

# Neosho Smallmouth Bass Spawning Movements and Associated Environmental Conditions in a Seasonally Discontinuous Boston Mountain Stream

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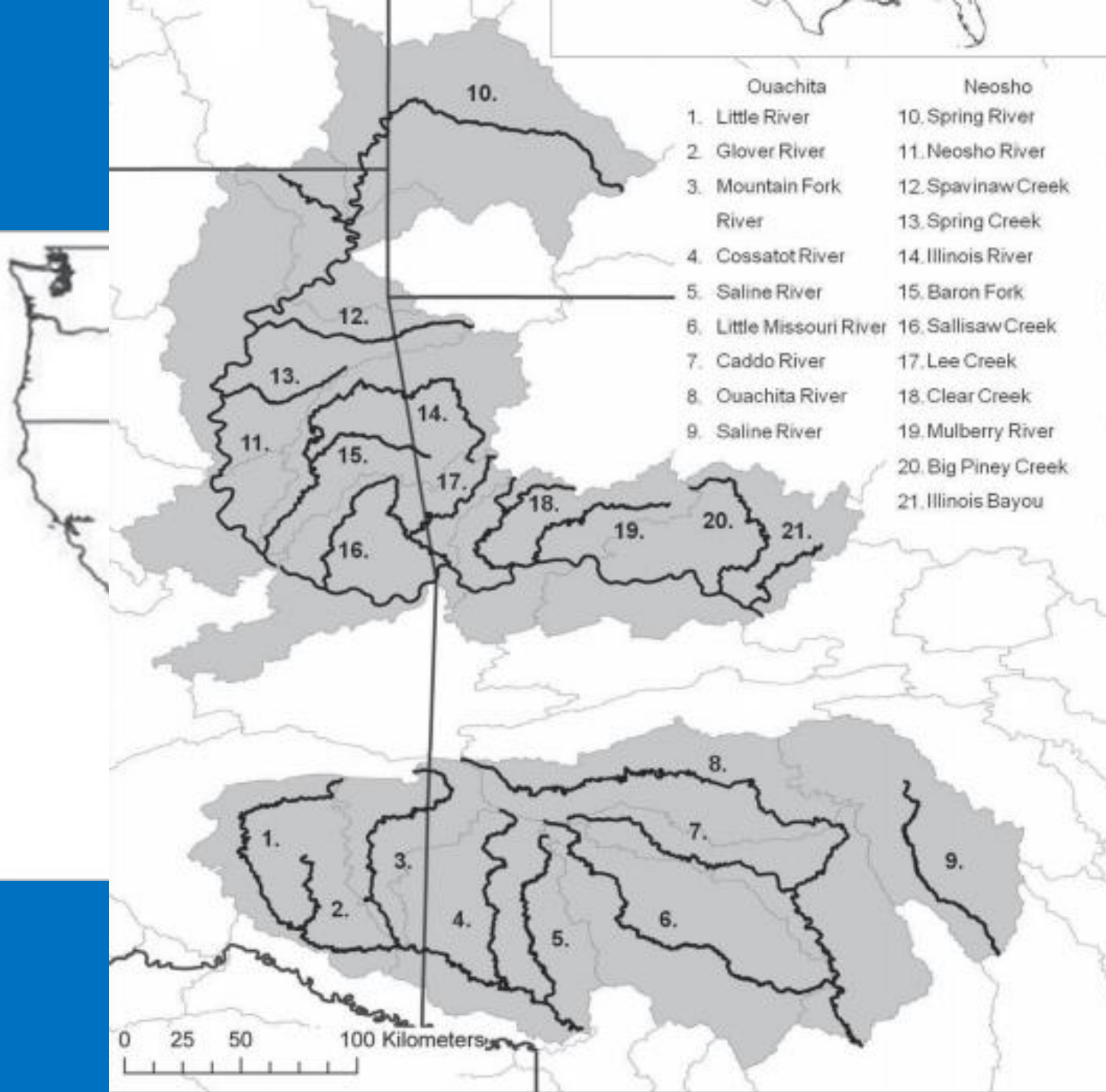


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# Introduction

- Few studies on Smallmouth Bass in seasonally discontinuous streams
- Challenges
  - Limited space and resources
  - High temperatures
  - Low productivity
  - Climate change
- Few studies on Neosho Smallmouth Bass and no studies on spawning movement





0 25 50 100 Kilometers

# Introduction

- Smallmouth Bass movement varies across their range and within a single drainage from highly sedentary, to highly migratory, and everywhere in between



# Introduction

- Smallmouth Bass spawn from April – June at water temperatures of 12-25 °C and prefer gravel.



