Development and implementation of a physical, chemical, and biological survey of Ouachita Mountain ecoregion streams

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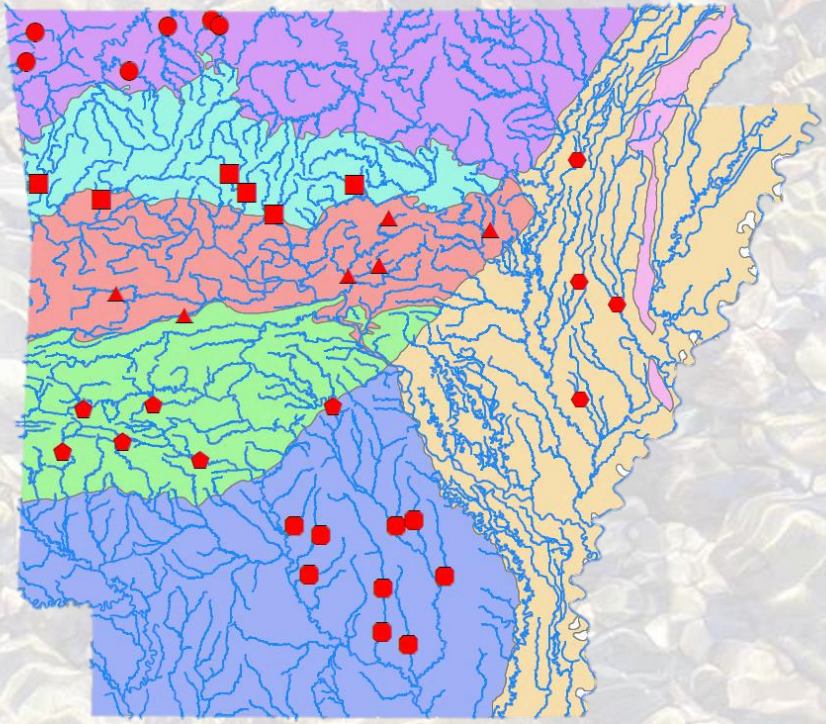
A project begins

- Combination of two 106 grants
  - Extraordinary Resource Water: Nutrient Study
  - Determine nutrient thresholds for ERWs in Ouachita Mountains
  - Continuation of Ozark and Boston Mountain ERW projects
- Ambient Biological Monitoring Program
  - Add biological samples to ambient water quality locations in Ouachita Mountains
- Go big
  - Design an all-encompassing project
  - Replicate across ecoregions

