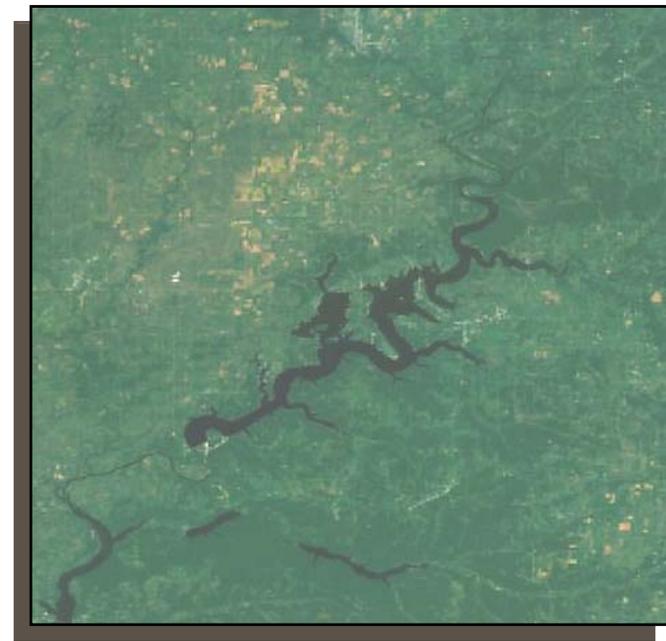


Grand Lake: Balancing Water Use & Protection



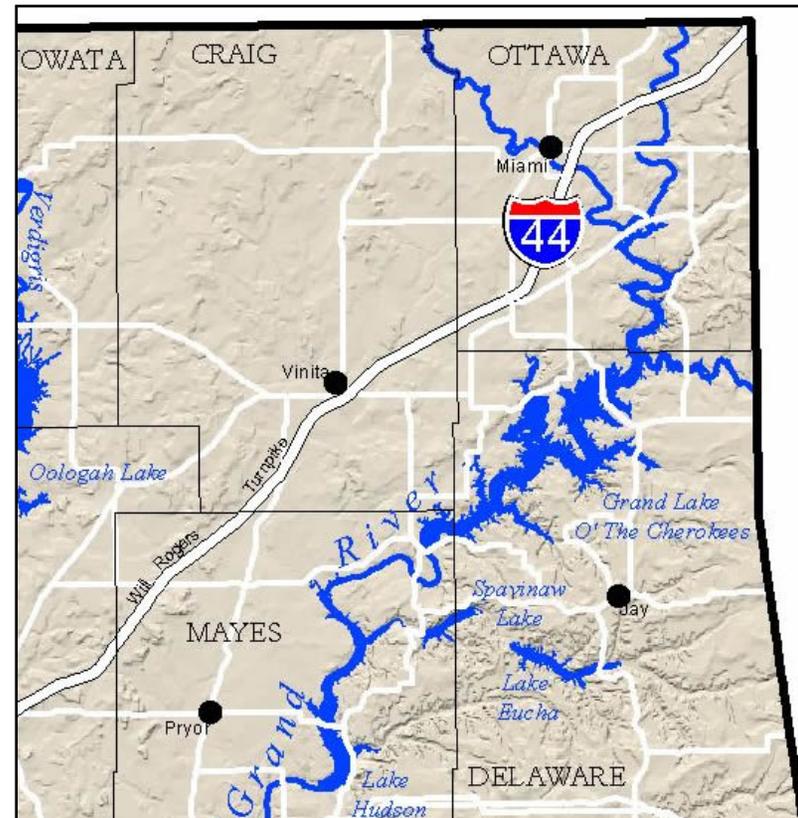
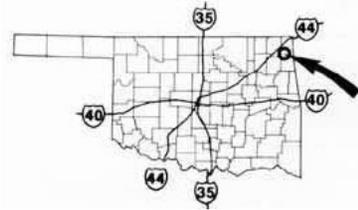
***Duane A. Smith, Executive Director
Derek R. Smithee, Water Quality Programs Chief
Oklahoma Water Resources Board***



Grand Lake Facts

Completed 1940 (Grand River Dam Authority):

- Cost = ~\$30 million
- Purposes:
 - hydroelectric power production
 - flood control (Corps of Engineers)
 - also water supply for area communities
- Prevented \$86 million in flood damages
- Hydropower benefit = \$13-25 million/year

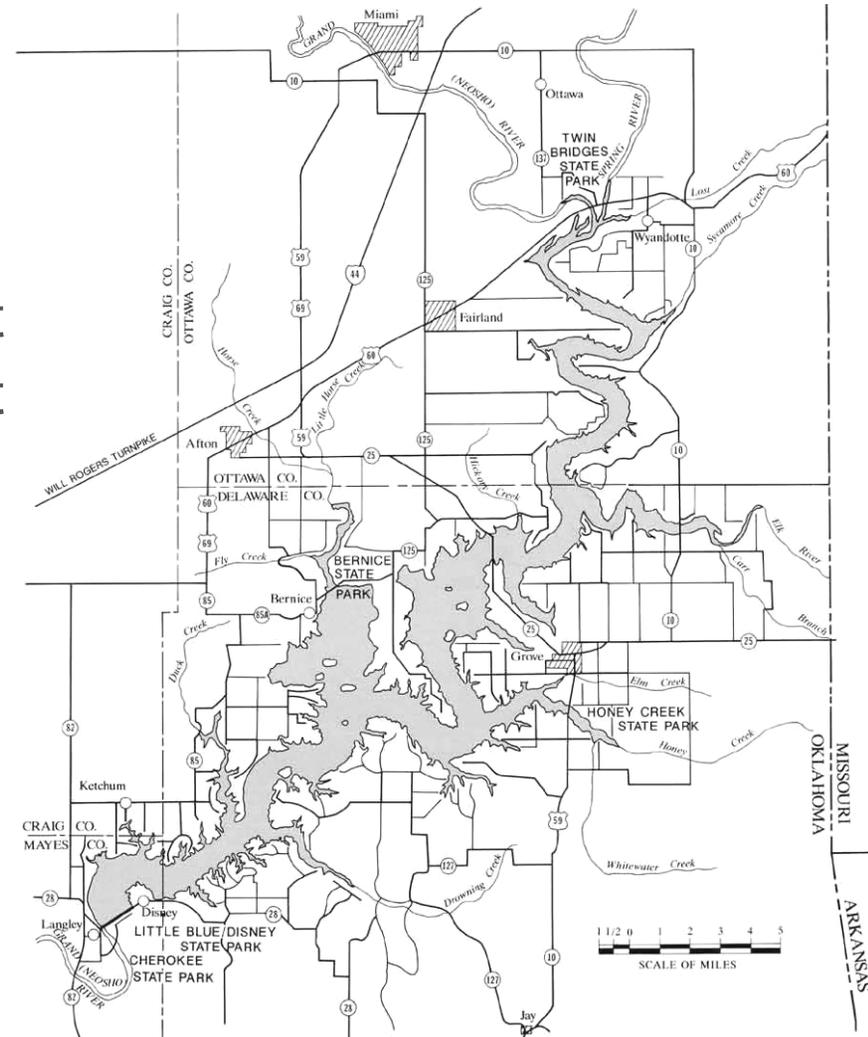


Grand Lake Facts

- 46,500 surface acres
- 1,672,000 acre-feet of storage
- 1,300 miles of shoreline
- mean depth = 36 feet
- maximum depth = 164 feet

