Water Quality Monitoring in the Upper Illinois River Watershed and Upper White River Basin

Project 11-500

ARKANSAS WATER RESOURCES CENTER

UA Division of Agriculture Arkansas Water Resources Center

Project Team

- Project Director – Dr. Brian Haggard
- Project Manager – Erin Scott
- Team Leads
  - NWA monitoring –Morgan Welch
  - Pathogen Sampling – Brina Smith
  - D.O. Sampling – Eric Cummings

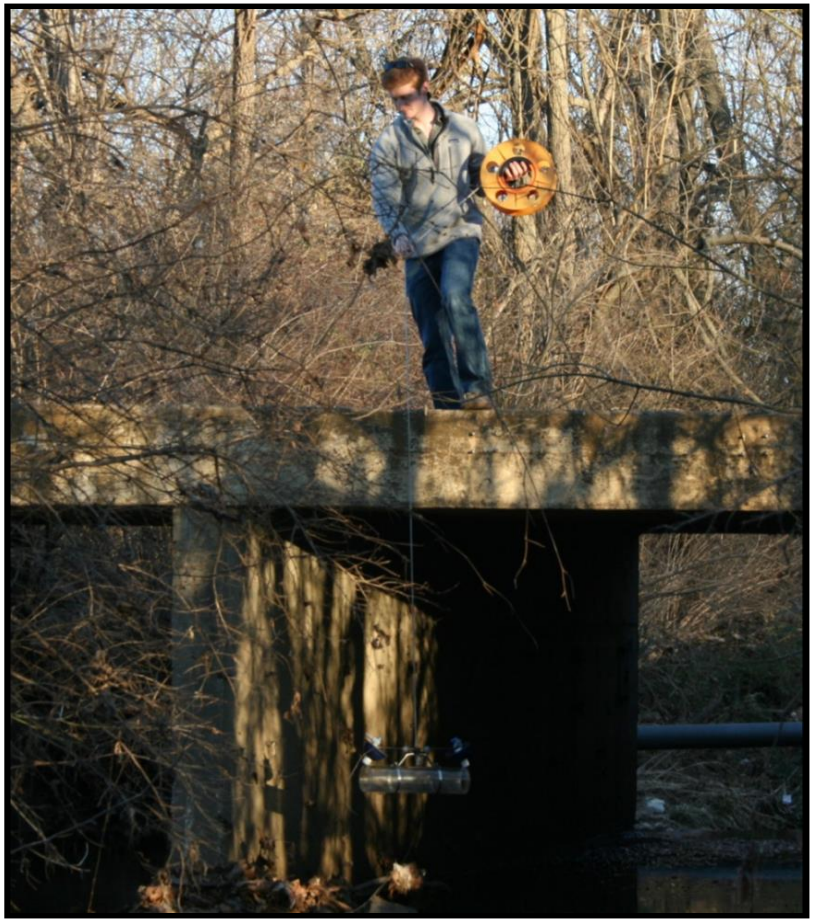
What is the purpose of project 11-500?

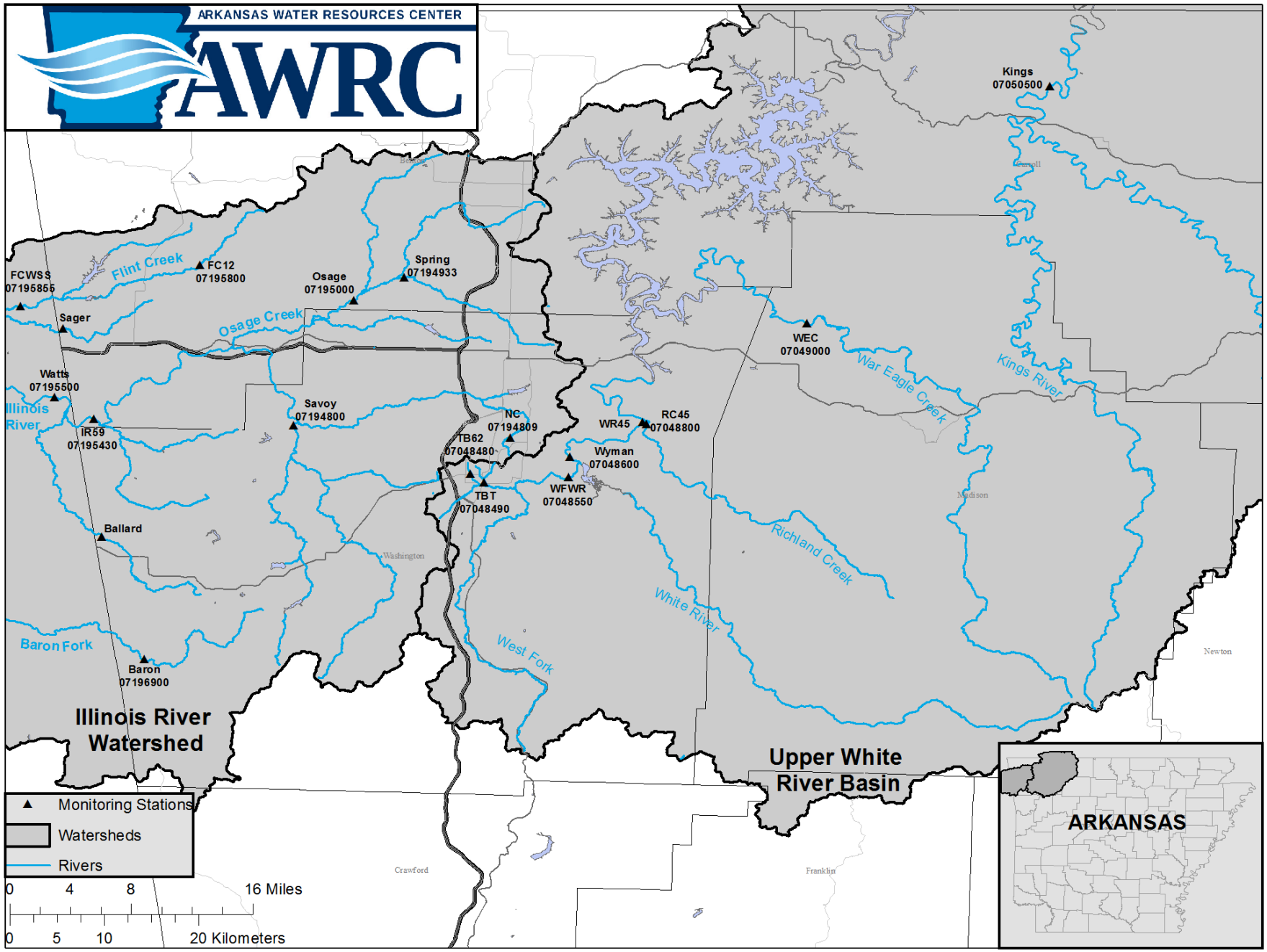
- Quality of water in the Illinois River Watershed and Upper White River Basin.
  - Flow in to neighboring states
  - Focus of trans-boundary WQ issues
  - 319 priority catchment
- Illinois River Watershed
  - Streams listed impaired on 303(d)
    - Nutrient, sediment, pathogens
- Upper White River Basin
  - Primary drinking source
  - Some streams & Beaver Lake listed on 303(d)
    - Sediment & Dissolved Oxygen