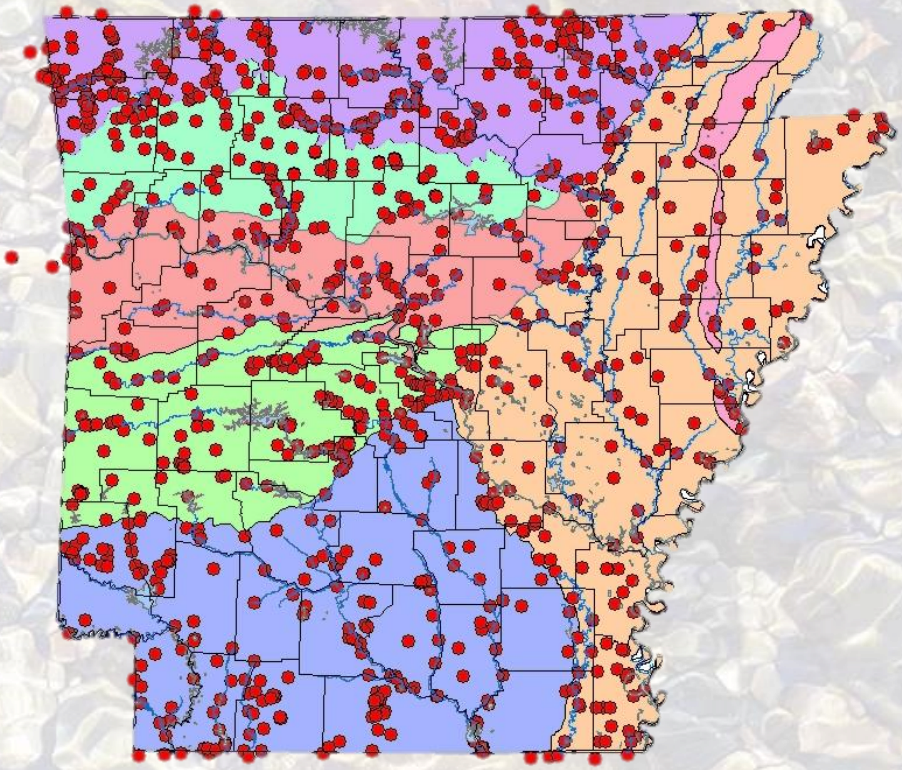
Why we need it

- 1987 ADEQ (Arkansas Department of Pollution Control and Ecology) published Physical, Chemical, and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas
  - Findings used for Reg. 2 criteria
    - Never finished
  - Poor geographic distribution
  - Low sample size
  - Varying drainage size
  - One year of data
  - Least-disturbed?
  - Comparable?



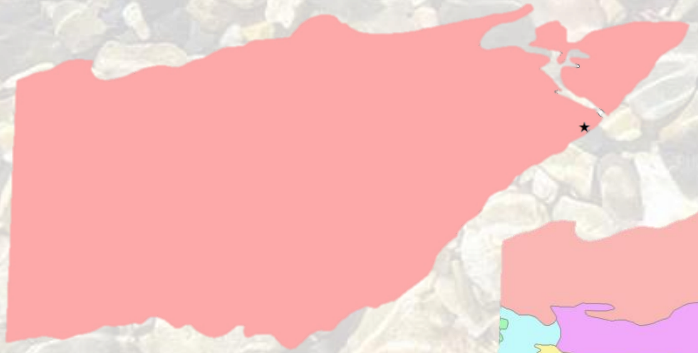
More on why we need it

- Improvement, but..
  - 30+ years
  - Limited paired physical, chemical, and biological data
  - Multiple methods
- Need large dataset
  - Current
  - Consistent
  - Thorough



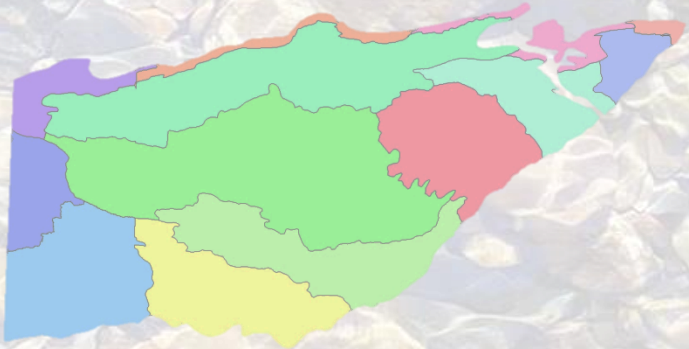
Goals

- Develop, update, or confirm criteria.
- Determine appropriate scale for criteria.
  - level 3 or 4 ecoregion
  - drainage basin
  - watershed size



Level III OM

Level IV OM



Basin OM

- Update or confirm current fish and macroinvertebrate IBI's.

Ouachita Mountains

Work plan

- 2 ½ year project began January 2016.
- 62 sites
  - Monthly water collection
  - Biology and habitat
    - Summer periphyton

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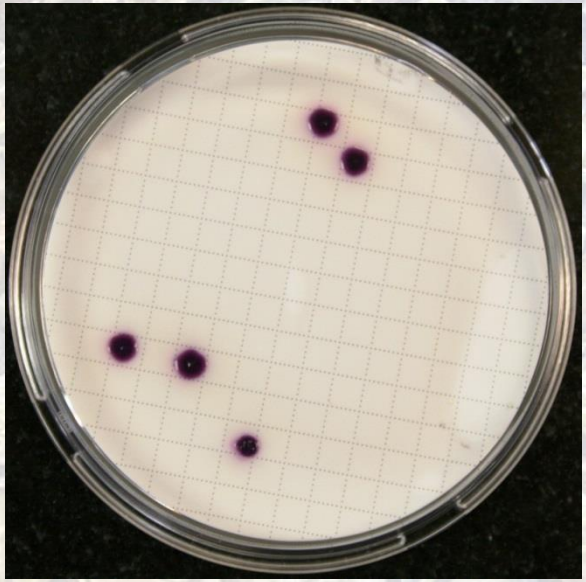
    - Eight primary contact season *E. coli* collections