*3rd best retirement location in U.S. (Rand McNally)

- One of only two Oklahoma lakes where residents can own lakefront property on water's edge



OWRB Water/Wastewater System Financing – Grand Lake Area

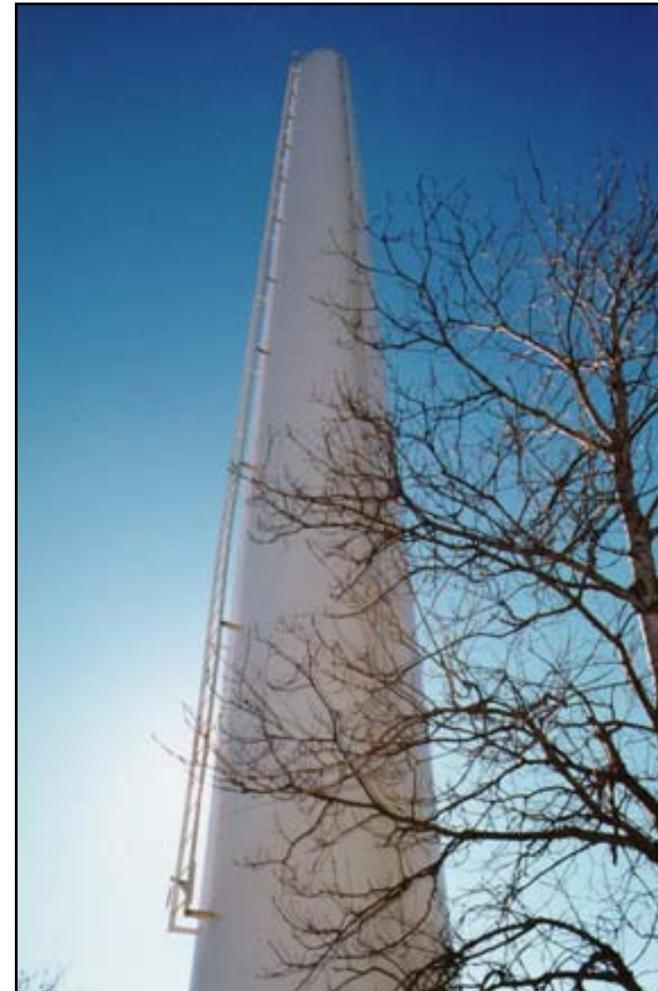
Loans:

- Bond Program
- Drinking Water SRF Program
- Clean Water SRF Program

Grants:

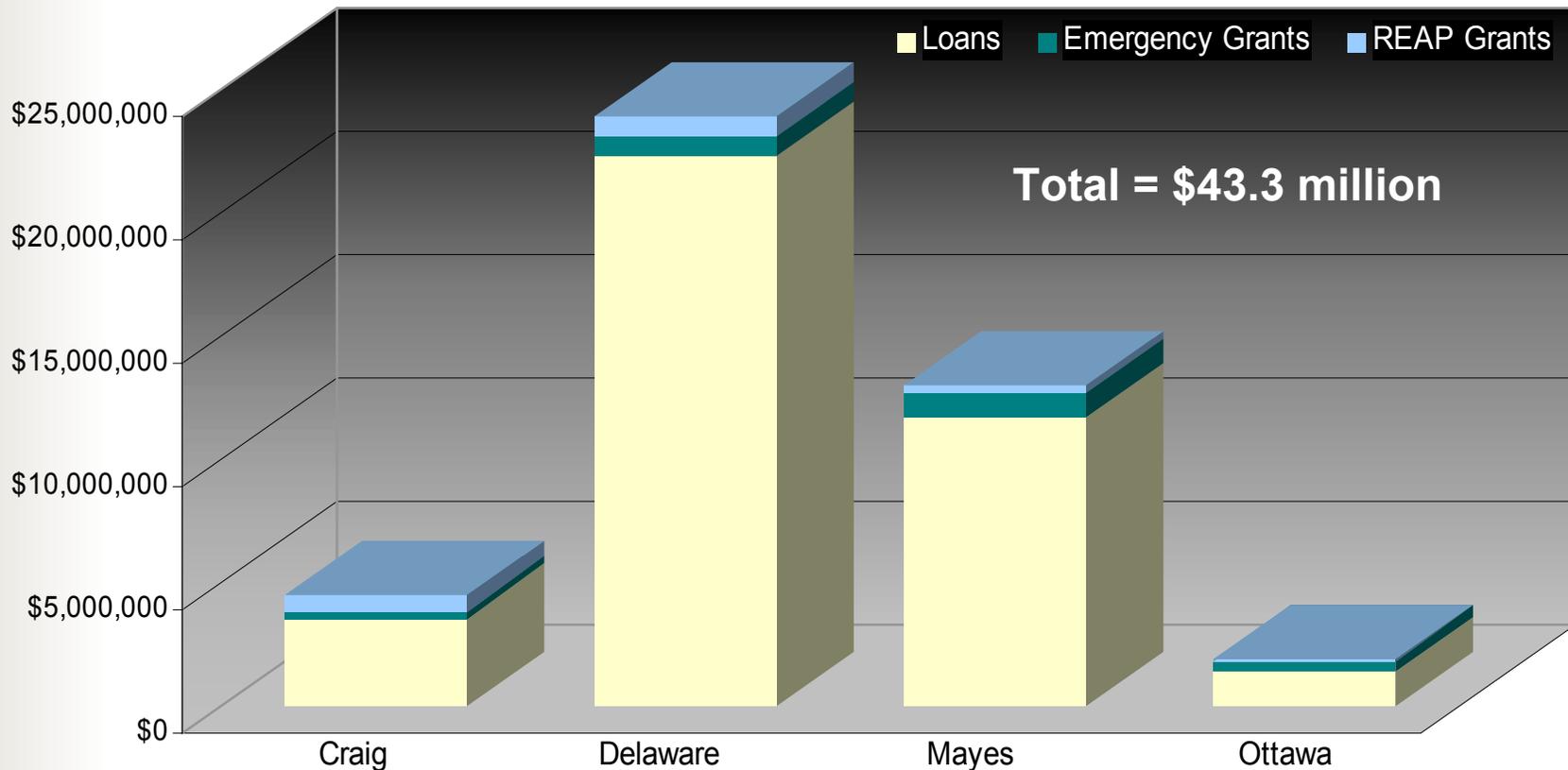
- Emergency
- Rural Economic Action Plan

****\$43.3 million total financing
approved in four-county lake
region***



OWRB Water/Wastewater System Financing – Grand Lake Area

Approved OWRB Loans/Grants



OWRB Water/Wastewater System Financing – Grand Lake Area

Grand Lake Public Works Authority:

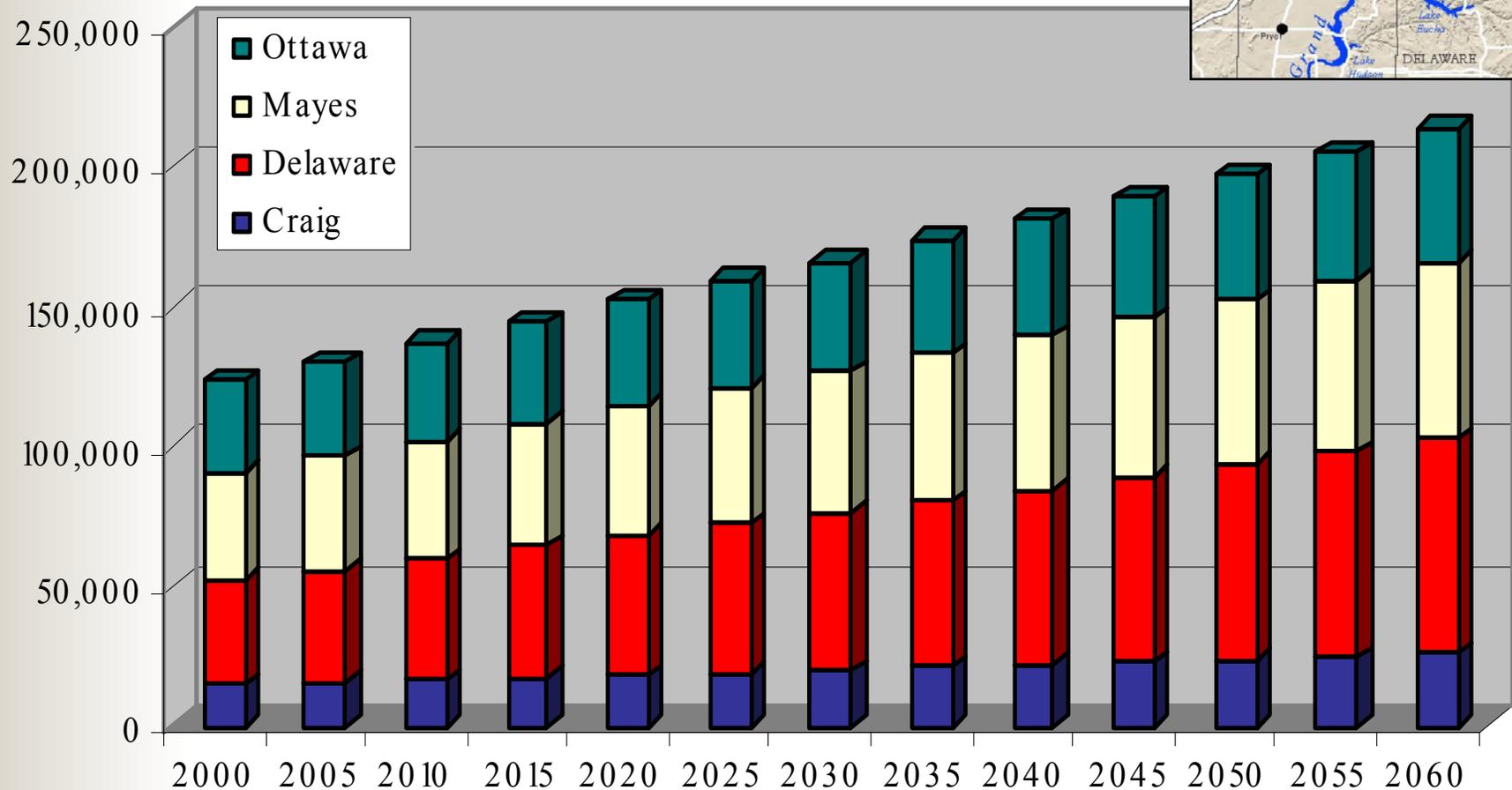
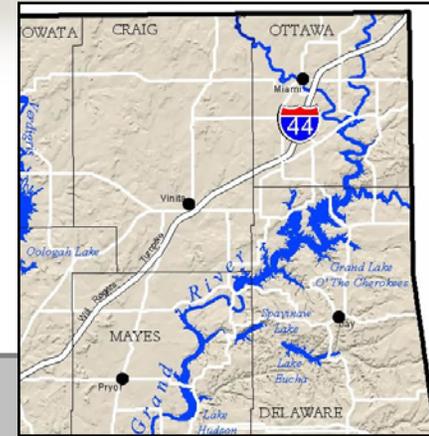
- Regional water supply & wastewater treatment system:
 - Similar to that established at Lakes Texoma, Kaw, and Tenkiller
- \$4.9 million in OWRB loans approved for Grand Lake PWA



Grand Lake Public Works Authority:

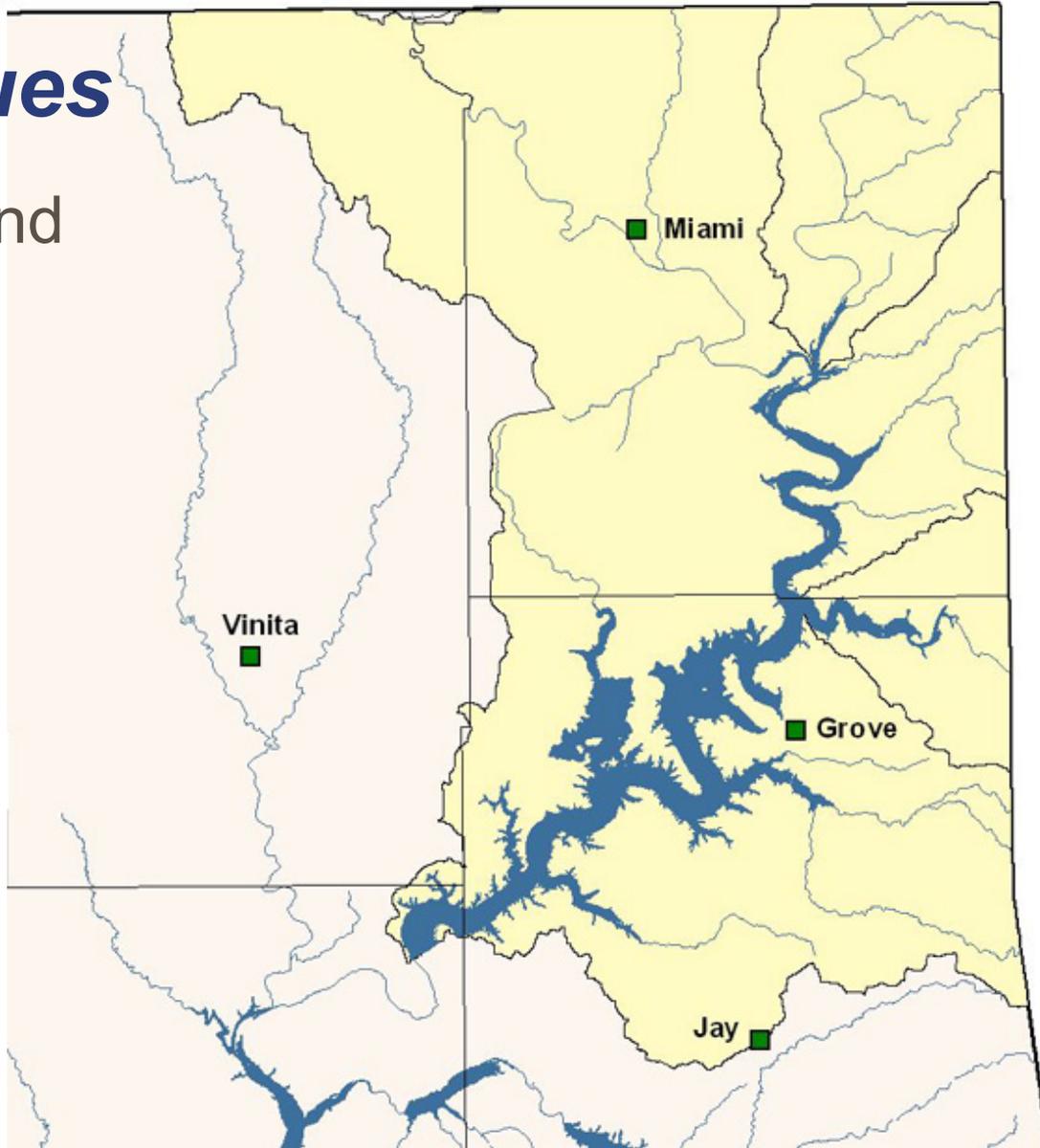
- wastewater treatment plant/interceptor sewer project
- 2 Clean Water State Revolving Fund Loans (\$3.5 million)