Water Quality Samples in the Upper Illinois River Watershed and Upper White River Basin

- Sampling multiple sites in the 2 watersheds will help determine outcome from 319 funded projects
  - Looking at concentrations and loads
- Collect an average of 46 samples/year for base and storm flow conditions from 19 sites
- Captured using alpha sampler in VCF
- Constituents analyzed at AWRC include:

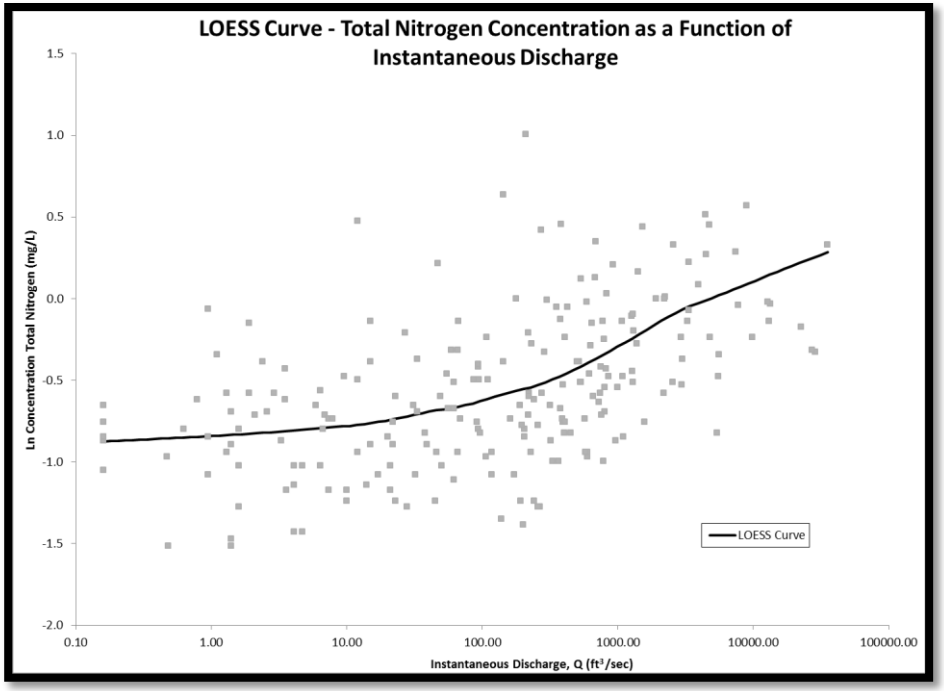
Total Nitrogen	Phosphate
Nitrate	Total Suspended Solids
Total Phosphorus	