# Introduction

- How do Neosho Smallmouth Bass in seasonally discontinuous streams in the Boston Mountain ecoregion move during the likely spawning months and what are the likely spawning months?

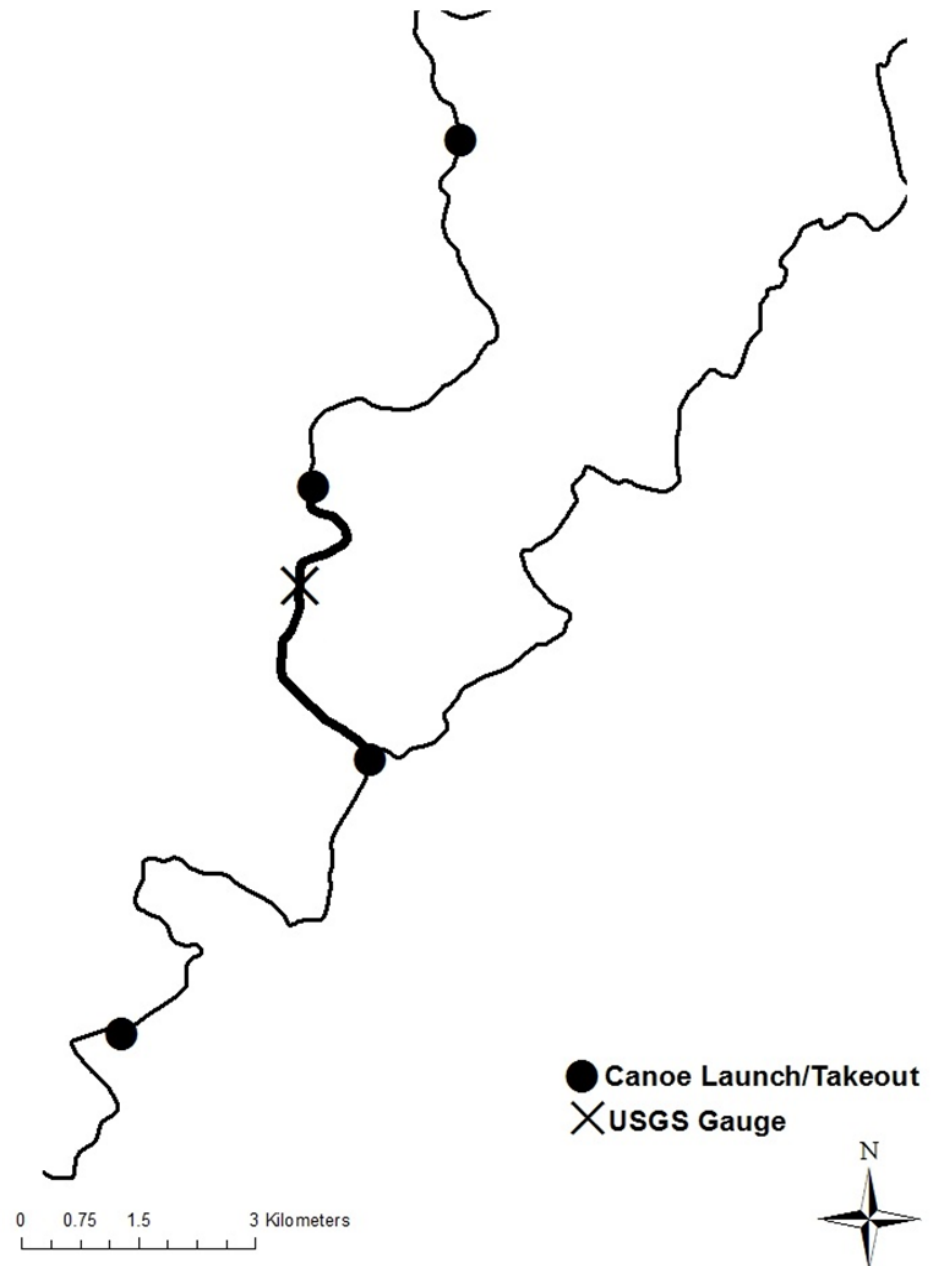


# Objectives

- Determine the timing of spawning events and associated water temperature and discharge fluctuations
- Characterize longitudinal movements of adult Smallmouth Bass, especially associated with spawning

# Study Reach

- Middle Fork Illinois Bayou
  - North of Hector and south of Smyrna
  - Chosen for accessibility, proximity to USGS water quality gauges, and availability of relevant data from previous studies