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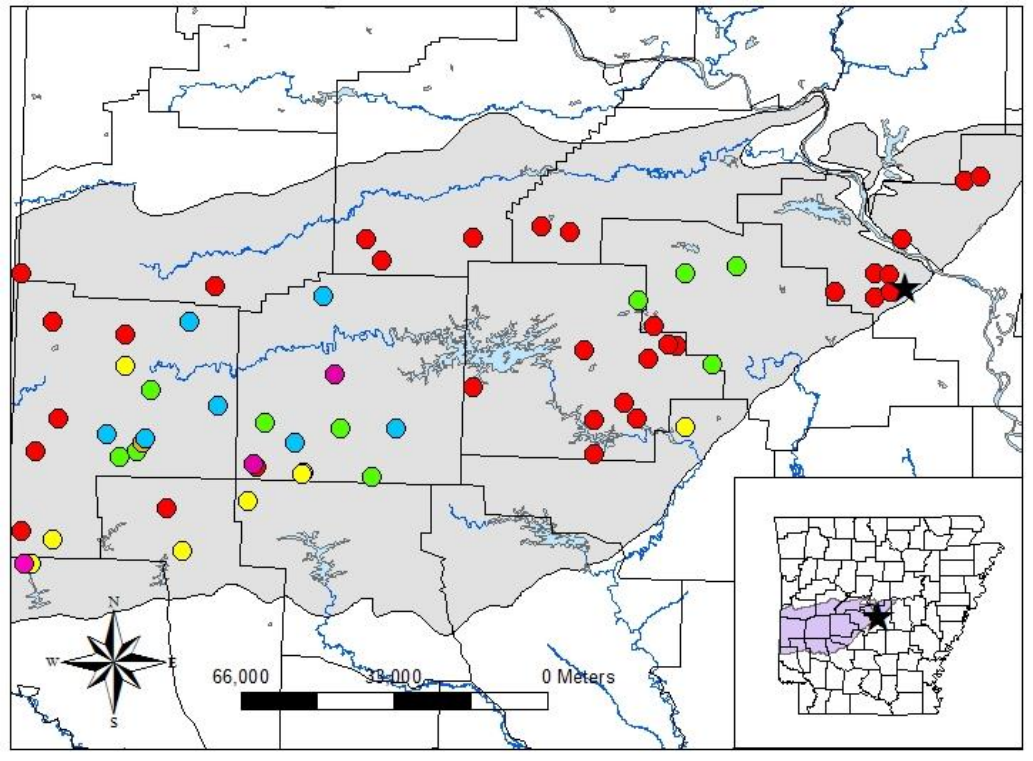
  - Monthly water collection
  - Biology and habitat
    - Late fall macroinvertebrates

Site selection

- Number of sites determined by staffing limitations (62).
- Physical site requirements:
  - Wadeable >50% of reach
  - Accessible year round
  - >4 sq. mi.
  - Good geographic distribution
  - Uniform distribution of LULC rankings



