

Hydrologic Issues and Information Needs of the National Park Service

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**“Linking Hydrological Change and Ecological
Response in Streams and Rivers of the
Eastern United States”**

**February 8, 2005
Herndon, Virginia**

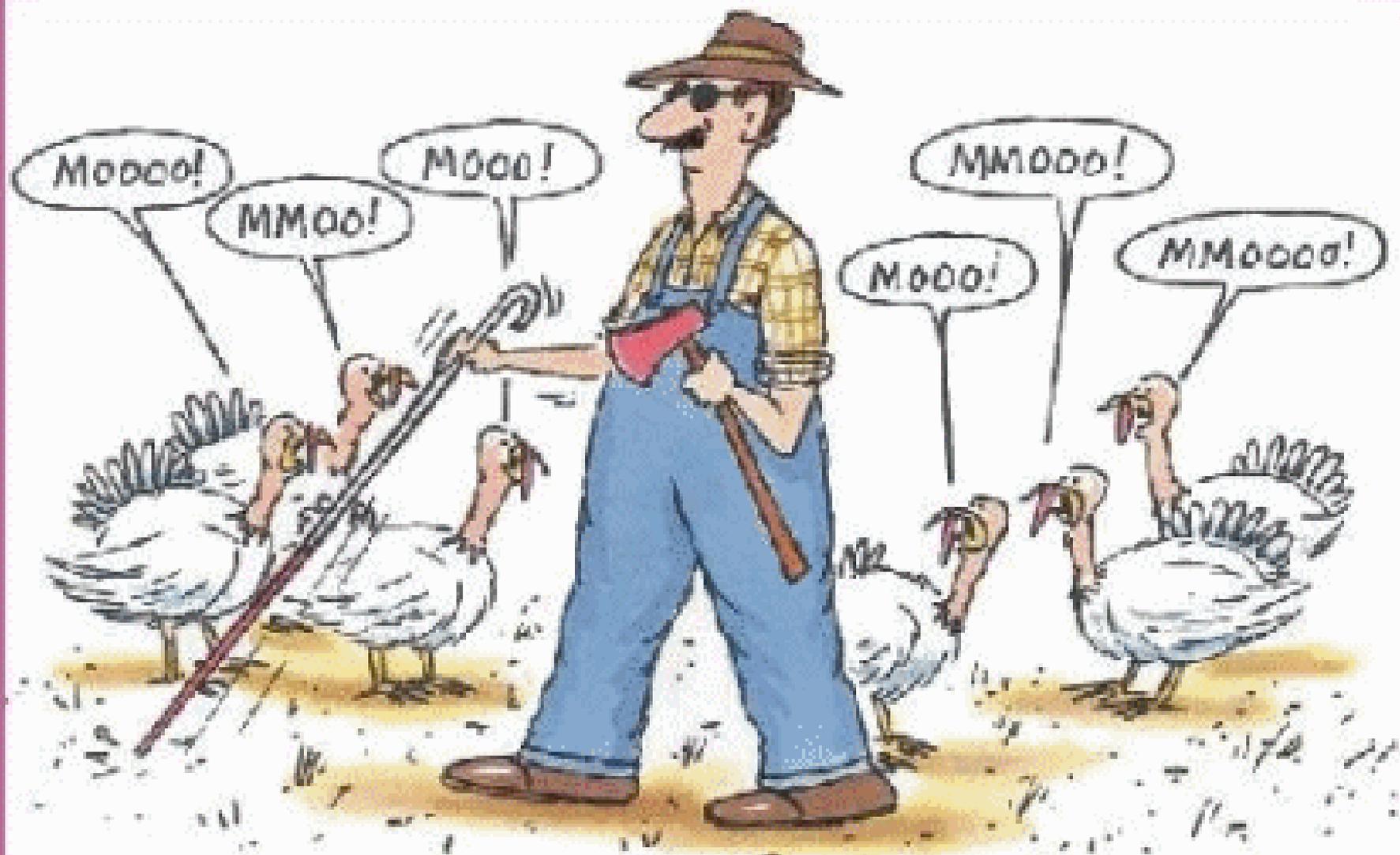


National Park Service

- **Manages 388 units**
- **About 250 units east of the 100th meridian.**
- **Threats caused by growth, development, and drought pressures.**
- **Park ecosystems seldom, if ever, coincide with legal, administrative and/or watershed boundaries.**
- **Threatened and endangered species**

NPS Mandate

NPS Organic Act - “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations”
(16 USC § 1)



Seeking Thanksgiving Dinner!