# Study Reach

- Characterized by run, riffle, boulder, pool sequences
- Few gravel bars (preferred spawning substrate)
- Some areas high gradient
- White water (class II-III) in stormflow
- Intermittency in summer months

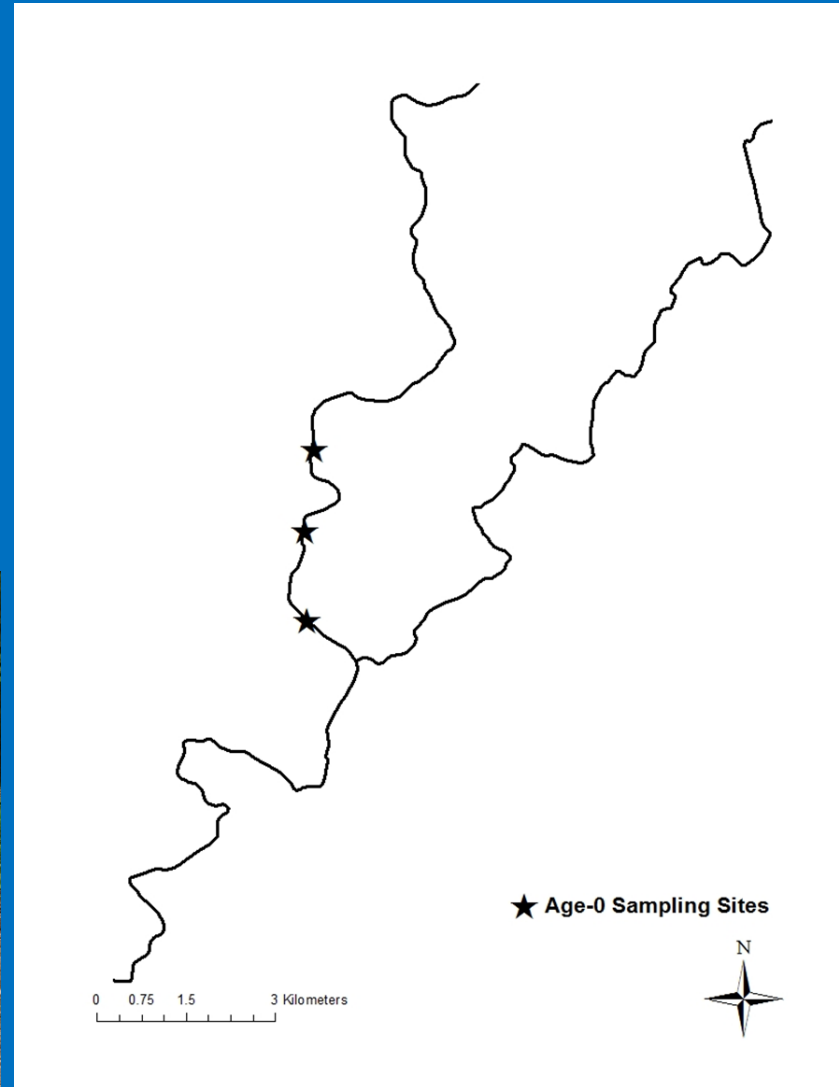
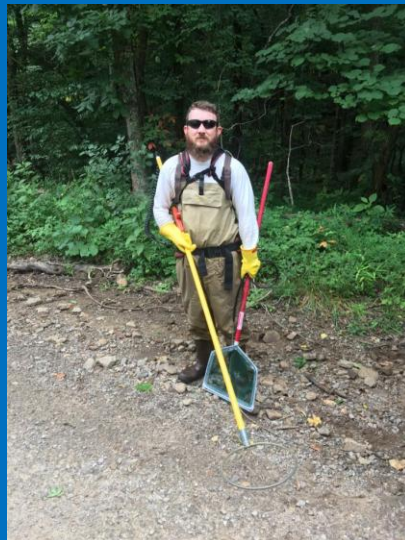


# Study Approach

- Observational, 1 stream
- Successful spawn dates estimated from YOY daily growth rings
- Movements measured weekly with radio telemetry
- Water temperature and discharge measured from center of study reach
- Adults and YOYs not directly linked