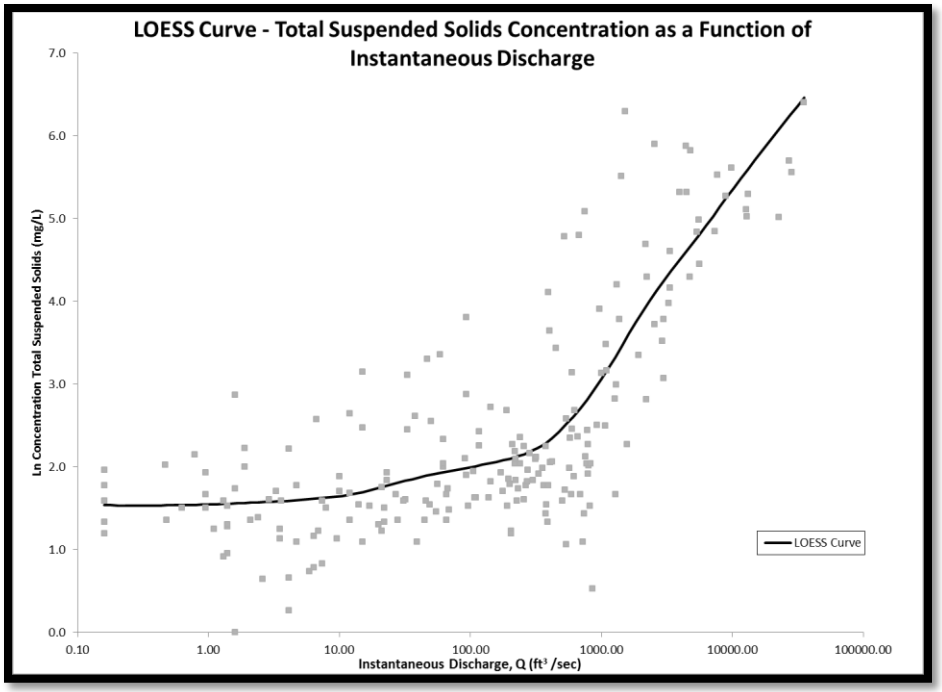


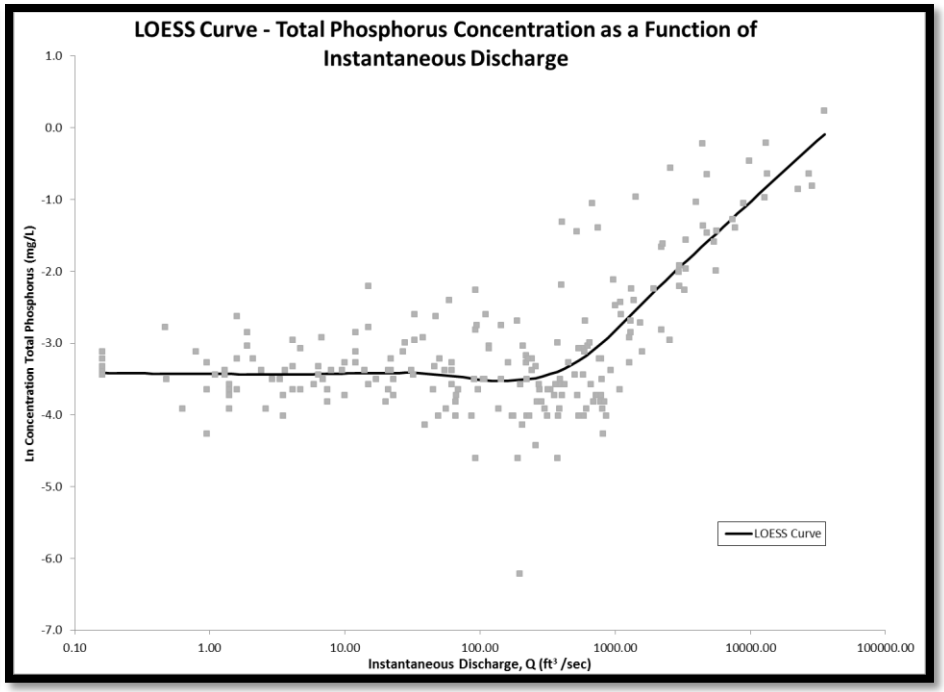

ARKANSAS WATER RESOURCES CENTER
AWRC
Kings
07050500
FCWSS
07195855
Flint Creek
FC12
07195800
Osage
07195000
Spring
07194933
Sager
Osage Creek
WEC
07049000
War Eagle Creek
Kings River
Watts
07195500
Illinois
River
IR59
07195430
Savoy
07194800
NC
07194809
WR45
RC45
07048800
TB62
07048480
Wyman
07048600
WFWR
07048550
TBT
07048490
Ballard
Richland Creek
White River
West Fork
Baron Fork
Baron
07196900
Illinois River
Watershed
Upper White
River Basin
Monitoring Stations
Watersheds
Rivers
0 4 8 16 Miles
0 5 10 20 Kilometers
ARKANSAS
Washington
Madison
Newton
Crawford
Franklin

Water Quality Samples

- Log-log transformations
  - Minimize outlier influence
- Relationship between concentration and discharge
- LOESS regression (sigmaplot)
  - a two dimensional smoothing technique