Challenge!

- How does the NPS assess *impairment* and develop necessary scientific tools to determine management objectives for *desired future resource conditions*, including water quality and instream flows?

Current NPS Issues in the Eastern U.S.

(Case Studies)

- NRC Vital Signs **Water Quality** Program
- Resource Impact of a Proposed **Tributary Dam** - Buffalo NR
- Cumulative **Impoundment Impacts** on Wild and Scenic River Values - Obed WSR
- Resource Impacts of **Bank Stabilization** and Artificial **Island Construction** - Missouri NRR

Current NPS Issues in the Eastern U.S.

- **Instream Flow Needs for Interstate Stream Compacts** - Chattahoochee NRA and Delaware Water Gap NRA
- **Impact of Groundwater Withdrawals on Vernal Wetland Vegetation** - *Cape Cod NS*
- **Land exchange for municipal reservoir** – *Blue Ridge Parkway*

Vital Signs Monitoring Networks



**Natural Resource Challenge
Water Quality Monitoring**

Natural Resource Challenge Water Quality Monitoring

TOTAL FISCAL ROLLOUT

- 2001: \$1.275 million
- 2002: None
- 2003: \$1.775 million
- 2004: \$2.372 million
- 2005: \$2.9 million

- 14 of 32 networks in east
- \$1.206 million to networks



Categories for Monitoring

- **Category 1 – Clean Water Act or Regulatory**
 - 303d water bodies (determine TMDL's)
 - Anti-degradation (ONRW designation)
 - Meet NPS strategic goals
- **Category 2 – Network/Park Threats**
 - May not fail designated use/numerical standards but...
 - Present/future ecological impairments possible
 - Need to establish baseline condition
 - Tie-in with other vital signs (e.g. Air Resource)

Freshwater Core Parameters

Required at all monitoring stations

- Water Quality
 - Temperature
 - pH and Specific Conductivity
 - Dissolved Oxygen
- Water Quantity
 - Flow or Discharge
 - Stage/Level
- Photographic Documentation