Population Projections 4-County Grand Lake Region



Grand Lake Watershed Issues

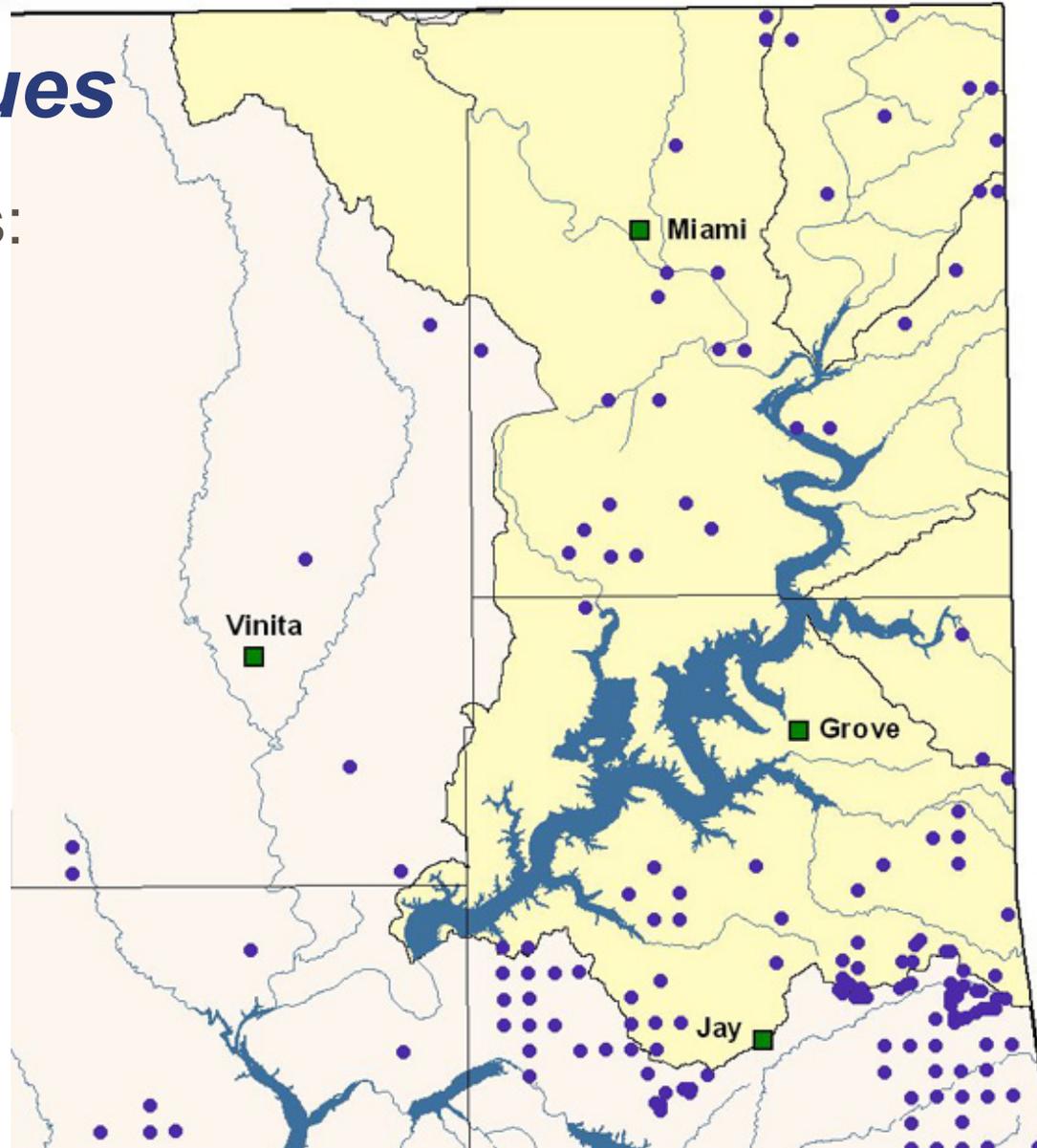
- Rapid growth and development in region:
 - shoreline development
 - multi-state resource
 - stormwater
 - wastewater treatment



Grand Lake Watershed Issues

● Poultry Operations:

- 34,000 tons of waste produced annually from 272 poultry houses in Oklahoma alone