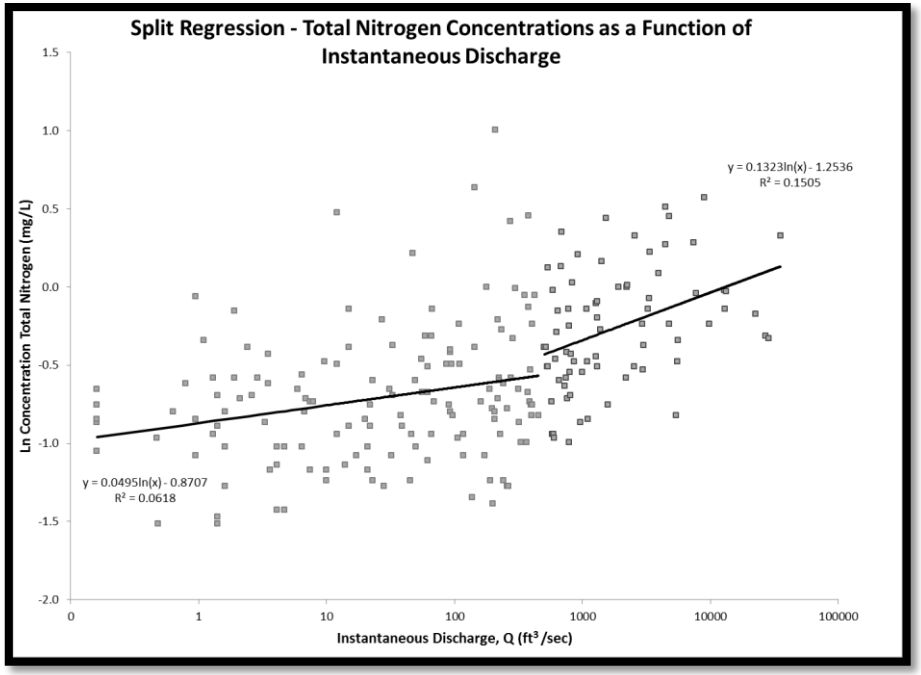


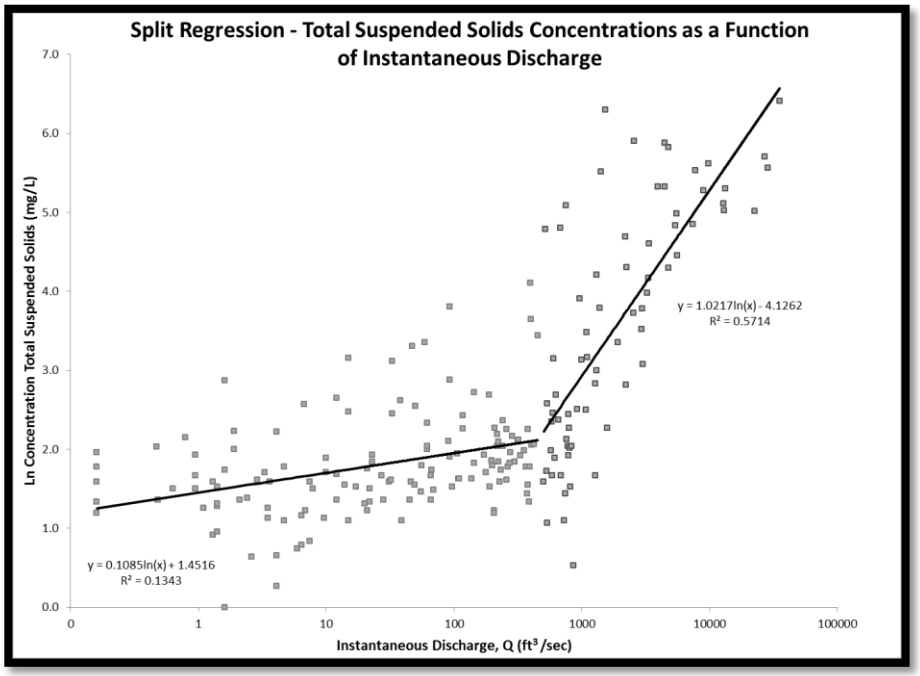


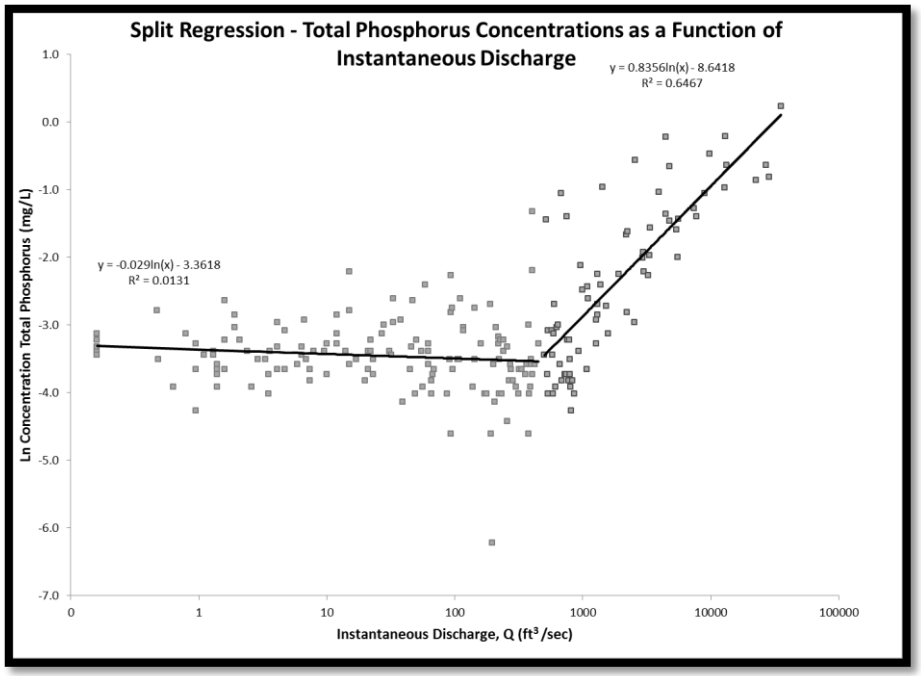


Water Quality Samples

- Breakpoint regression shows changes at base and storm flow conditions
- Combined with project 319 to acquire over 5 years of WQ data