**Searcy County's Proposal to Dam
Bear Creek Above Buffalo National
River, Arkansas**



MISSOURI

Kansas City

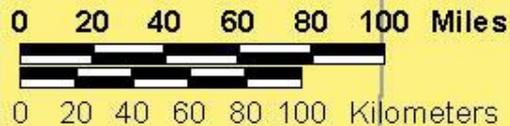
Jefferson City

St. Louis

Rolla

Springfield

Cape Girardeau



Ozark National Scenic Riverways

Fayetteville

Harrison

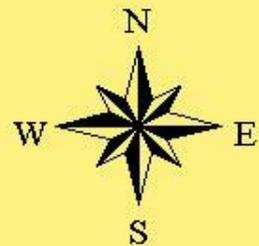


Buffalo National River

Bear Creek Area

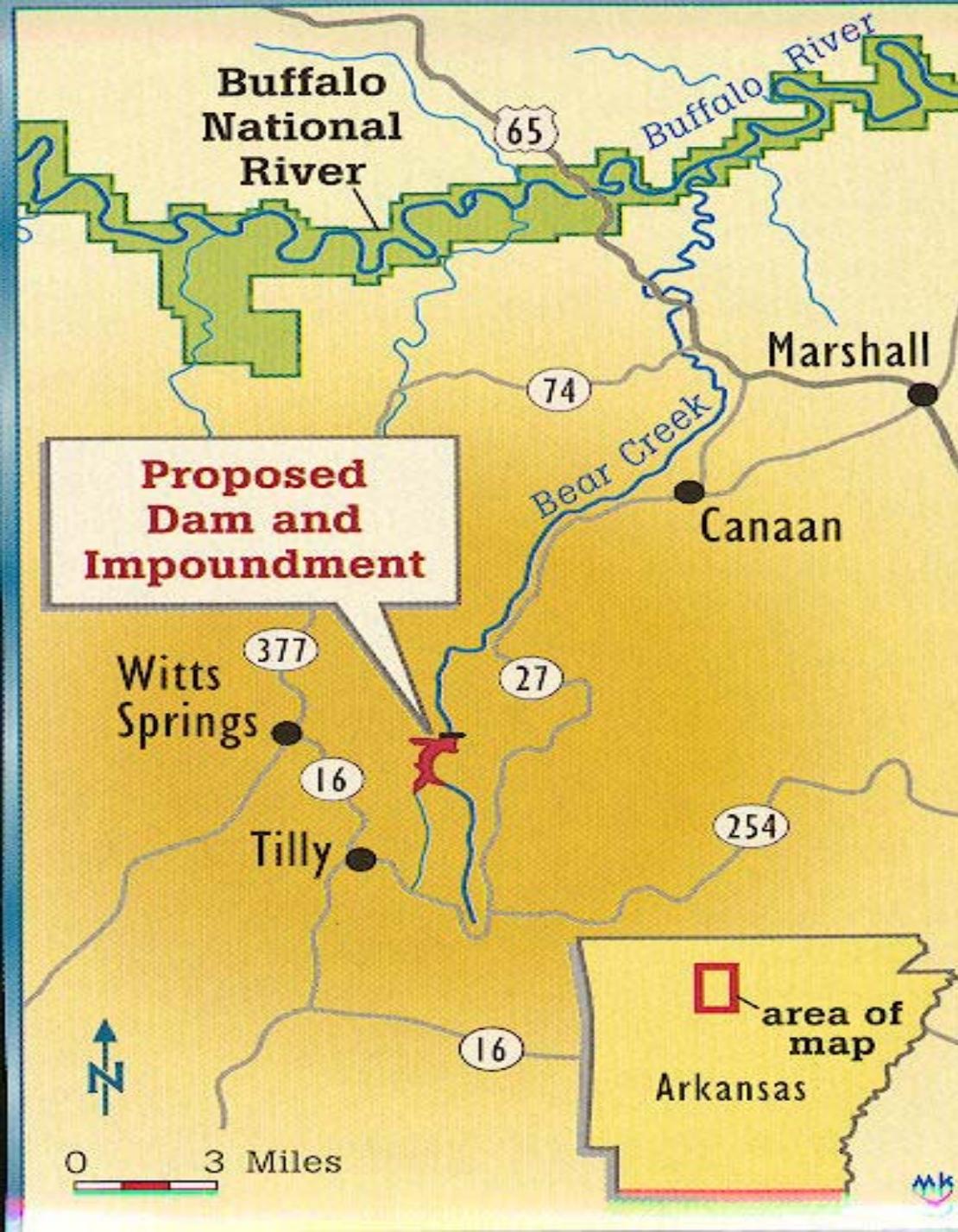
ARKANSAS

Little Rock



Bear Creek Dam

- 25 river miles above NPS boundary
- 107 foot earthen dam
- 100 acre reservoir
- Multi-purpose water supply project (3.7 million gpd)
- Dam captures 12% of Bear Creek and about 1.1% of Buffalo River watershed



History of 404 Permit Bear Creek Dam

- Construction requires 404 permit and EA
- NPS advised COE:
 - Secretary (DOI) must make determination
 - Insufficient data to make determination
- COE District denied permit
- COE Division issued 404 permit
- Seven environmental groups sued COE
- COE revoked permit
- County needs NPS determination

NPS Needs Data To Make Determination

- **Natural Flow Patterns**
- **Water Quality**
- **Sediment and Organic Matter Transport**
- **Fish, Mussels and Macroinvertebrates**
- **Riparian Communities**
- **Scenic and Recreational Values**