Grand Lake Watershed Issues

- Poultry Operations
- NPDES Dischargers

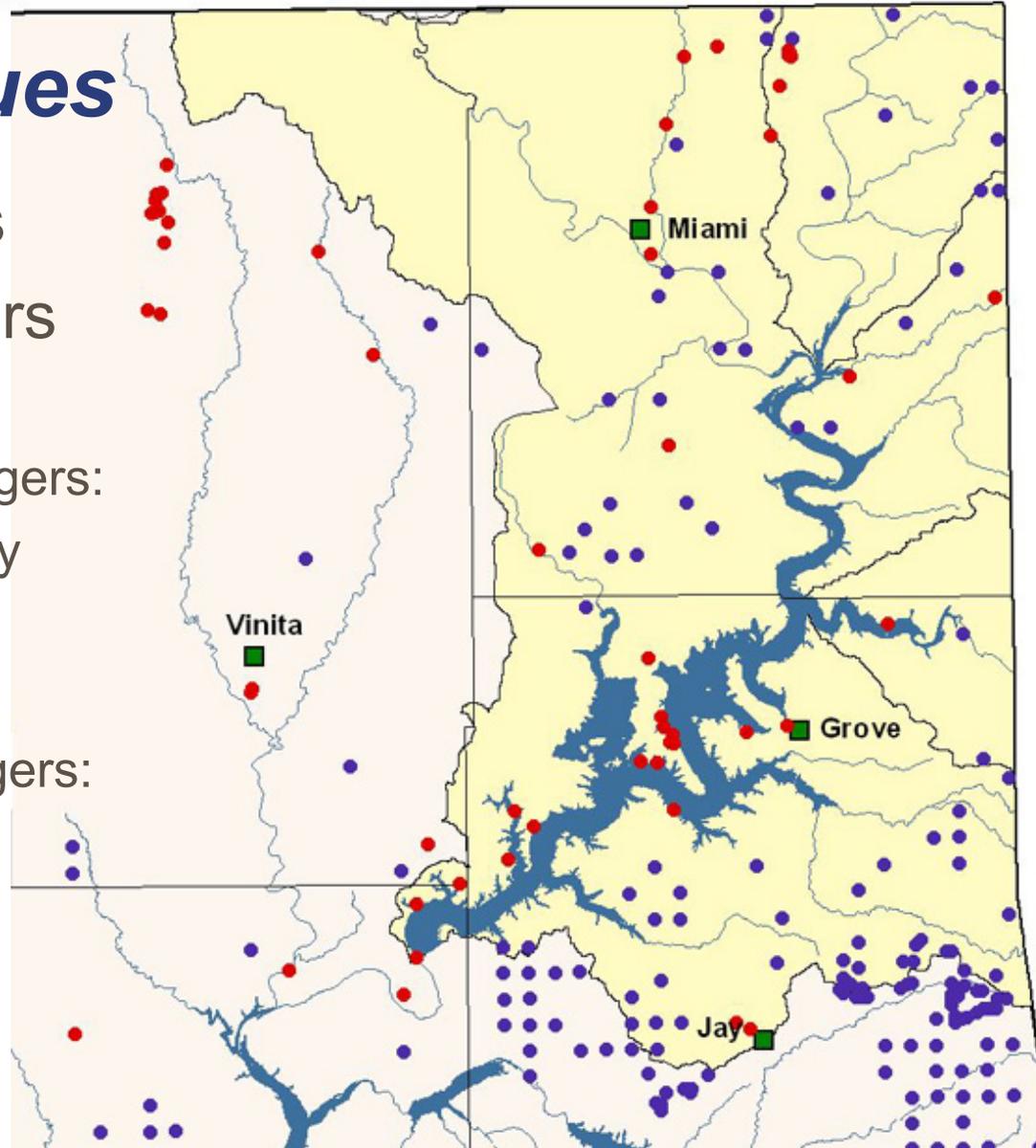
Major municipal dischargers:

- Jay Utilities Authority
- City of Miami

Major industrial dischargers:

- Simmons Foods

**Thousands of lake-side
septic tanks*





Grand Lake Watershed Issues

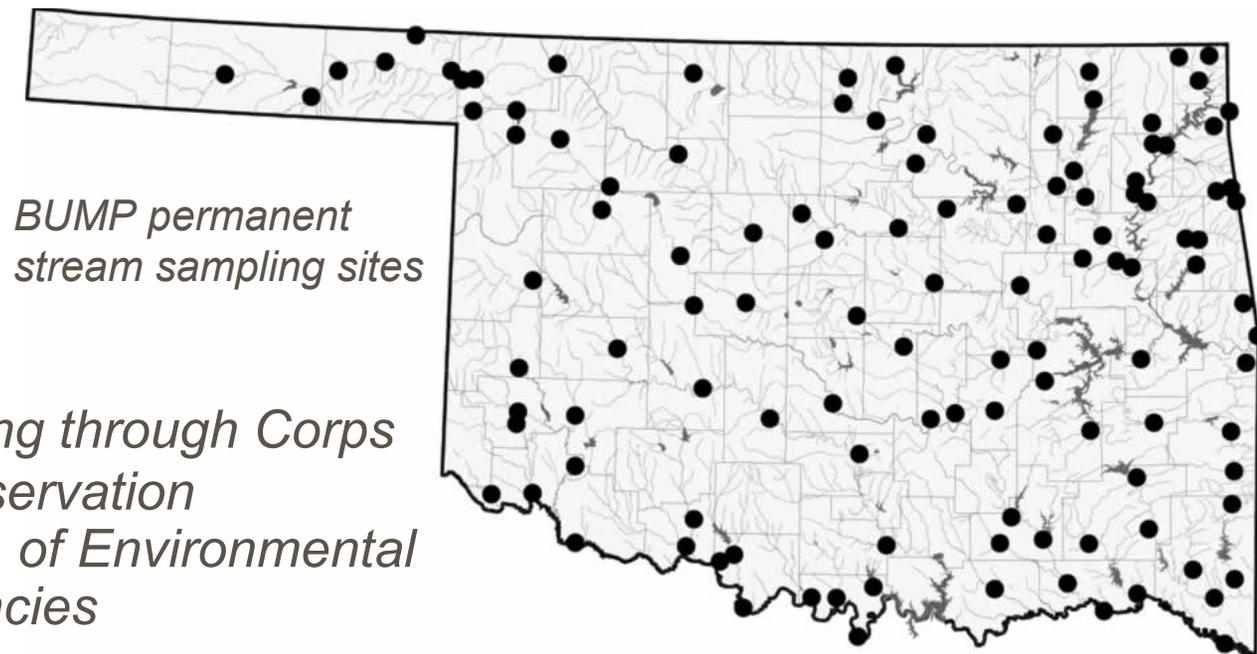
Grand Lake Sewer System Study (OWRB & Corps of Engineers):

- Phase I completed in 2000
 - Conceptual designs and cost estimates developed for the treatment and disposal of wastewater for four geographical regions around Grand Lake
 - Estimated cost per connection (assuming 100% participation) = \$24-30/month
- Phase II will refine design work, as identified by potential system users

OWRB Water Quality Monitoring at Grand Lake

Beneficial Use Monitoring Program (BUMP):

- Created in 1998
- Comprehensive statewide monitoring effort



**Additional monitoring through Corps
of Engineers, Conservation
Commission, Dept. of Environmental
Quality, other agencies*

OWRB Water Quality Monitoring at Grand Lake

BUMP Goals:

- Document beneficial use impairments
- Identify impairment sources, if possible
- Detect water quality trends
- Provide information for Water Quality Standards
- Assist in prioritization of pollution control activities



OWRB Water Quality Monitoring at Grand Lake

Summary of 2002 BUMP Report (4 sampling events August 2000--July 2001):