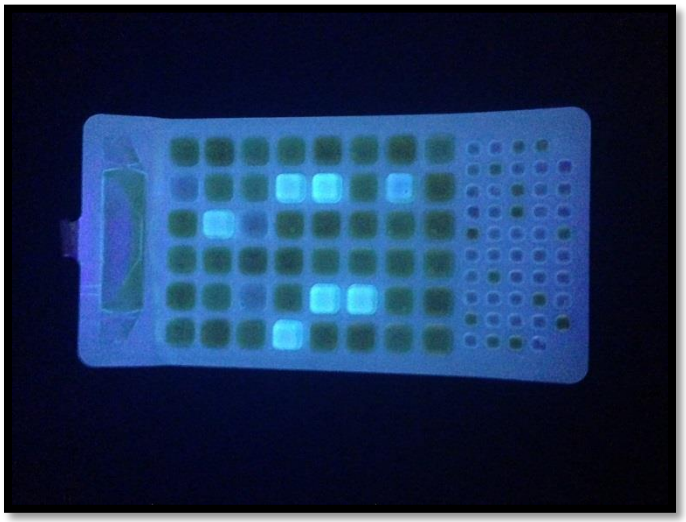




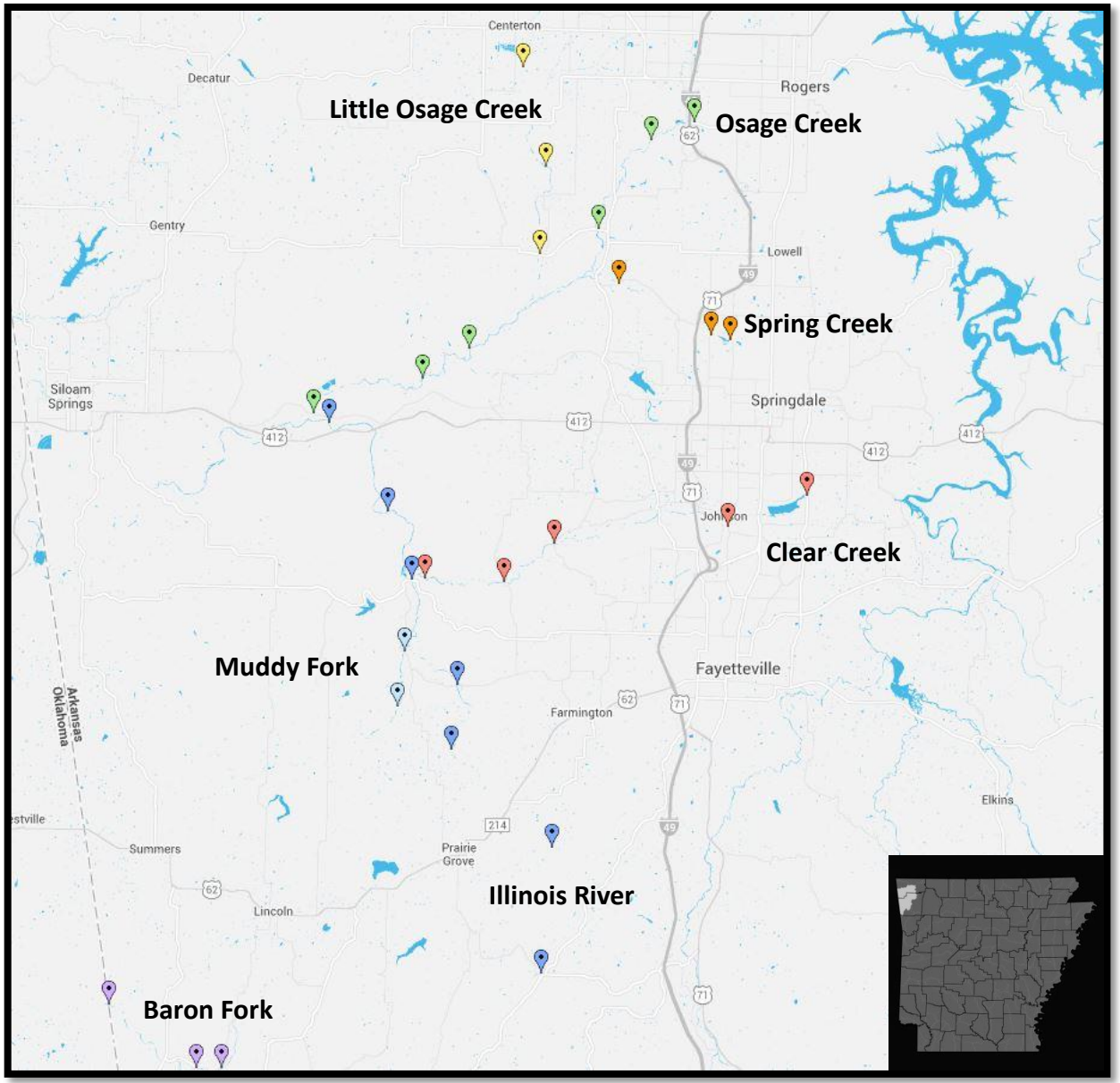


Water Samples for Bacteria in Upper Illinois Watershed

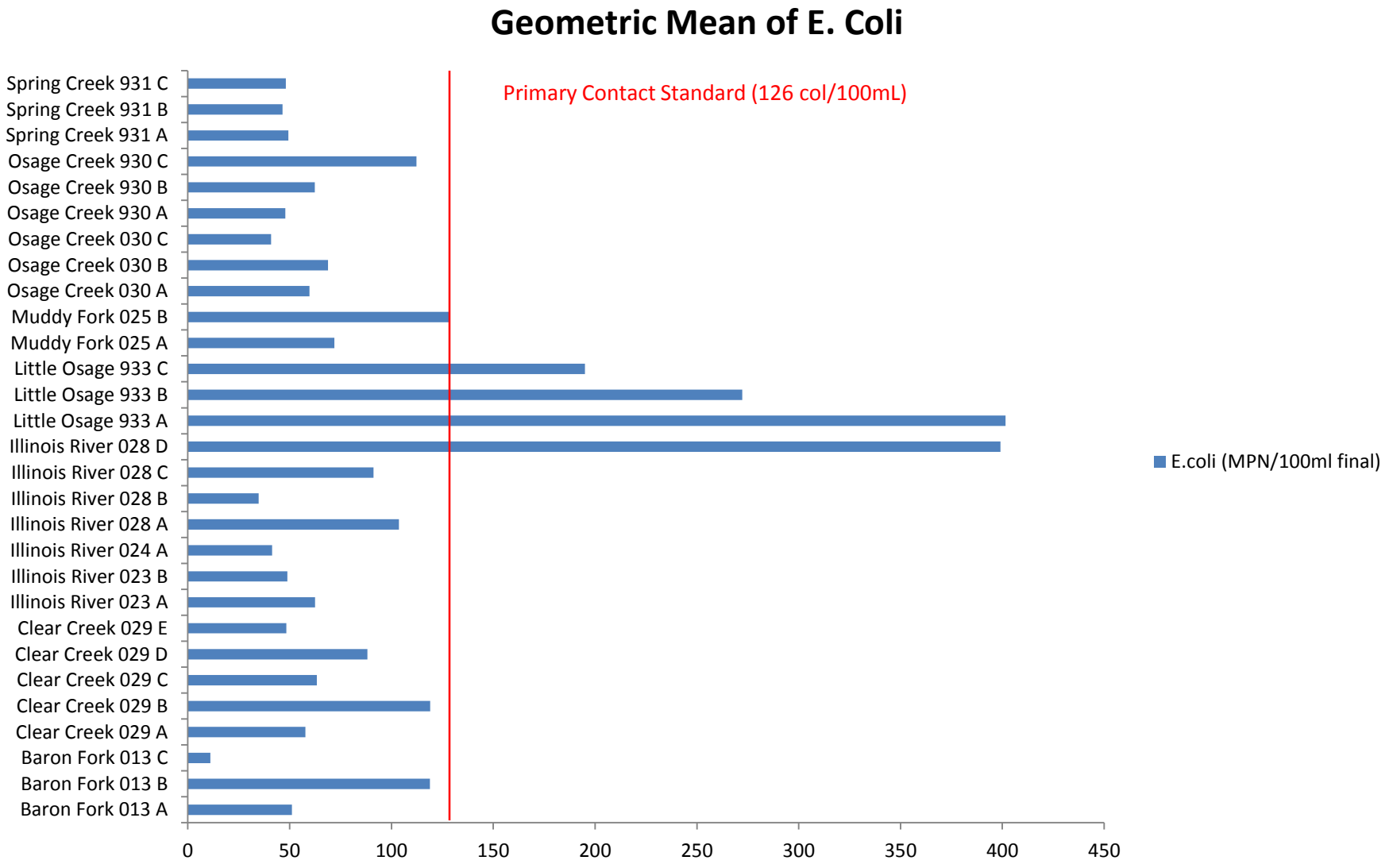
- Measuring E. Coli and total coliform
- Average of 3 sampling locations per reach
- 8 water samples collected between May 1st and Sept. 30th (Primary contact season)