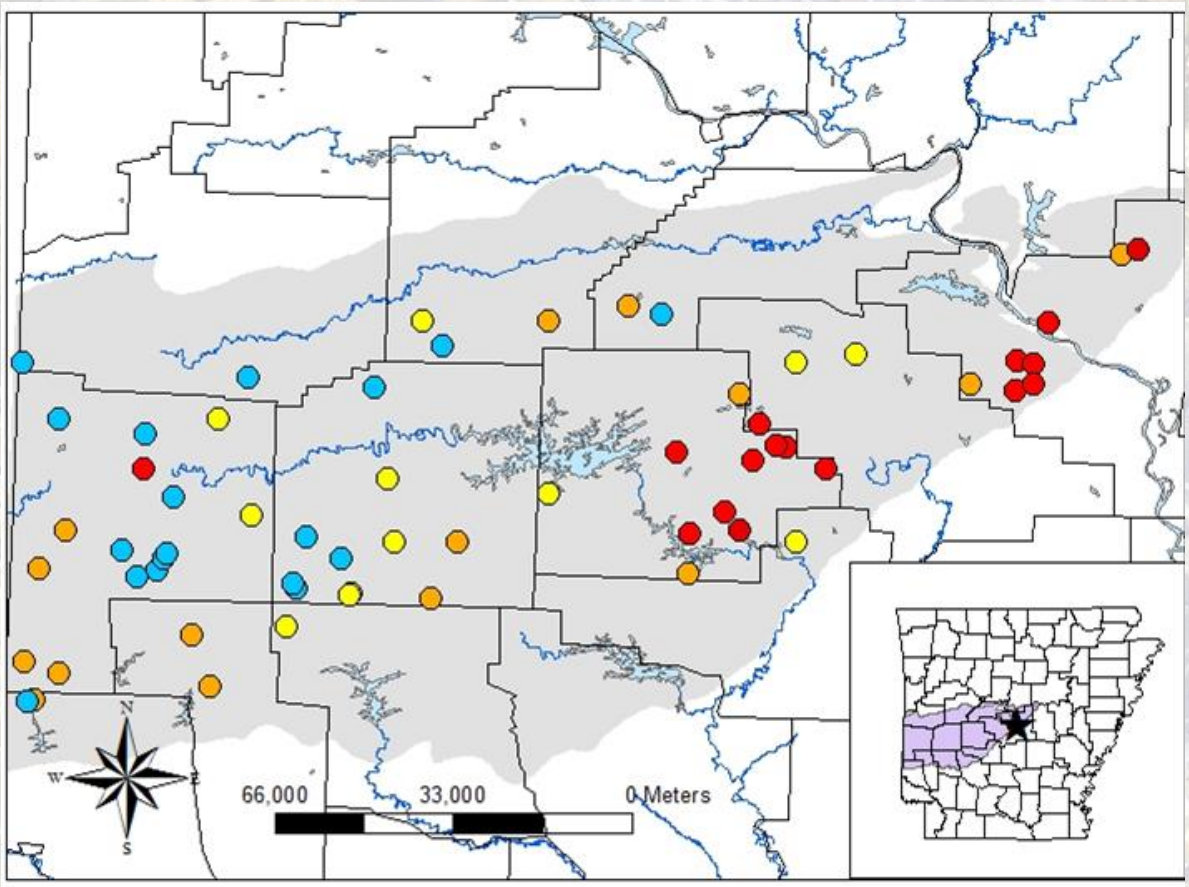
- ERW (11)
- Ambient stations (10)
- 1986 ecoregion reference sites (2)
- <10 mi² ecoregion reference sites (5)
- Random (34)

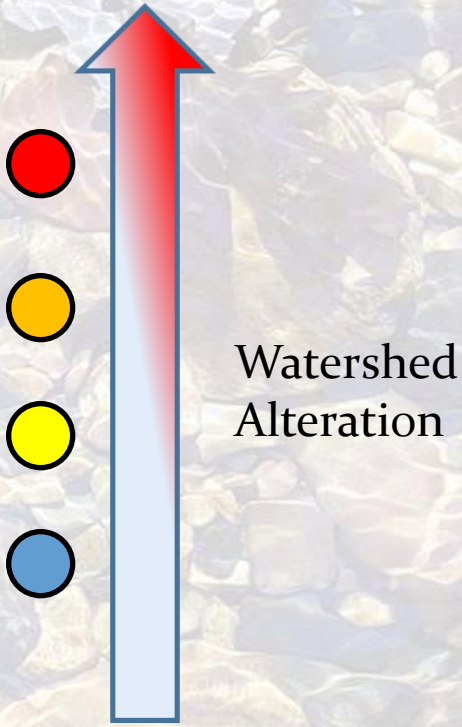
How to account for this?