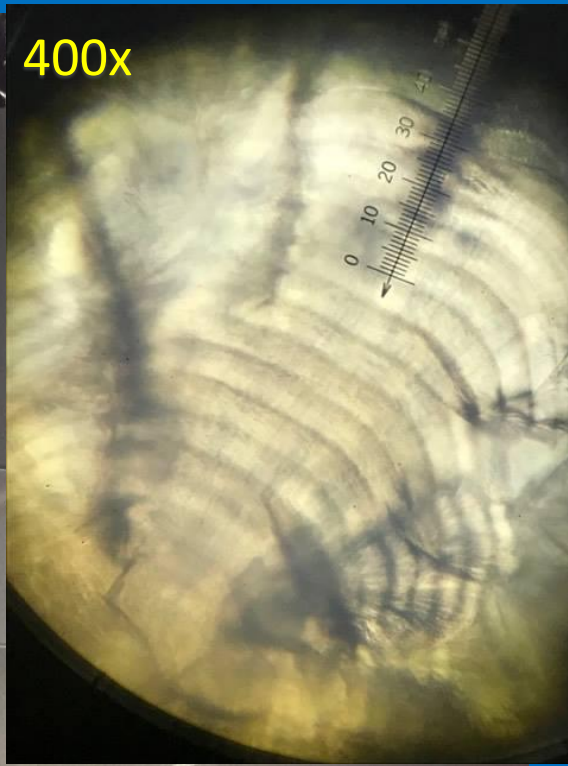
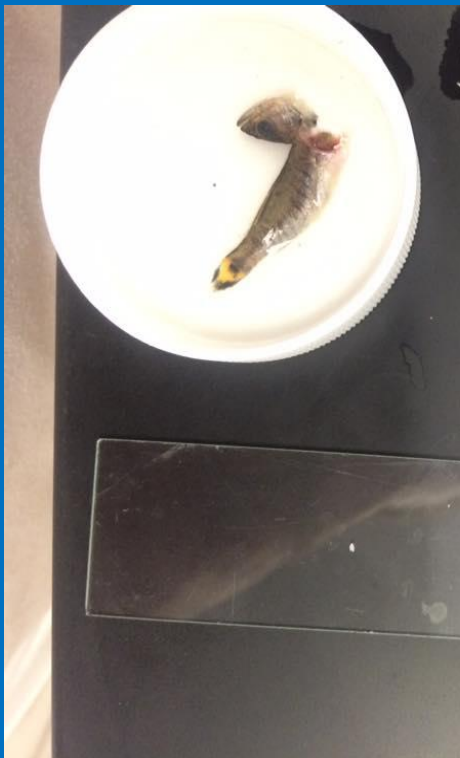
# Methods: Spawn Date

- Backpack electrofished for YOY from late April until early September
- 3 sites: upstream, midstream, and downstream
- ~200 m reaches



# Methods: Spawn Date

- Otoliths extracted and daily rings counted
  - Read at 400x magnification
  - Mounted and sanded if necessary
- Spawn date = capture – age – 5



# Methods: Movements

- Smallmouth Bass (TL > 250 mm) were implanted with radio transmitters (n=30) in the month of March 2016
- Fish were caught using hook and line sampling and boat electrofishing



# Methods: Movements

- Fish were tracked weekly from April through July 2016
- Tracked from canoe, vehicle, or on foot