Water Samples for Bacteria in Upper Illinois Watershed



Water Samples for Bacteria in Upper Illinois Watershed

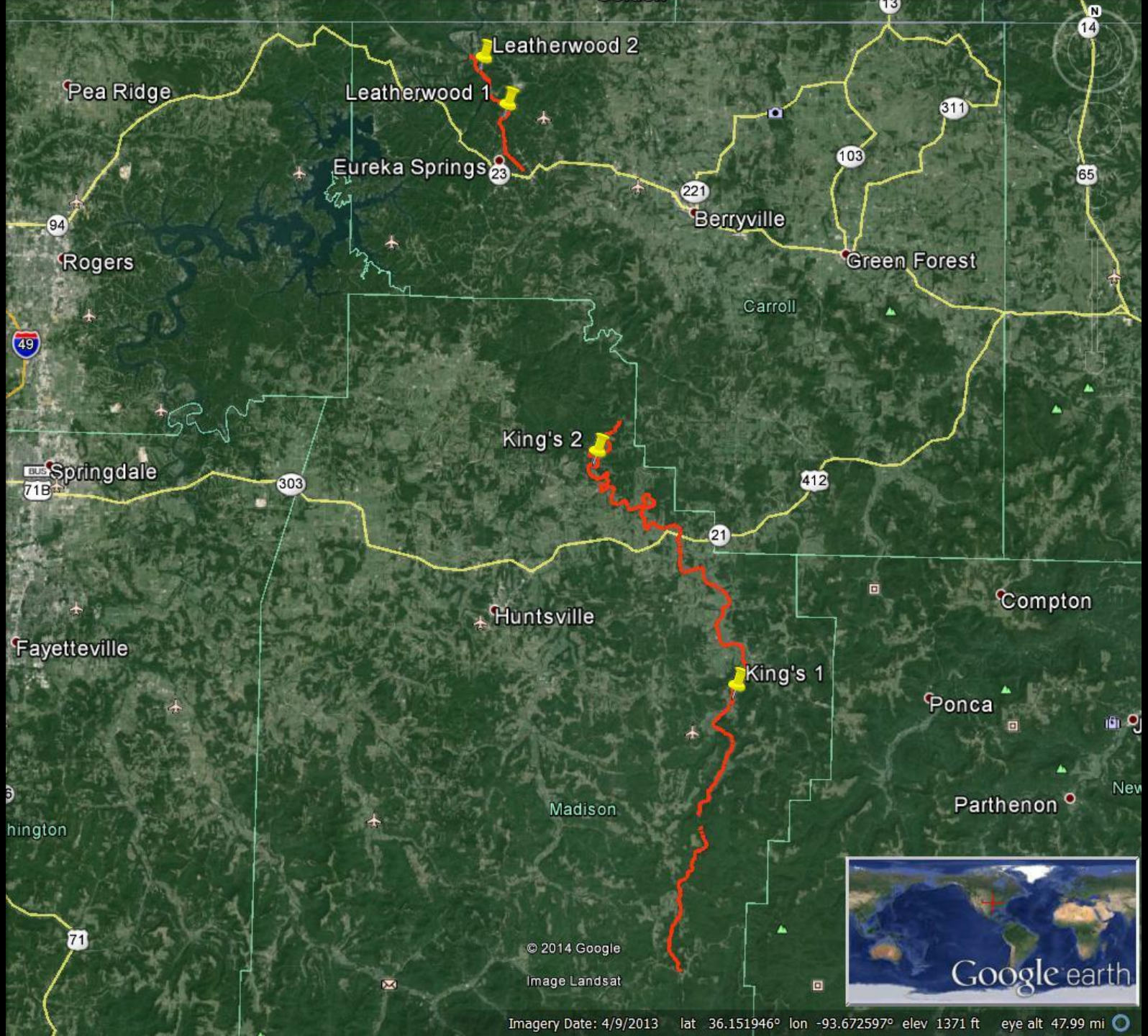


Water Samples for Bacteria in Upper Illinois Watershed

- 29 sites were sampled along 7 different reaches.
- 6 of the 7 reaches contained sites that were on the 303 (d) list before the study.
- From the preliminary analysis, there's potential that Little Osage and will remain on 303(d).
- The Illinois River shows one site far above primary contact standard, and Muddy Fork is near the limit.
- Not source tracking, but potential causes along reaches are wildlife, cattle, septic

Diurnal Dissolved Oxygen Concentrations in Upper White River Basin

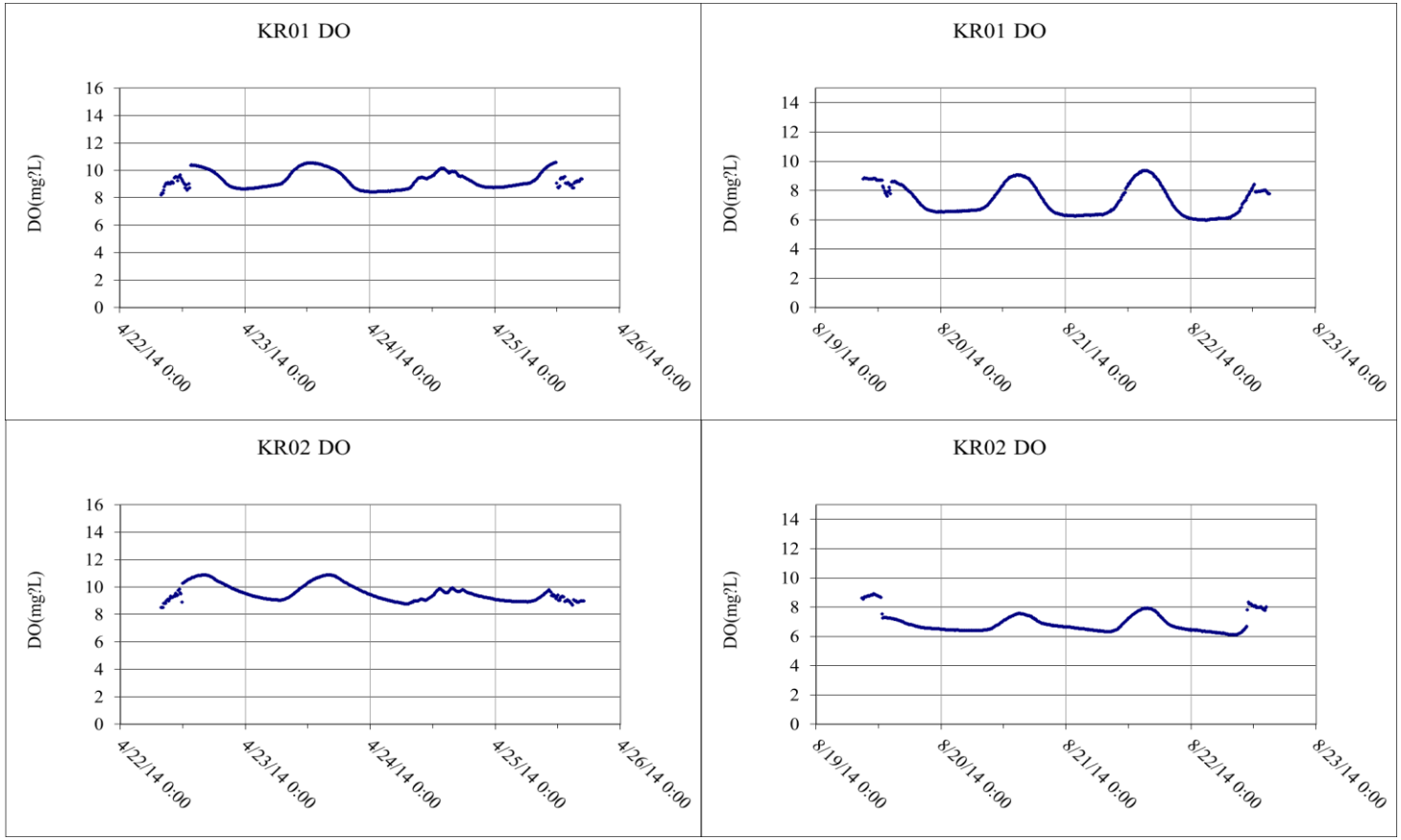
- Four sites
  - 2: Kings River
  - 2: Leatherwood Creek
- Data sondes deployed four times a year:
  - Once: Jan. and April
  - Twice: May and Sept.
  - Once: Oct. and Dec.
- 72 hours at each site
  - 2 diurnal cycles
- DO
  - %sat, cond, pH, temp
- Grab samples collected before and after


Leatherwood 2
Leatherwood 1
Pea Ridge
Eureka Springs
Berryville
Green Forest
Rogers
Carroll
King's 2
Springdale
Huntsville
Compton
Fayetteville
King's 1
Ponca
Madison
Parthenon
94
23
221
311
103
65
49
303
412
21
71B
71
14
© 2014 Google
Image Landsat
Google earth
Imagery Date: 4/9/2013 lat 36.151946° lon -93.672597° elev 1371 ft eye alt 47.99 mi