LULC ranking

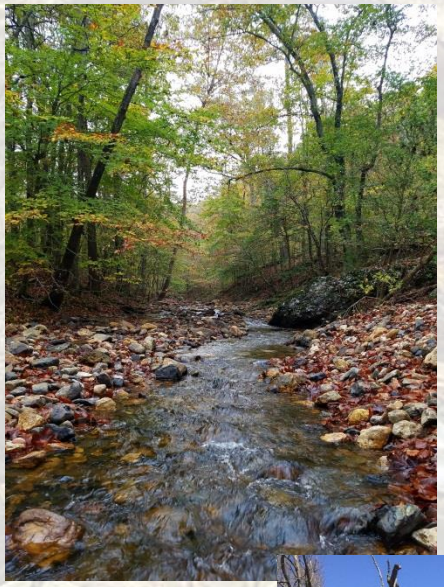
- 270 sites were ranked from 1 to 10 for each variable:
- Watershed and 100m buffer
  - % alteration based on LULC polygons
  - Households #/sq. mi
  - Population #/sq. mi
  - All roads mi/sq. mi
  - Unpaved roads mi/sq. mi
  - CAFO #/sq. mi
- Watershed
  - NPDES #/sq. mi
  - Road crossings #/sq. mi
  - Dams #/sq. mi
- Final disturbance determined by summing all rank values.

