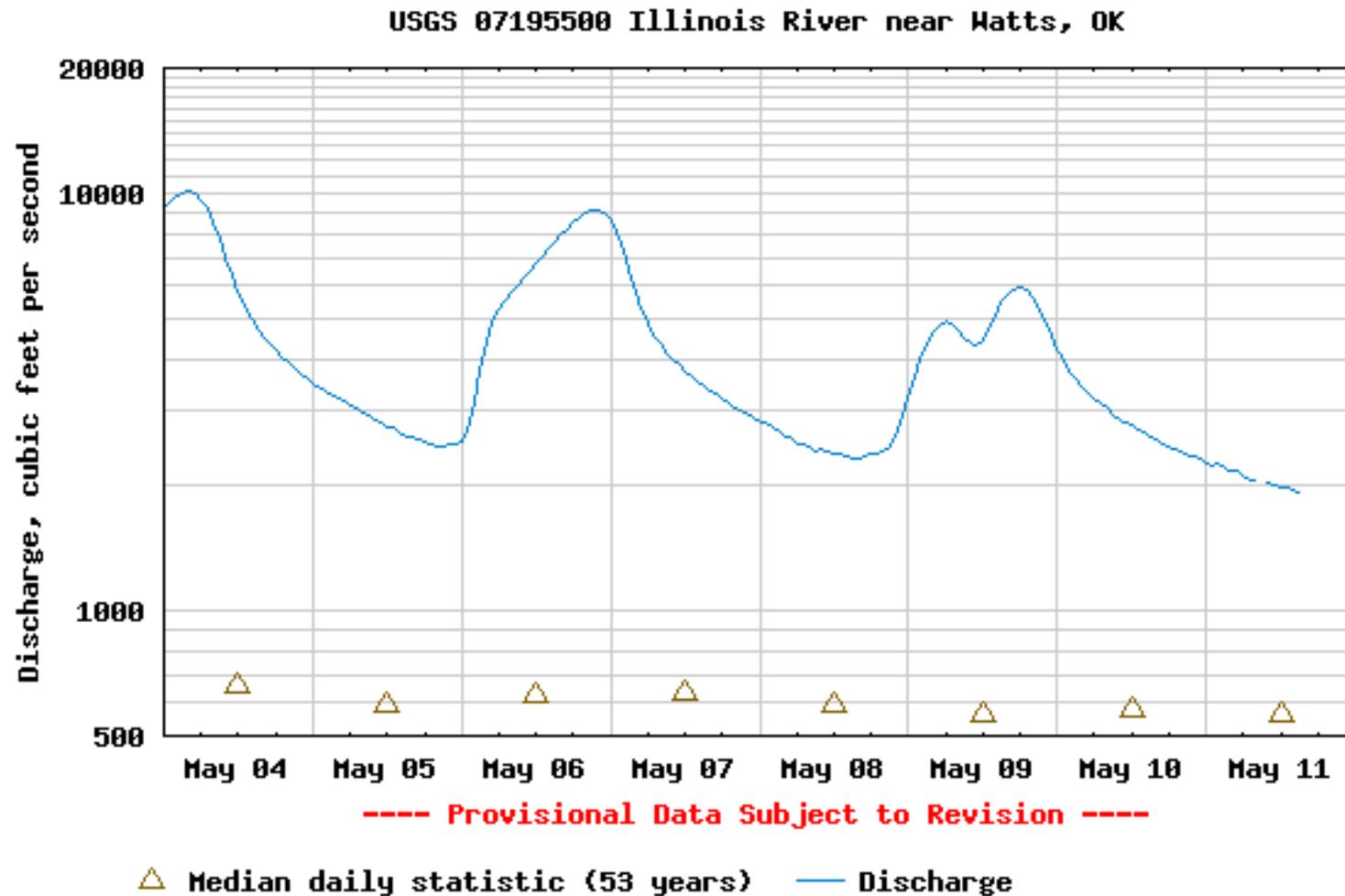
- USGS operates ~180 stream gages in Oklahoma.
- 20 continuously measure selected water quality constituents.
- More complete water-quality samples are collected at 40 gages.
- Used for flood prediction, drought status, recreation, climate trend analyses, and calculating loads and yields of contaminants.