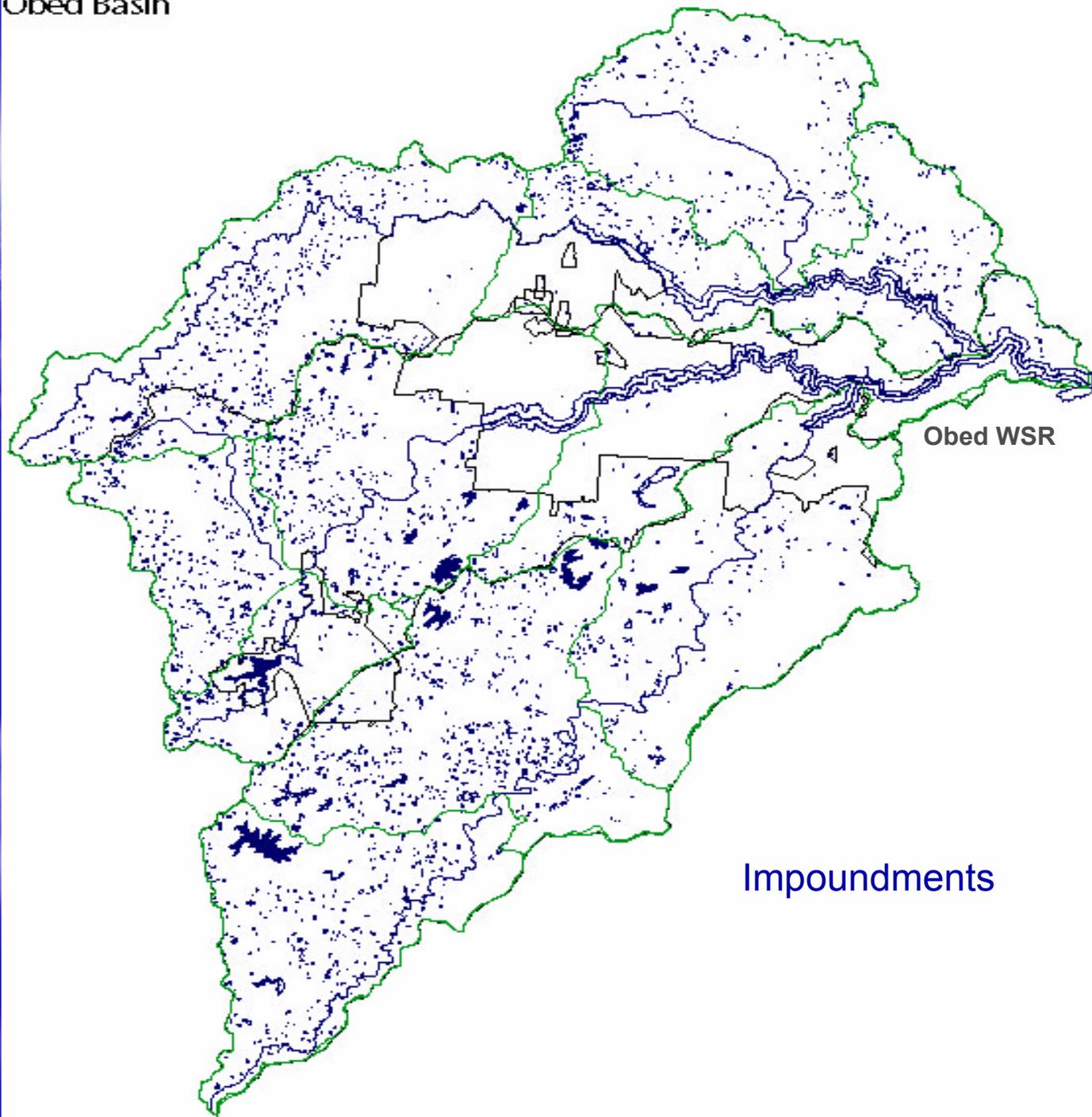
Cumulative Impoundment Impacts on Wild and Scenic River Values - Obed WSR



Paired Basin Study on Fox and Elmore Creeks:

**Evaluate impact of over 4,000
impoundments on the Obed WSR
hydrology?**

Obed Basin



Obed WSR

Impoundments

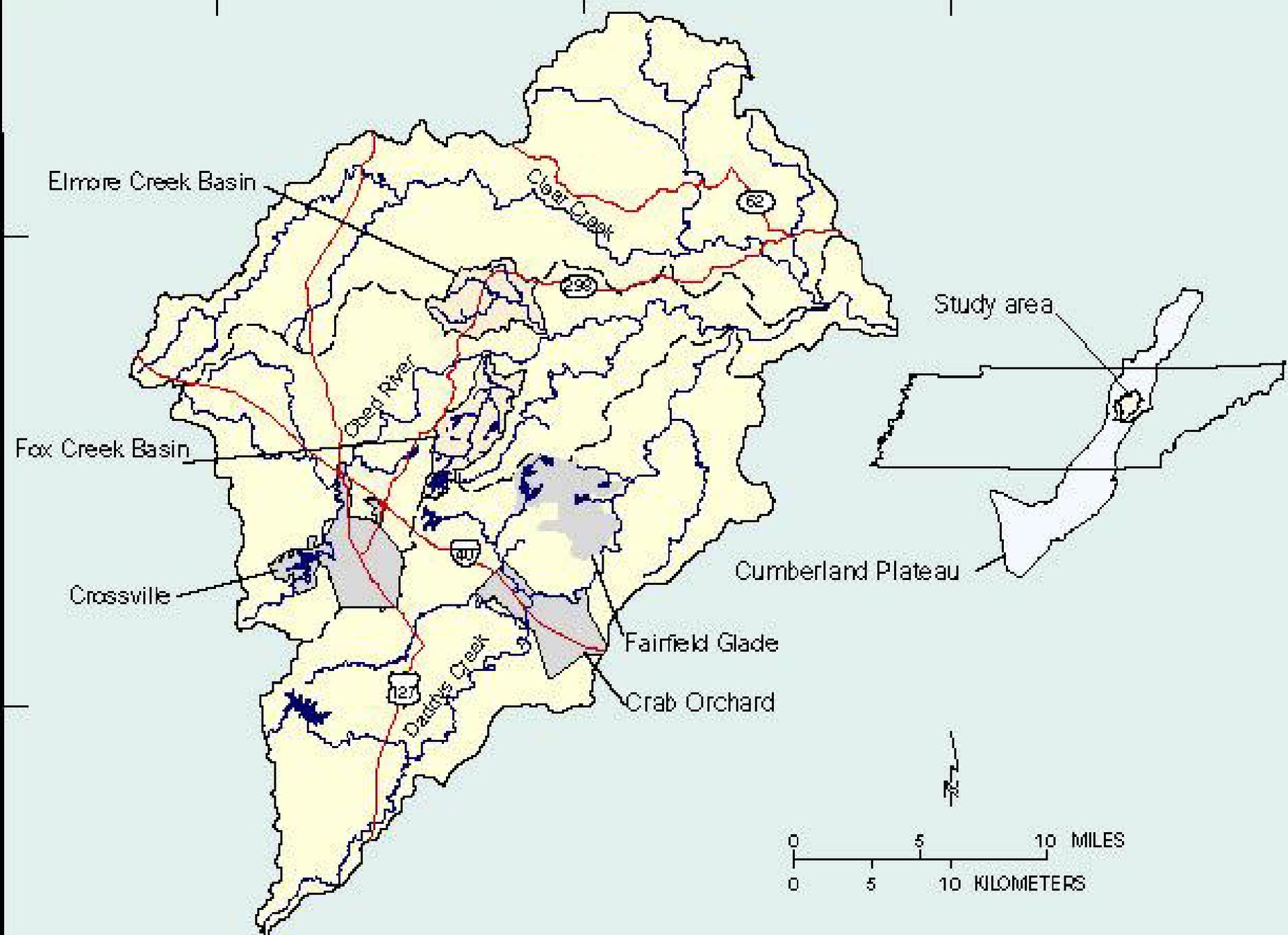
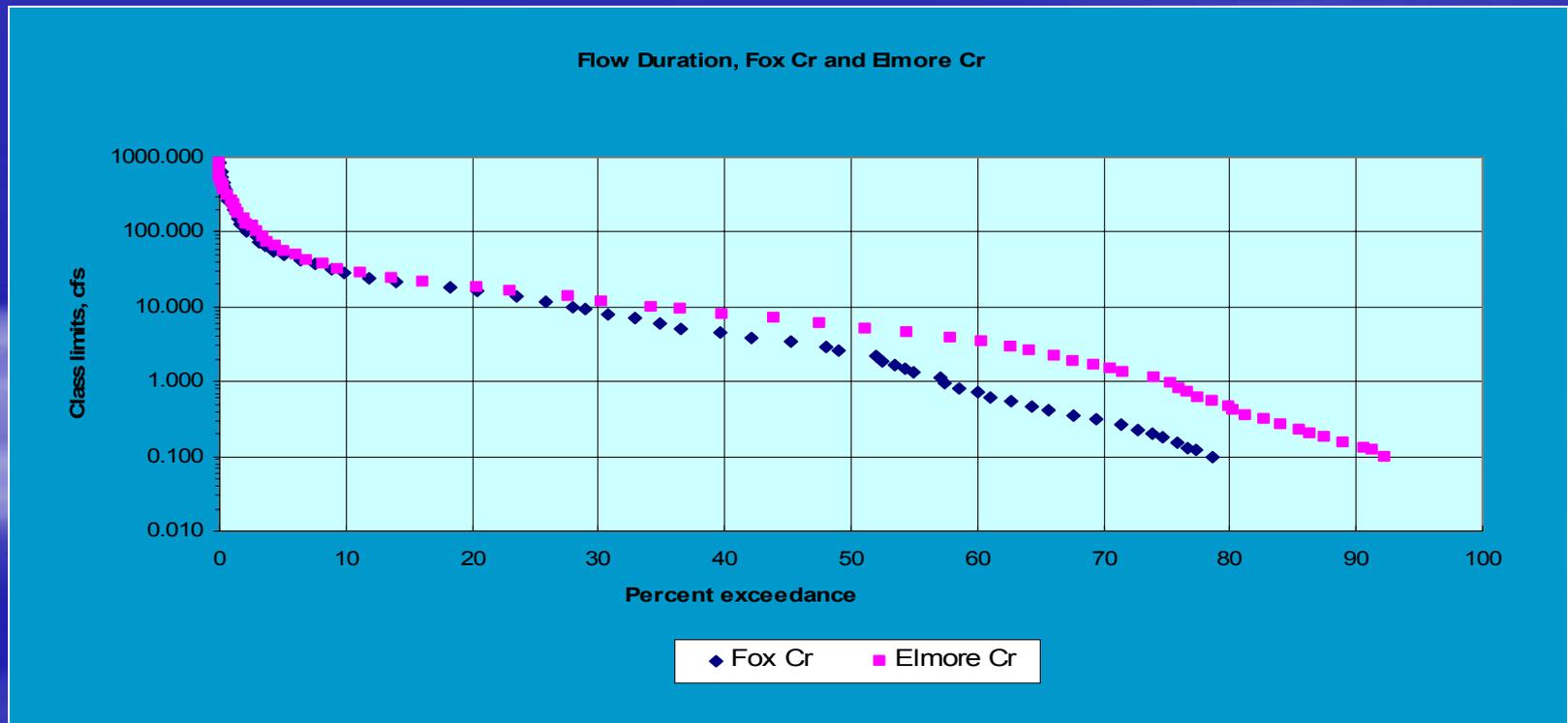