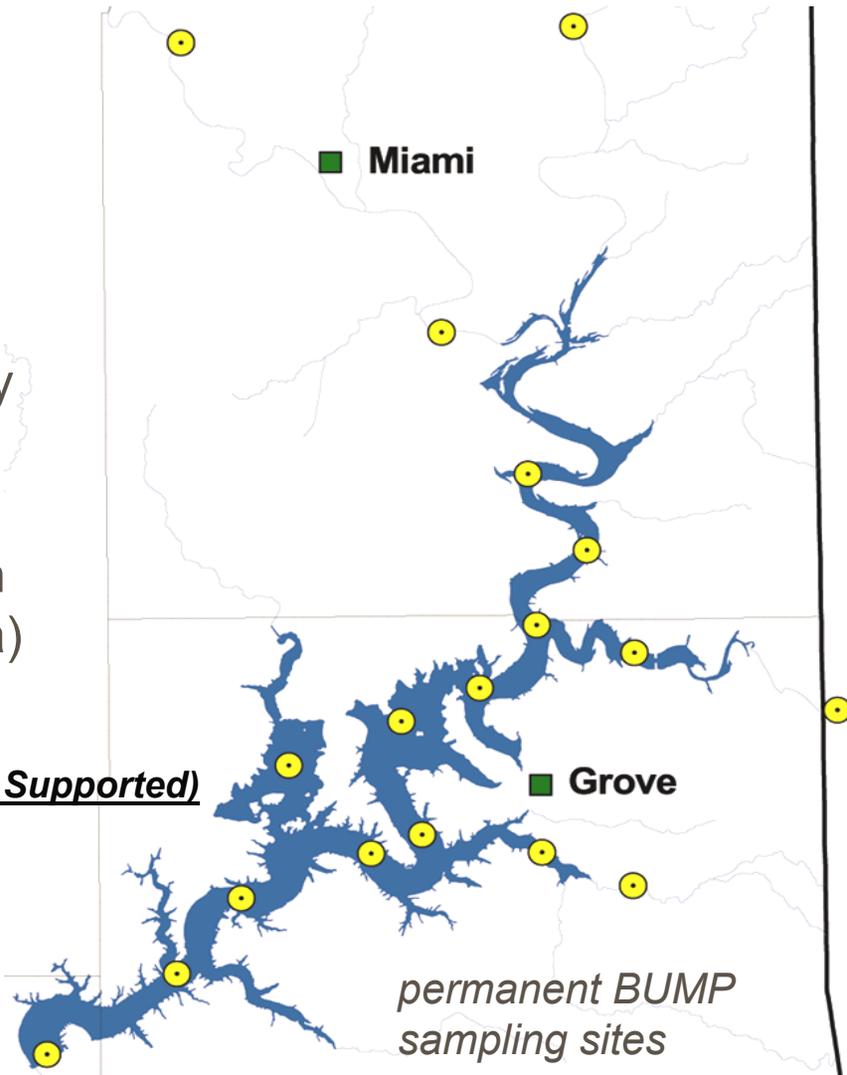
- Poor to average water clarity (based on Secchi depth)
- Eutrophic (high levels of productivity and nutrient-rich conditions; TSI/chlorophyll-a)

Stream

Neosho River (Commerce)
Neosho River (Conner Bridge)
Spring River (Quapaw)
Elk River (Missouri)
Honey Creek

Impaired Waters (Beneficial Uses Not Supported)

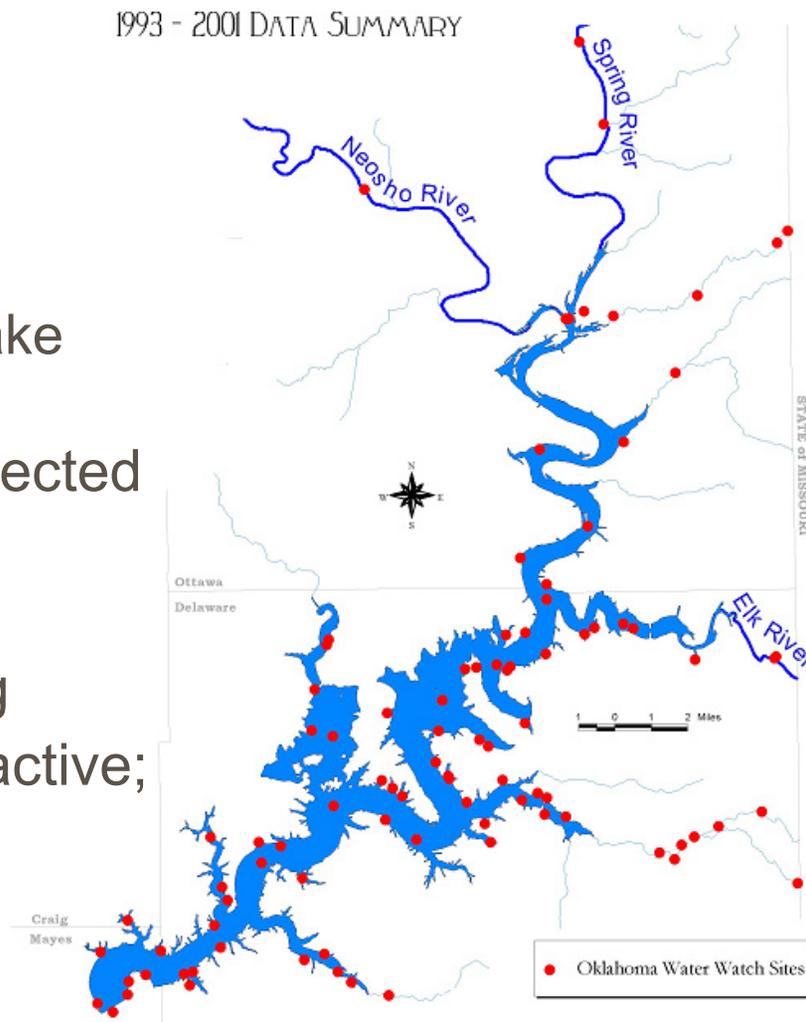
Fish & Wildlife
Fish & Wildlife
Fish & Wildlife
Primary Body Contact
Primary Body Contact



OWRB Water Quality Monitoring at Grand Lake

Oklahoma Water Watch Volunteer Monitoring Program:

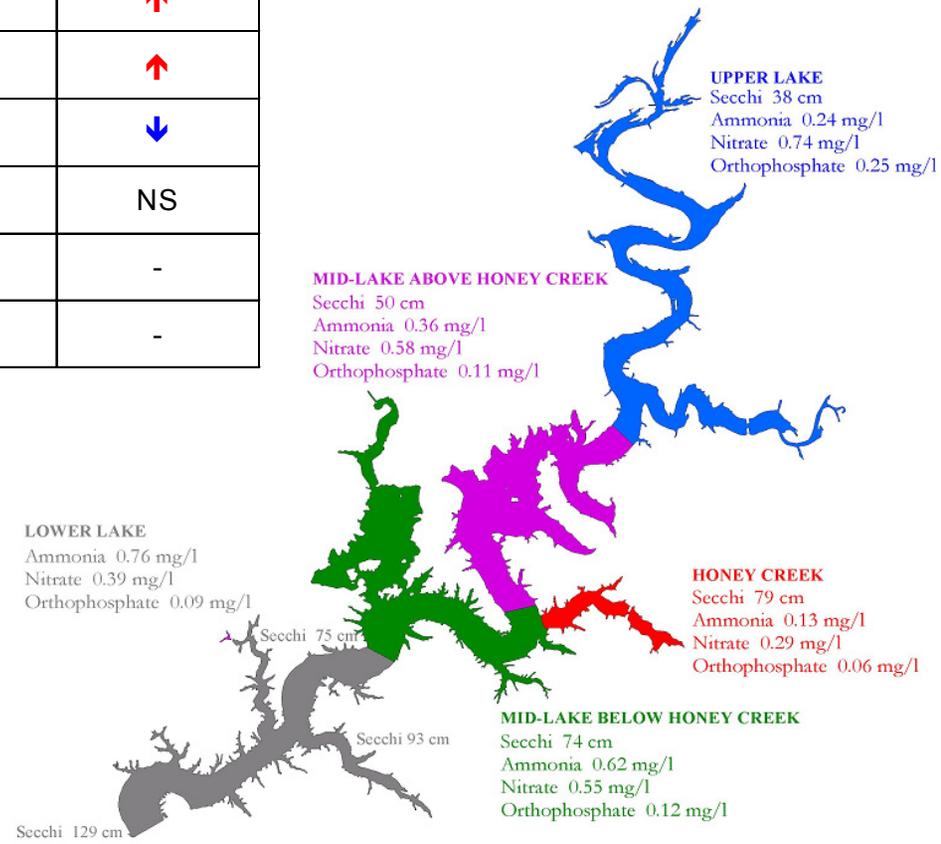
- Coordinated by Grand Lake Association
- >10,000 data points collected since 1993
- >90 volunteers
- >10,000 hours of testing
- >90 sampling sites; 48 active; 6 in-lake sites

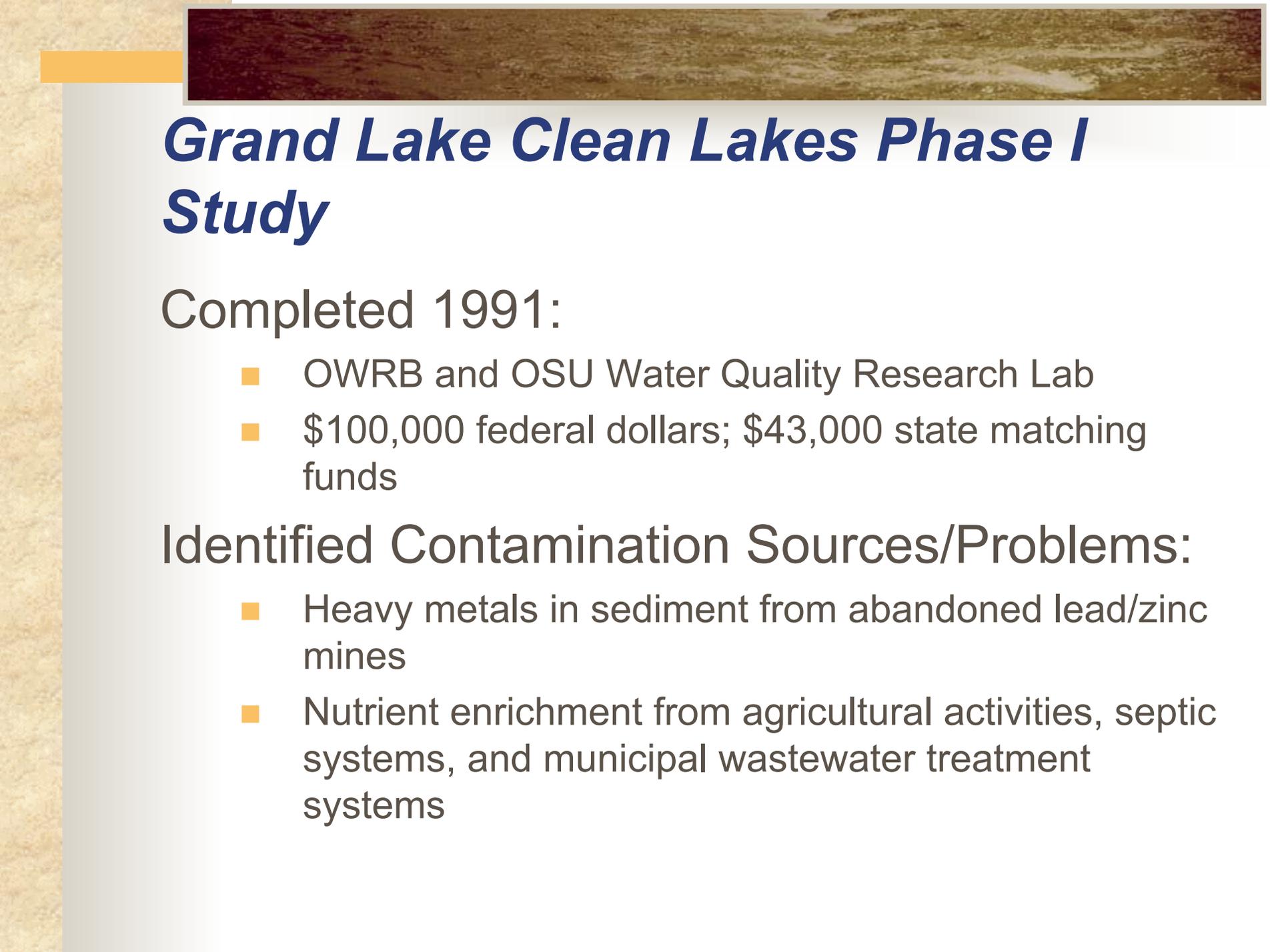


Volunteer Monitoring Trend Summary (1993-2001)

	Turbidity (Secchi depth)	Ammonia Nitrogen	Nitrate Nitrogen	Ortho- phosphate
Upper Lake	↓	↓	-	↓
Mid-lake Above Honey Creek	↑	↓	↓	↑
Mid-lake Honey Creek Cove	↑	↓	NS	↑
Mid-lake Below Honey Creek	NS	NS	NS	↓
Lower Lake Upper	NS	↓	↓	NS
Lower Lake Dam	↑	-	-	-
Drowning Creek	↑	-	-	-

NS = no significant change





Grand Lake Clean Lakes Phase I Study

Completed 1991:

- OWRB and OSU Water Quality Research Lab
- \$100,000 federal dollars; \$43,000 state matching funds

Identified Contamination Sources/Problems:

- Heavy metals in sediment from abandoned lead/zinc mines
- Nutrient enrichment from agricultural activities, septic systems, and municipal wastewater treatment systems



Comprehensive (Clean Lakes) Study of Grand Lake

- Senate Bill 408 (\$125,000)
- OWRB & Oklahoma Secretary of Environment:
 - Department of Environmental Quality
 - Scenic Rivers Commission
 - OK Conservation Commission
 - OK Department of Commerce
 - OK Department of Wildlife Conservation
 - OK Dept. of Agriculture, Food and Forestry
 - Grand River Dam Authority
- Goals:
 - address water quality impacts associated with rapid growth in region
 - conduct a bathymetric study to assess lake's current capacity and sedimentation rate