Mon., Dec. 23, 2002 11:20ET



 USGS

# Live data via the Internet

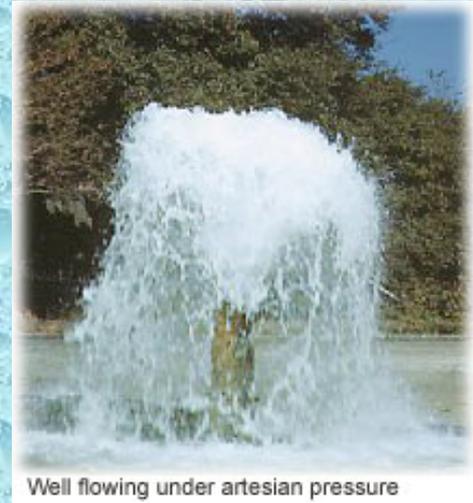


# Gage Data for Studies

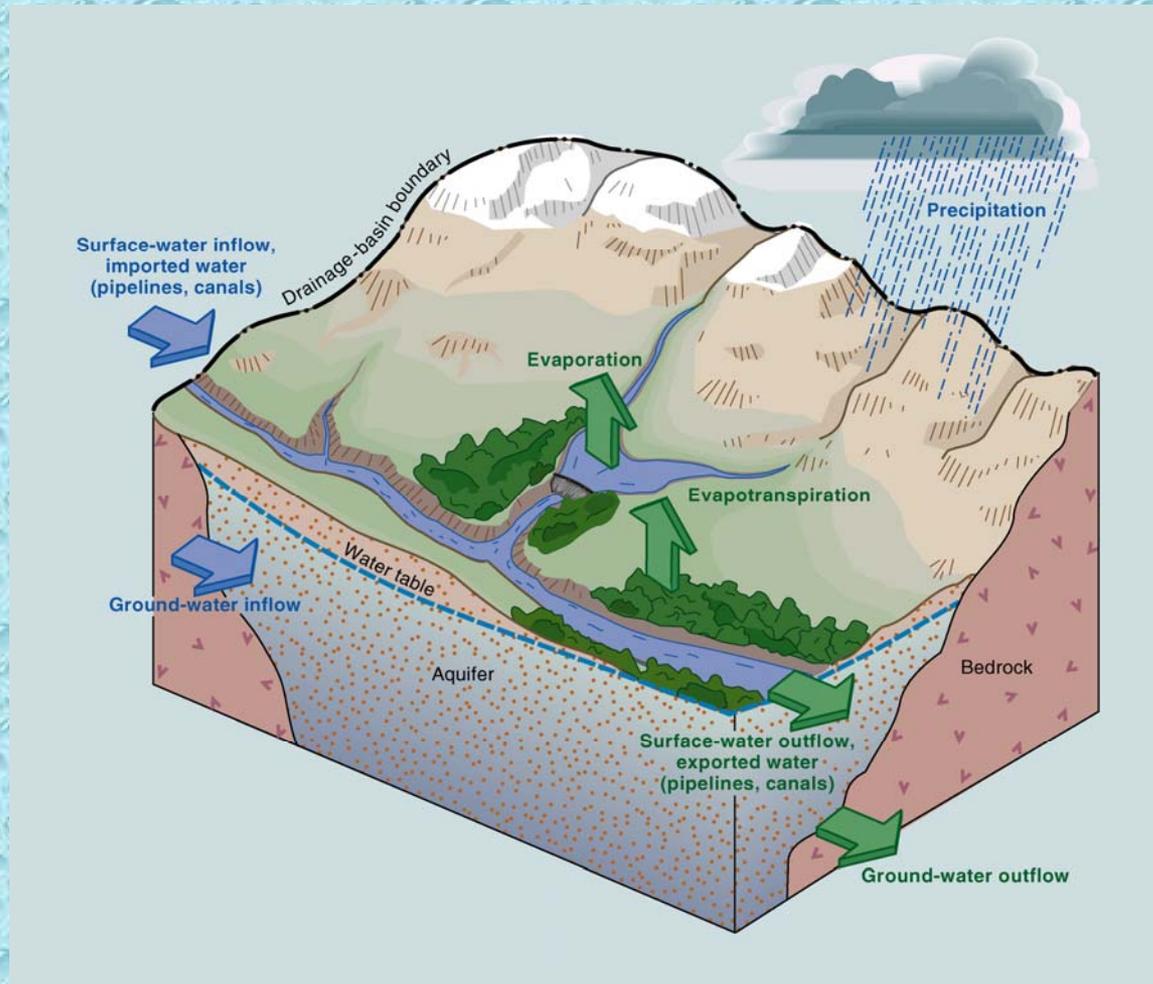
- Stream gage and water quality data are used for studies. (i.e. Arbuckle Simpson model; Eucha Spavinaw Nutrient Loading, Trends in the Illinois River)
- Identify a Problem (i.e. nutrient loading, effectiveness of BMPs, predictive models)
- Develop a Proposal
- Seek Cooperative Funding Partner (i.e. OWRB, ODEQ, Cities, Tribes, other federal agencies)

# Proposal Development

- Summary of Study Area
- Problem Statement
- Objectives and Scope
- Relevance and Benefits
- Work plan
- Quality Assurance Plan
- Safety
- Budget
- Product



# Ground-Water/Surface-Water Interactions



# Springs



# Water-Quality Sampling



# Event (high-flow) Sampling

If you sample every week at same time, you have a <math><1\%</math> chance of getting “high flow” sample.