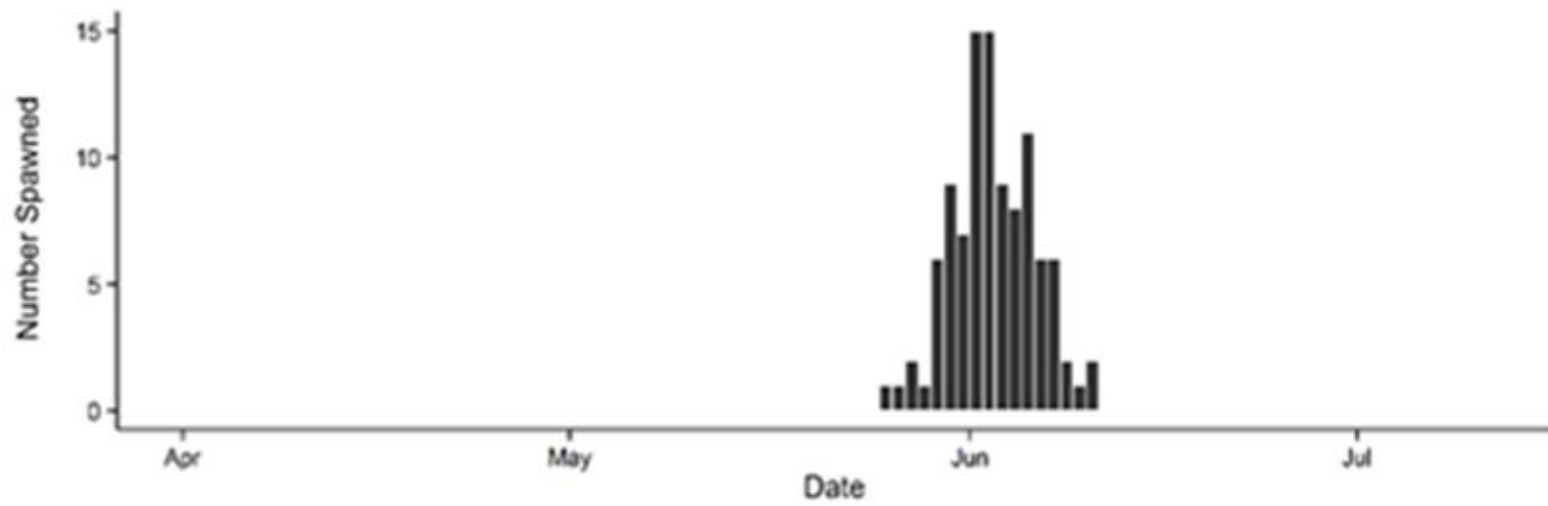
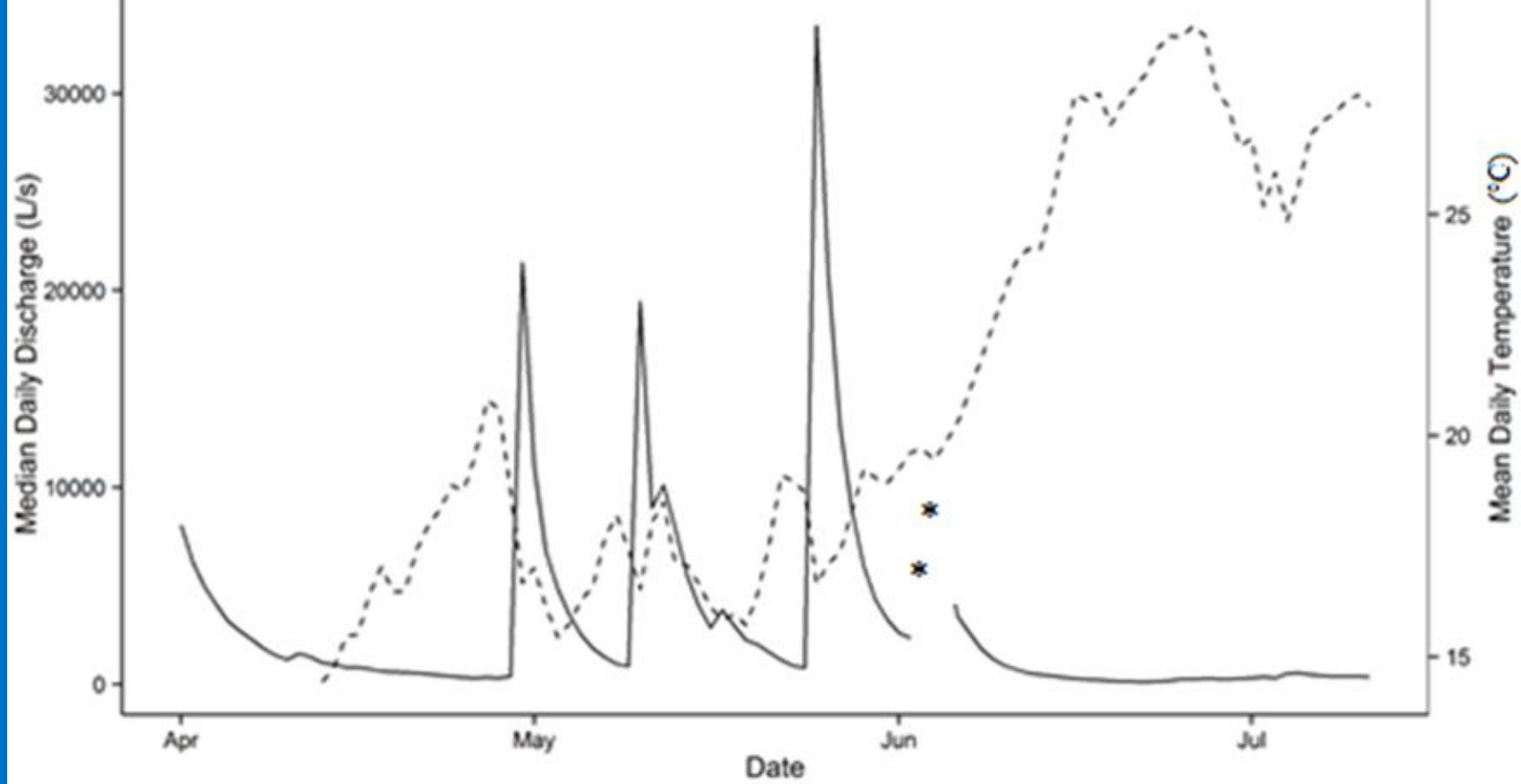
● Canoe Launch/Takeout  
X USGS Gauge