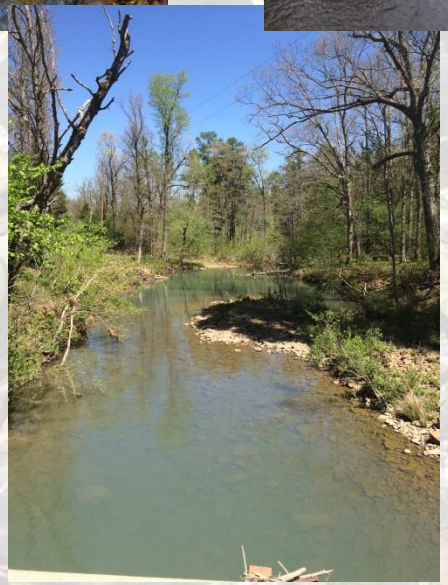
Sample sites





What it looks like



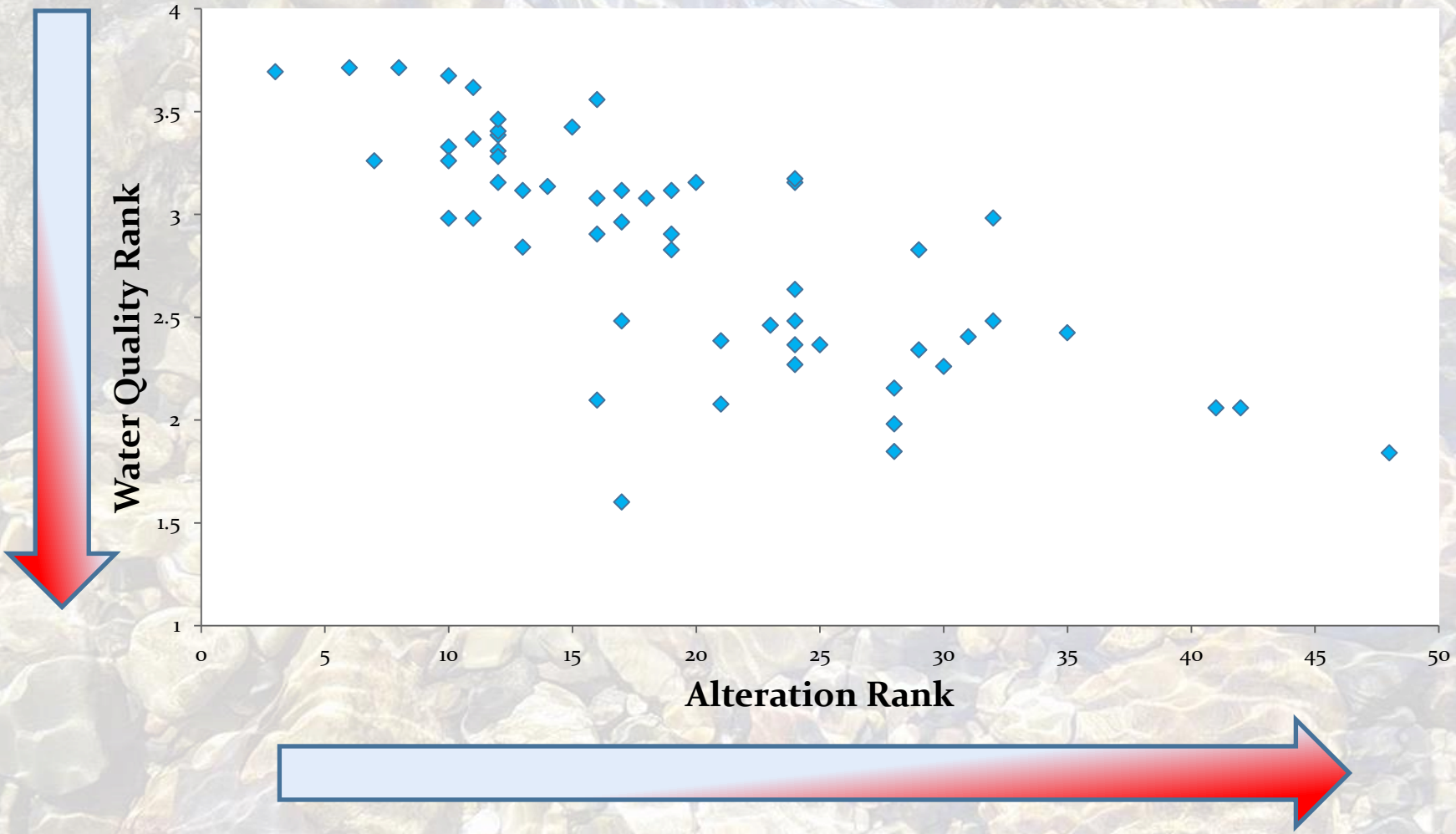


Water quality

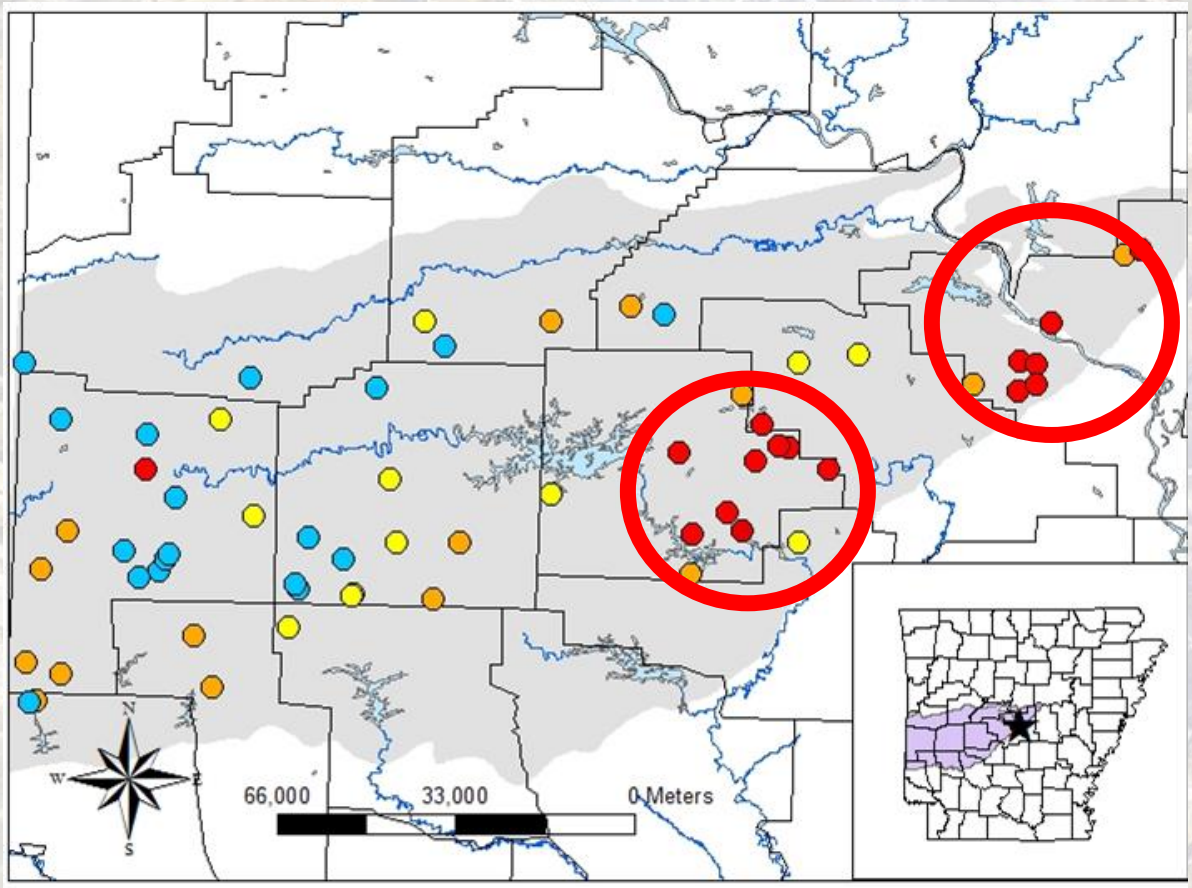
Water quality ranking

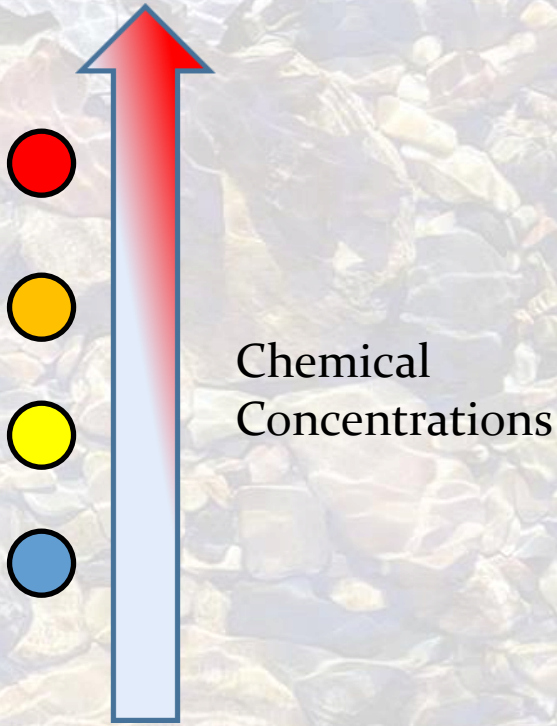
- Each site received water quality score.
- Ranked on site-specific medians for 52 variables:
  - Temperature
  - pH
  - DO
  - Nutrients
  - Minerals
  - Metals
- Each variable given rank value of 1 to 4 based on quartiles.
  - Low rank = high chemical concentrations.
    - Exception pH and DO
    - Does not distinguish between natural or man-made alterations
    - Does not mean impairment
- Final score reported as site-specific mean of rank values.