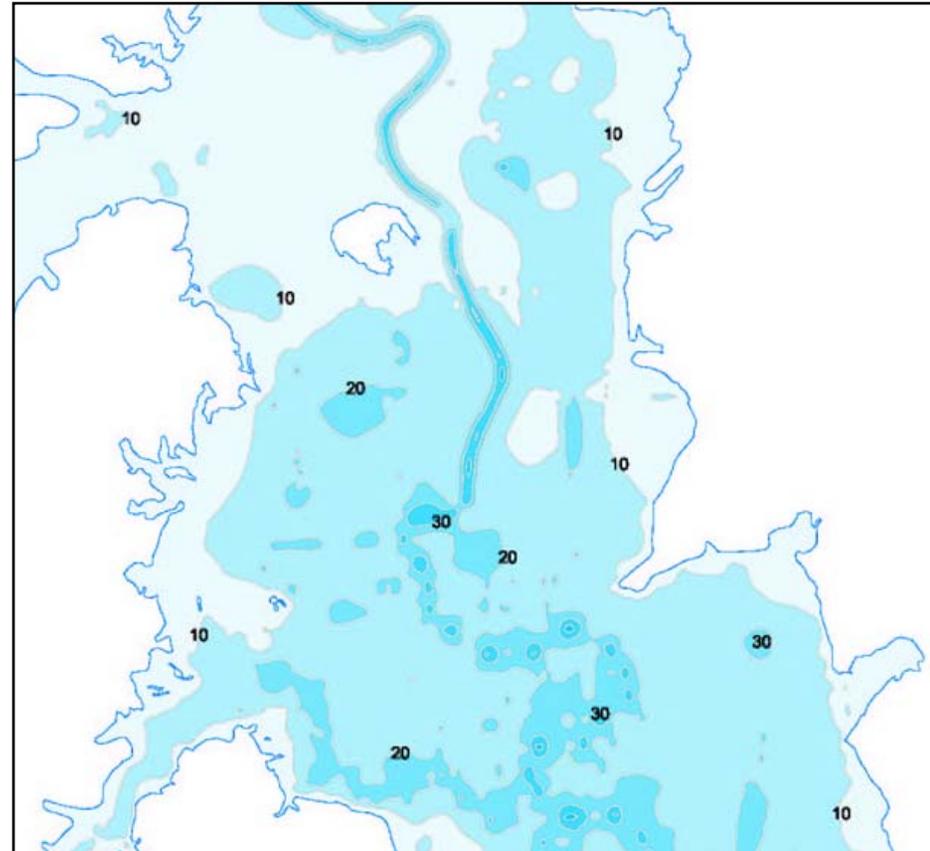
Comprehensive (Clean Lakes) Study of Grand Lake

Bathymetric Study:

- Employ global positioning satellite technology to calculate lake depth
- Compare with previous data
- Utilize OWRB's Geographic Information System (GIS)

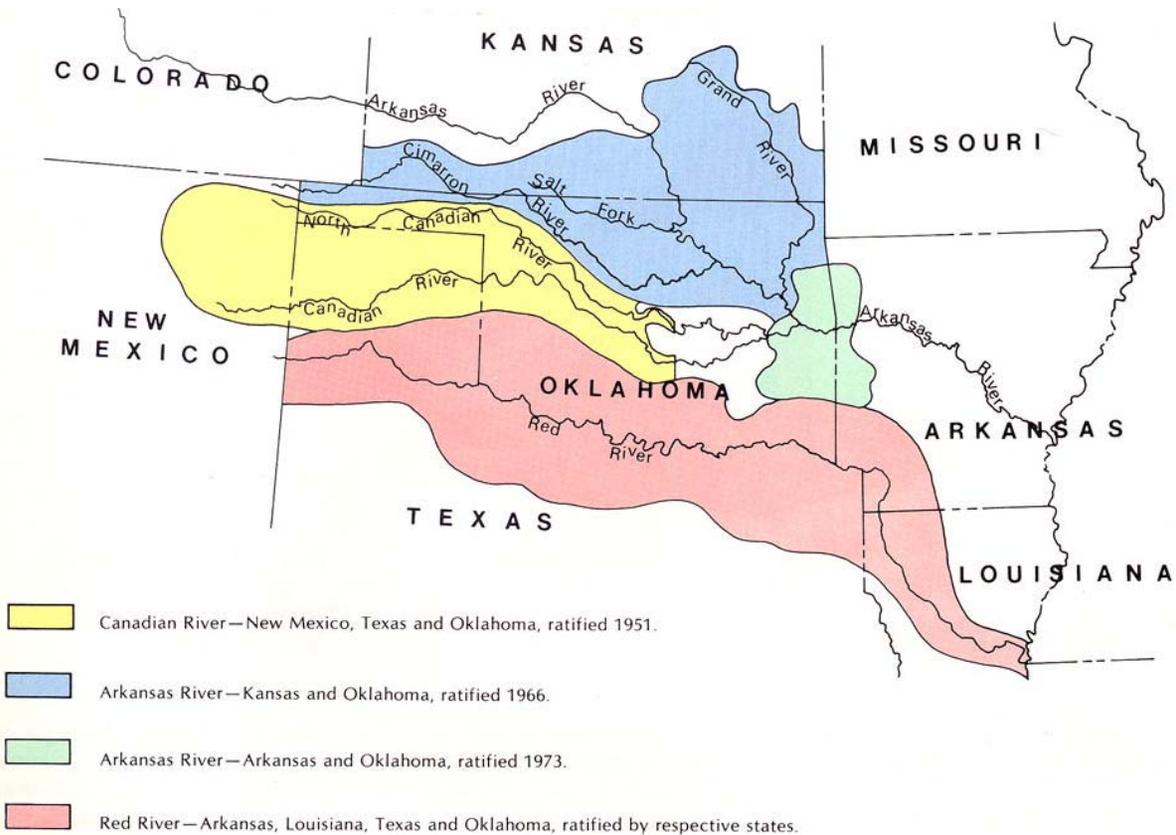
Sedimentation Survey:

- Determine sedimentation since impoundment



Kansas-Oklahoma Arkansas River Compact Commission

- Created in 1966 to address issues impacting shared, interstate waters





Addressing Water-Related Impacts Associated with Future Growth in the Grand Lake Region

- Continue/expand monitoring efforts:
 - BUMP
 - Water Watch
- Water/wastewater system improvements:
 - Continue to explore regionalization and other opportunities
- OSE/OWRB Study (SB 408):
 - Bathymetric mapping
 - Water quality evaluation
 - Sedimentation survey
 - Clean Lakes Study
- Non-point source/stormwater controls to limit nutrient enrichment and slow eutrophication
- Balance water quality issues with regional economic development goals

Oklahoma Water Resources Board

Oklahoma's Water Agency

Questions?

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