Diurnal Dissolved Oxygen Concentrations in the Upper Kings River (221 mi^2)

April 2014
Primary - 6 (mg/L)

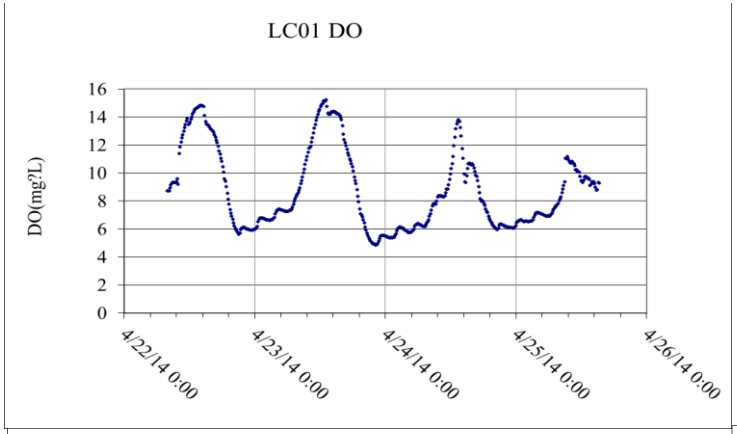
August 2014
Critical – 6 (mg/L)

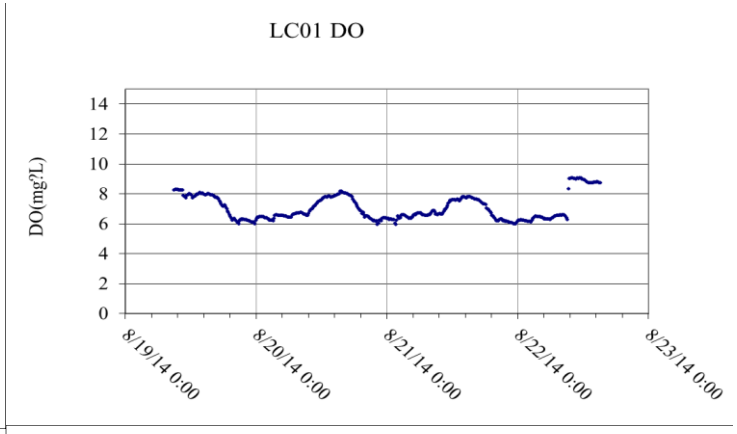


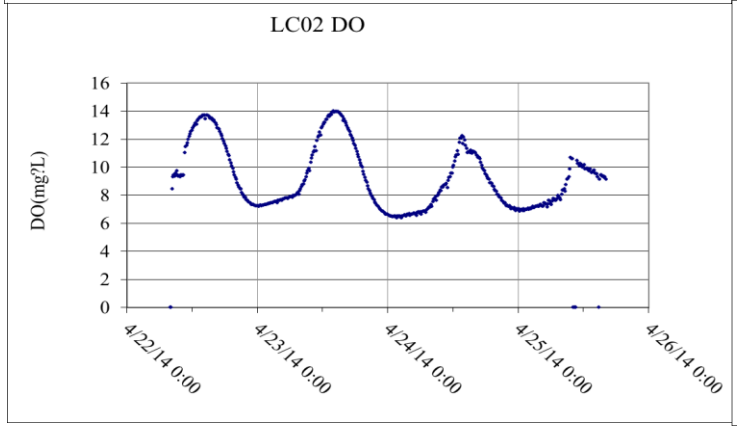
Diurnal Dissolved Oxygen Concentrations in Leatherwood Creek (30 mi^2)

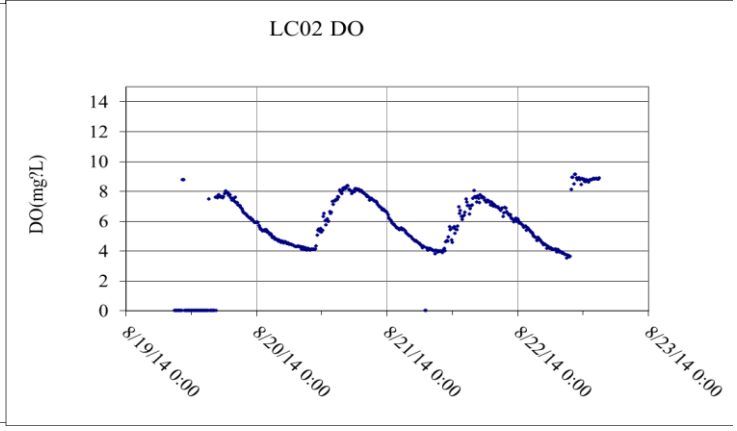
April 2014
Primary - 6 (mg/L)

August 2014
Critical – 5 (mg/L)