# Results: Spawn Date

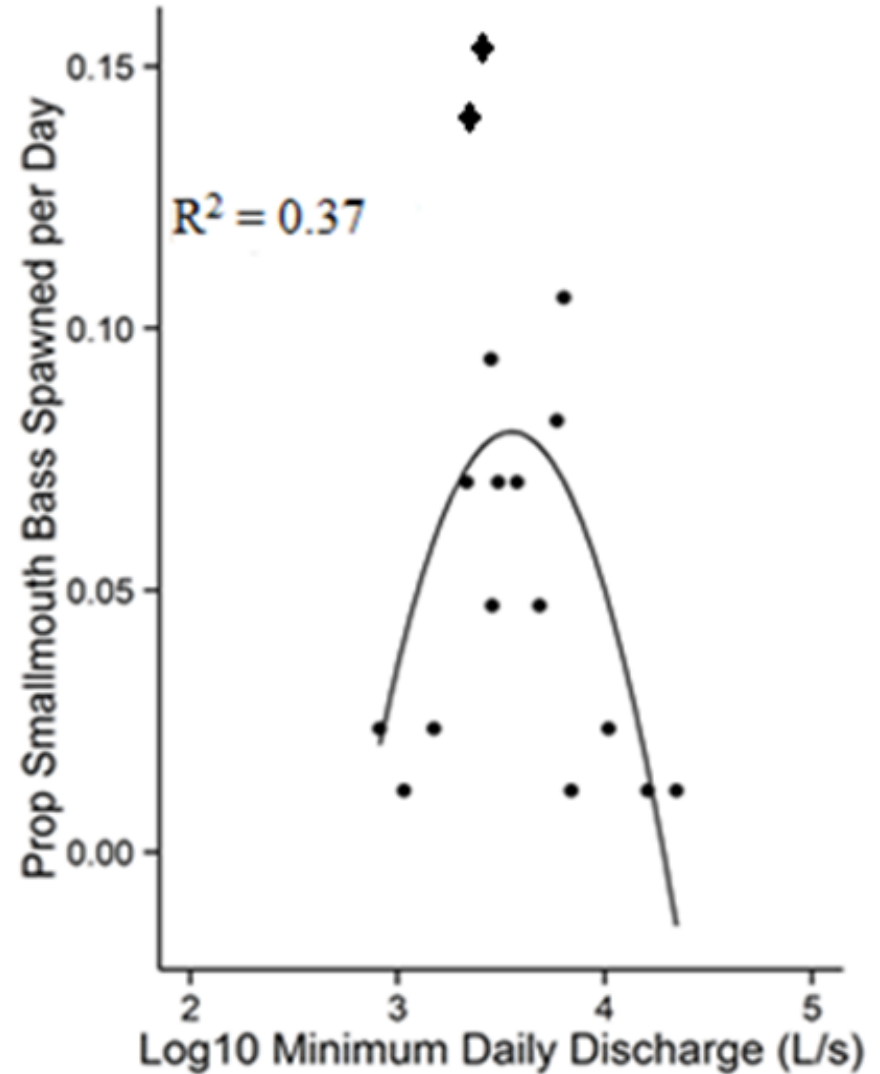
- No YOY in electrofishing surveys until July
- 91 YOY Smallmouth Bass collected from early July to early September (Along with 17 Spotted Bass)
- Spawning occurred over 17 days
- Spawning occurred between 17 C and 25 C