If you like charts

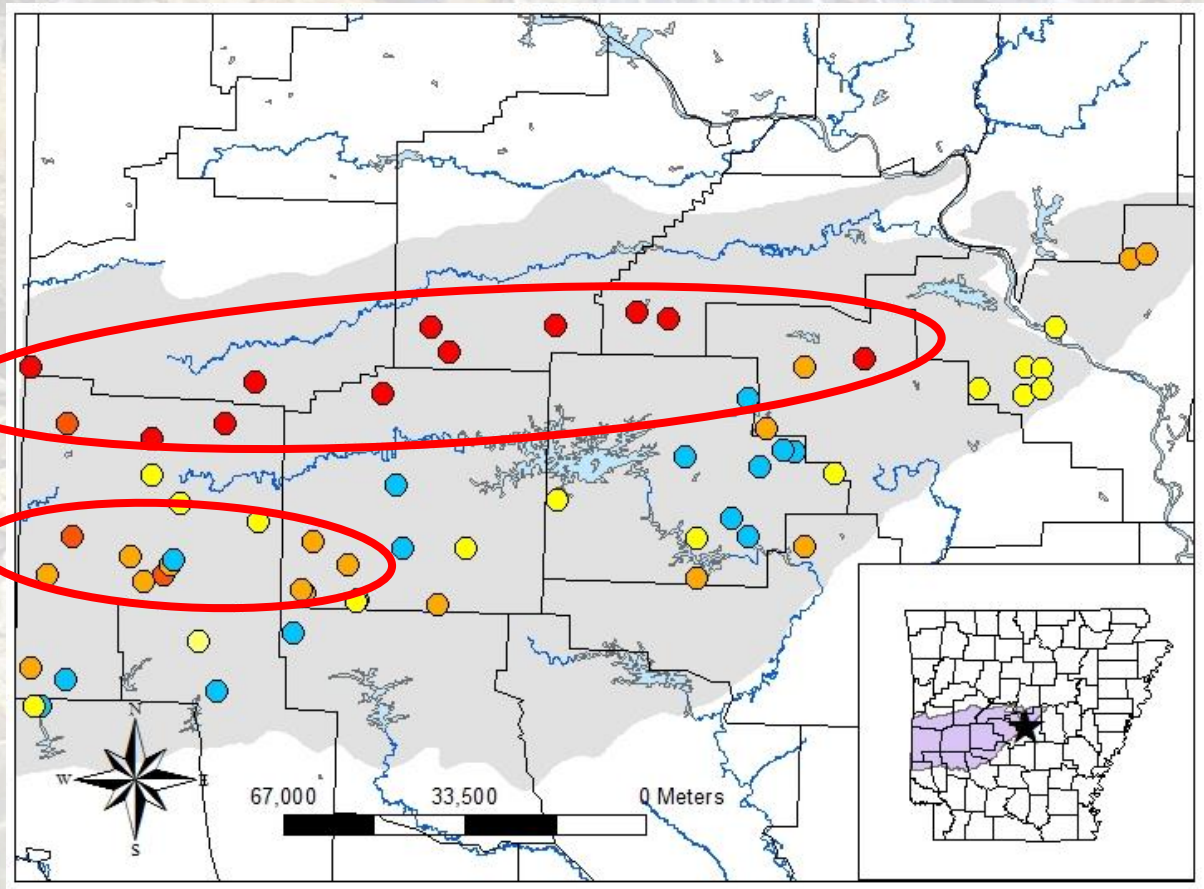


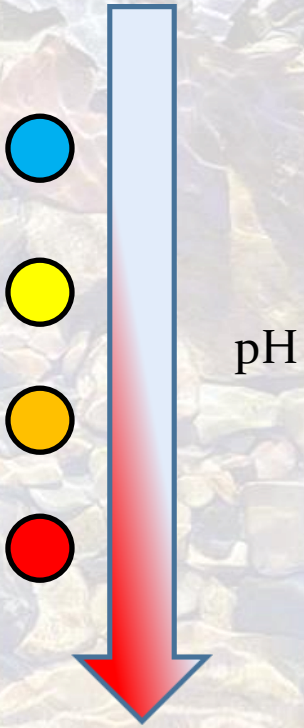
If you like maps





Just the start





What we hope the data can tell us

- Determine Least-altered conditions for:
  - Water Chemistry
  - Biology
  - Habitat
- Determine appropriate scale.
- Determine biological degradation.
  - One of our main attainment concerns of Clean Water Act
    - Fishable and Swimmable
    - Impacted by many variables
- Reassess criteria and IBI's.
  - Many ways to do this

Looking to the future

- Ouachita Mountain Study:
  - Finish sampling
  - Analyze data
  - Finalize Report
  - Report findings to all of you
  - Data mine
- Gulf Coastal or Delta:
  - Develop project
  - Find partners

Obligatory work collage





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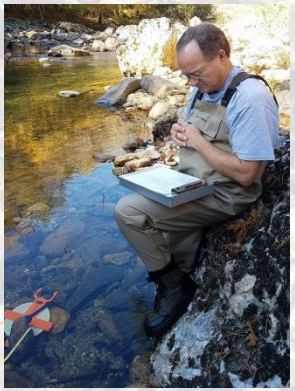



Questions?