70-90% of phosphorous load is in high flow events (possibly 1-2 samples)

# Spavinaw Creek Event Sampling Images

## High Flow –

70-90% of nonpoint source contaminants are delivered in high flow event



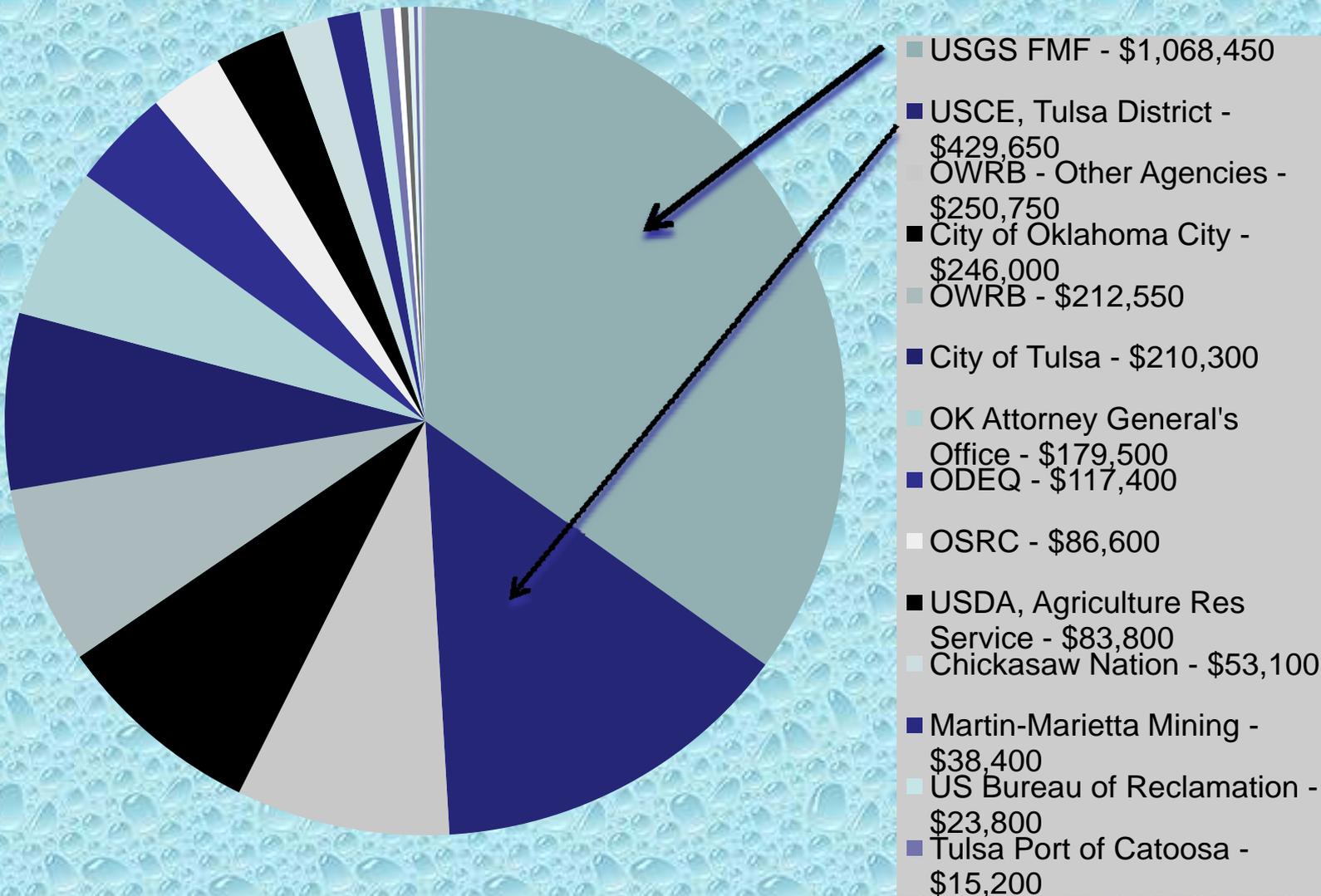
Base Flow (low flow)– more influenced by point sources such as effluent discharge



# How are Data Collection & Studies Activities Funded?

- Partnerships
- Federal, State, Cities, Counties, Tribes,
- Cost share funding (Cooperative Water Program, National Streamflow Information Program).

# GAGING STATION FUNDING AND FUNDING PARTNERS



# Thank You