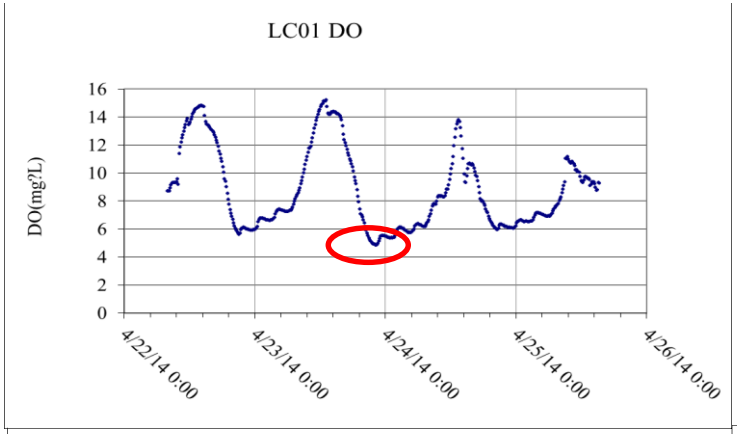


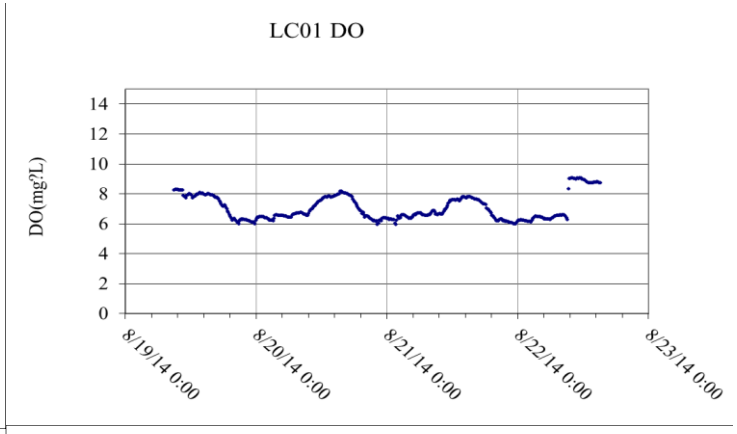


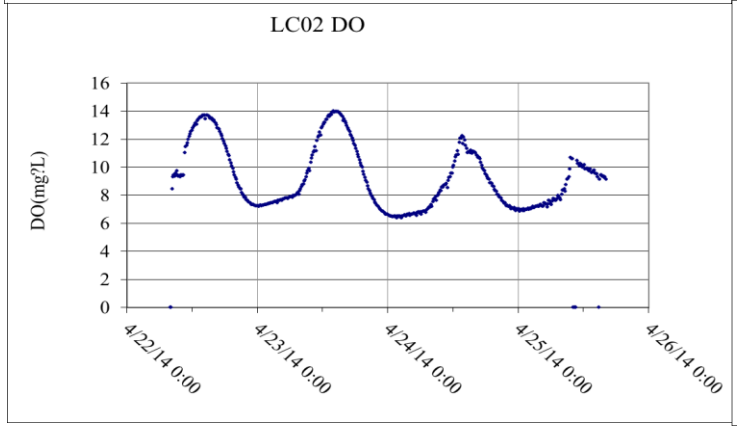
Diurnal Dissolved Oxygen Concentrations in Leatherwood Creek (30 mi^2)

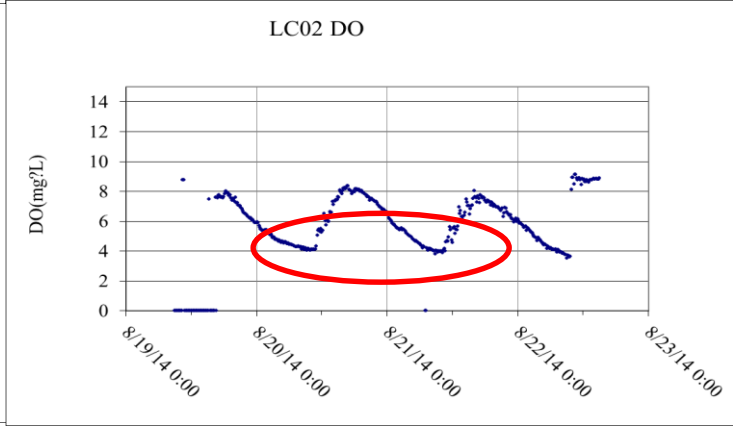
April 2014
Primary - 6 (mg/L)

August 2014
Critical – 5 (mg/L)



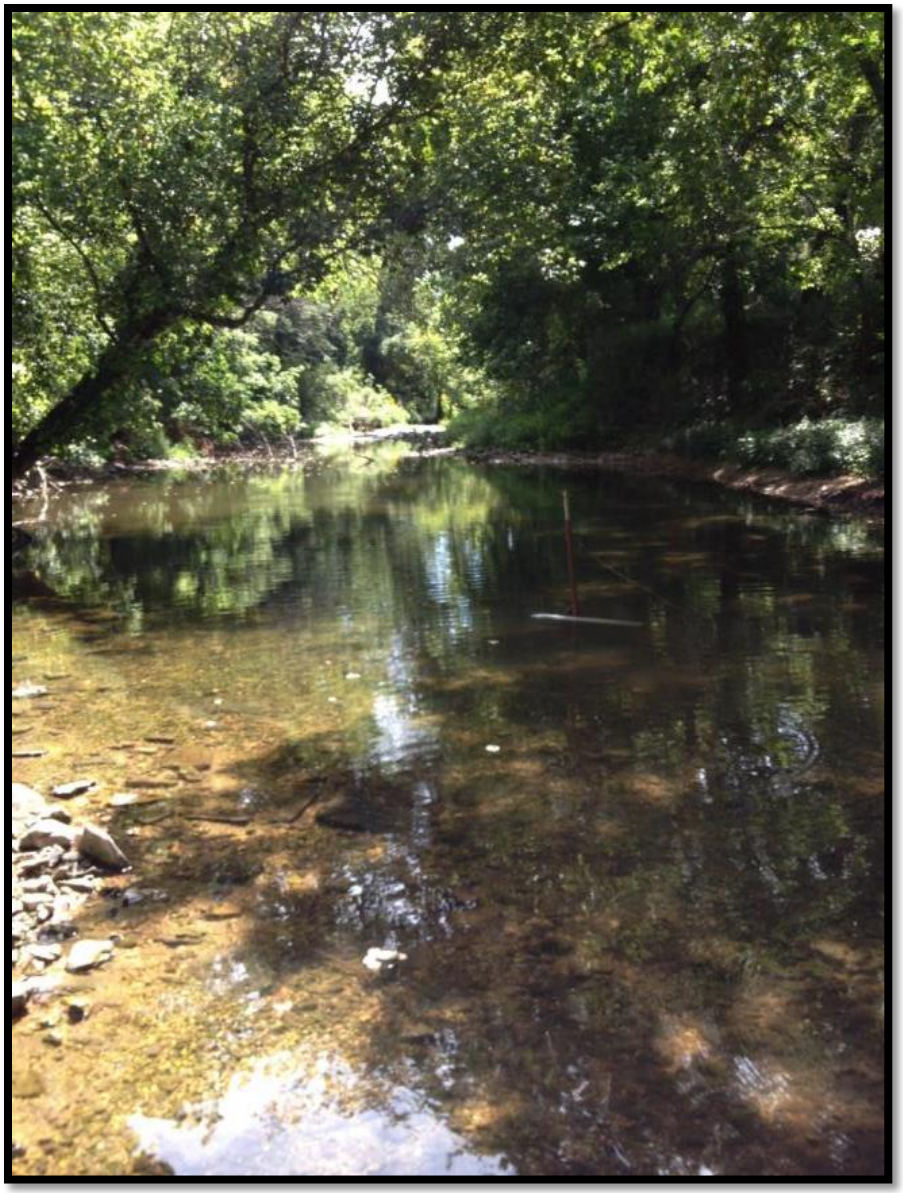






Project 11-500

- This has been an update on the progress of project 11-500
- This project will end June 2015
- A more comprehensive analysis will follow after completion




Questions?