Figure 1. Map showing location of Fox Creek and Elmore Creek Basins with the Obed River Basin.

Preliminary conclusions:

- When **Fox Creek** dams full/overflowing, flows in Fox and **Elmore** Creeks are similar
- When Fox Creek dams not flowing low flows affected. ET may be a cause.



Future actions

- Update impoundment maps
- Collect synoptic measurements in 25 sub-basins to test effects of impoundments
- Develop impoundment indices
- Evaluate resource impacts caused by flow changes

Resource Impacts of Bank Stabilization and Artificial Island Construction - Missouri NRR



Missouri River Basin



Fort Peck

Montana

Garrison

North
Dakota

Wyoming

South
Dakota

Oahe

Big Bend

Ft Randall

Gavins Point

Iowa

Nebraska

Colorado

Kansas

Missouri

Conflict – Bank Stabilization v. Wild and Scenic River Values









Threatened and Endangered Species



Emergent Sandbar Habitat Construction



Impact on Outstandingly Remarkable Values



Threats/Challenges/Issues

- **Growth, development and drought pressures will increase**
- **Legal, administrative and watershed boundaries will not be redefined**
- **Park ecosystems and waters will be affected**
- **Impairment will be difficult to define/assess**
- **Scientific data/information will be needed to make difficult management decisions**

NPS Information Needs

- **Baseline Inventories**
- **Gages for “Ecosystem Purposes”**
- **Surface and Ground Water Models**
- **Habitat Simulation Models for Fish, Insects and Mussels**
- **Methods to Assess Instream Flow, Spring Flow and Ground Water Changes on Vegetation, Aesthetics, Recreation and Cultural Values**
- **Economic Models to Assess Resource Protection in Complex Water Allocations**

How Will NPS Use Data/Information?