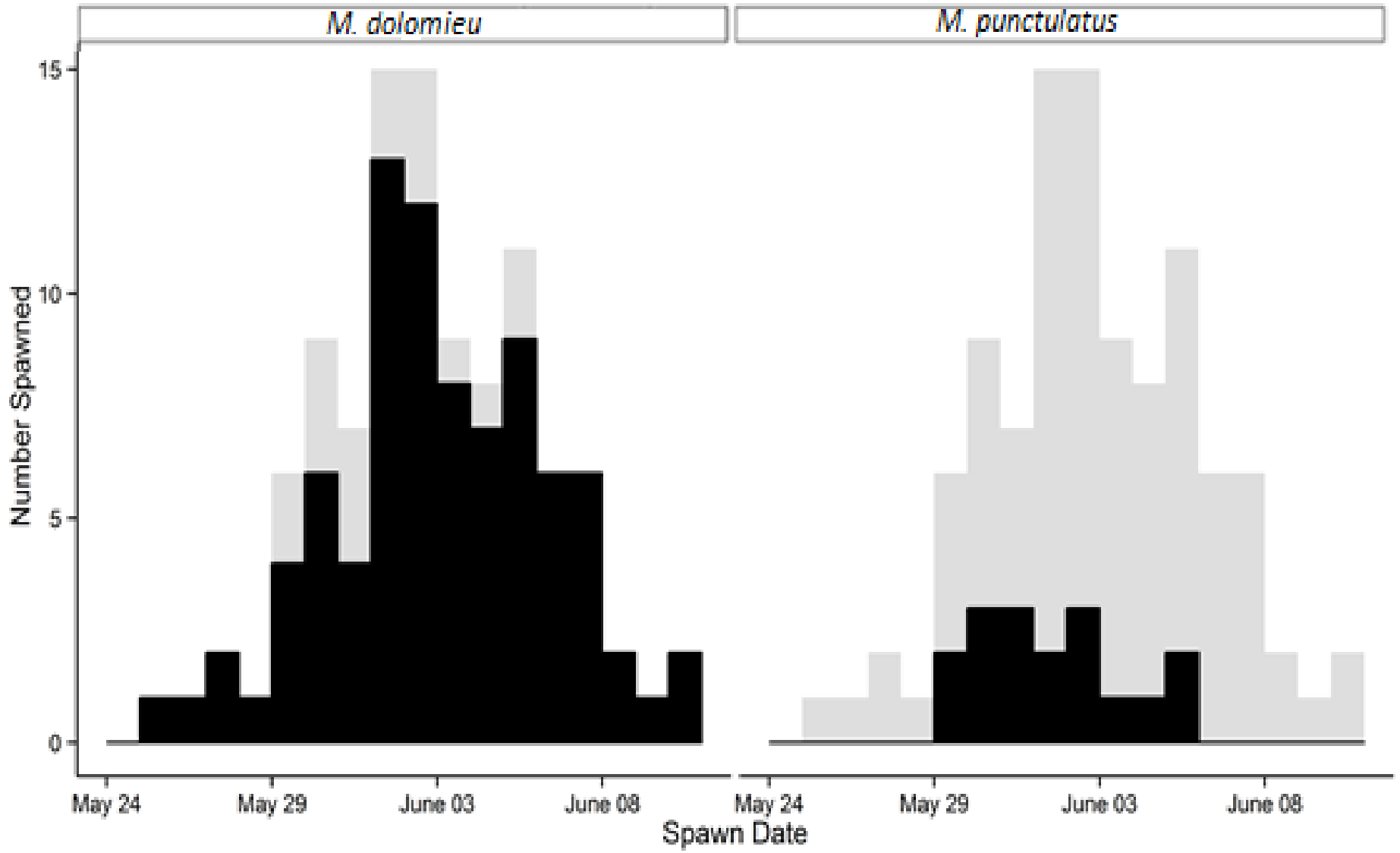
# Results: Spawn Date

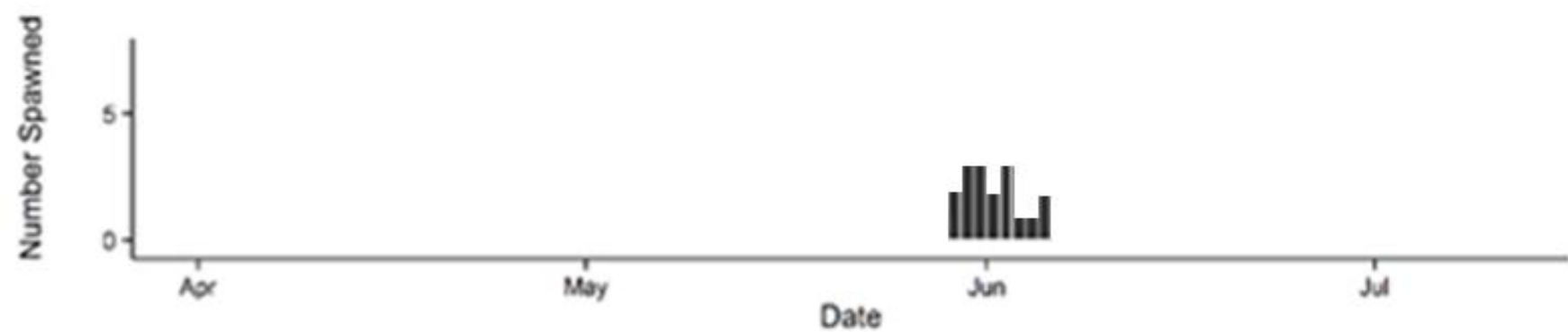
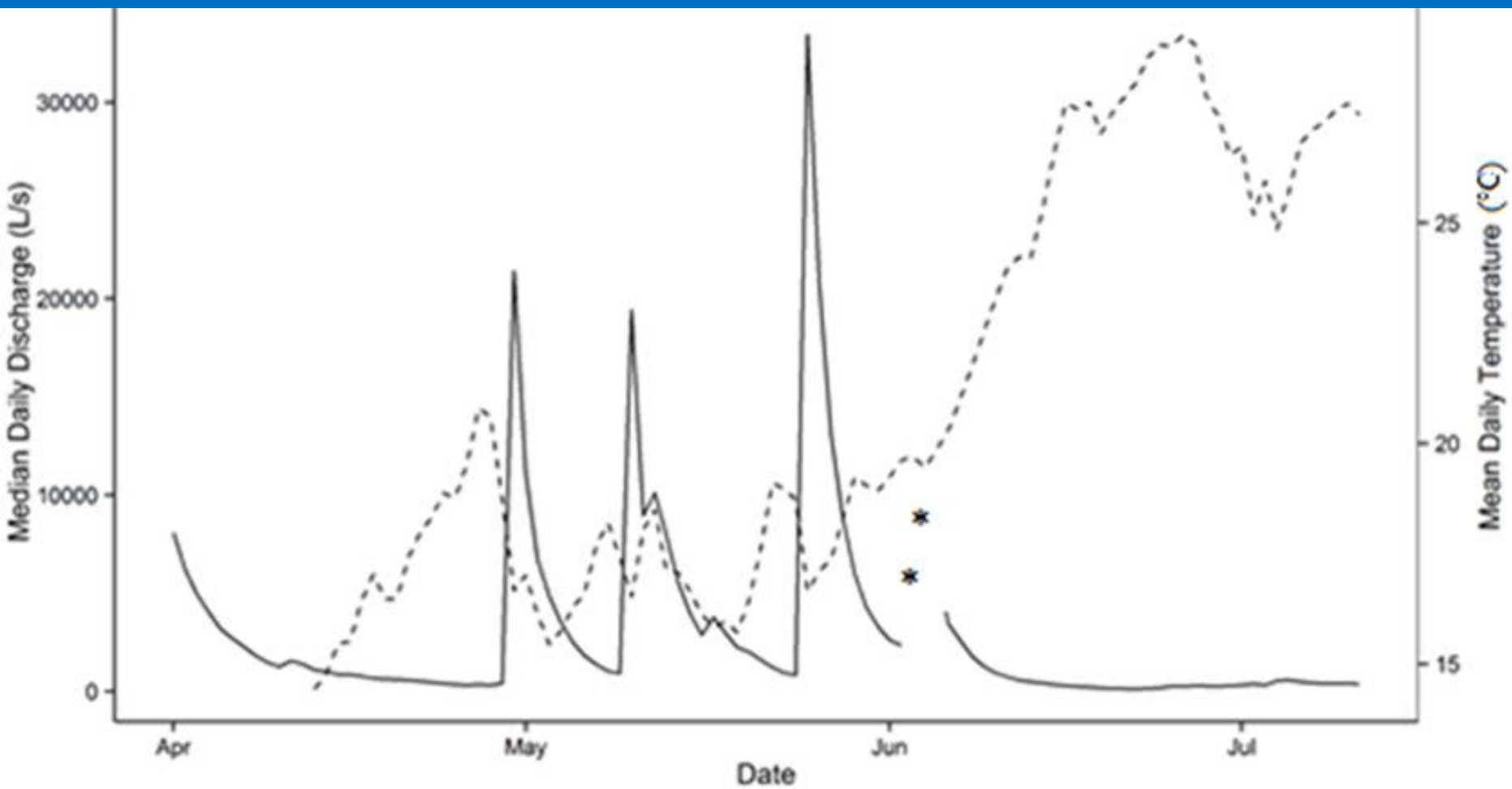
- Median daily temperature was the best temperature model ( $P < 0.01$ )
- $\log_{10}$  minimum daily discharge was the best discharge model ( $P < 0.05$ )



# Results: Spawn Date

- 17 Spotted Bass collected
- Spawning overlapped with Smallmouth Bass spawning but was noticeably shorter in duration (8 days)
- Spawning occurred between 18 C and 21 C





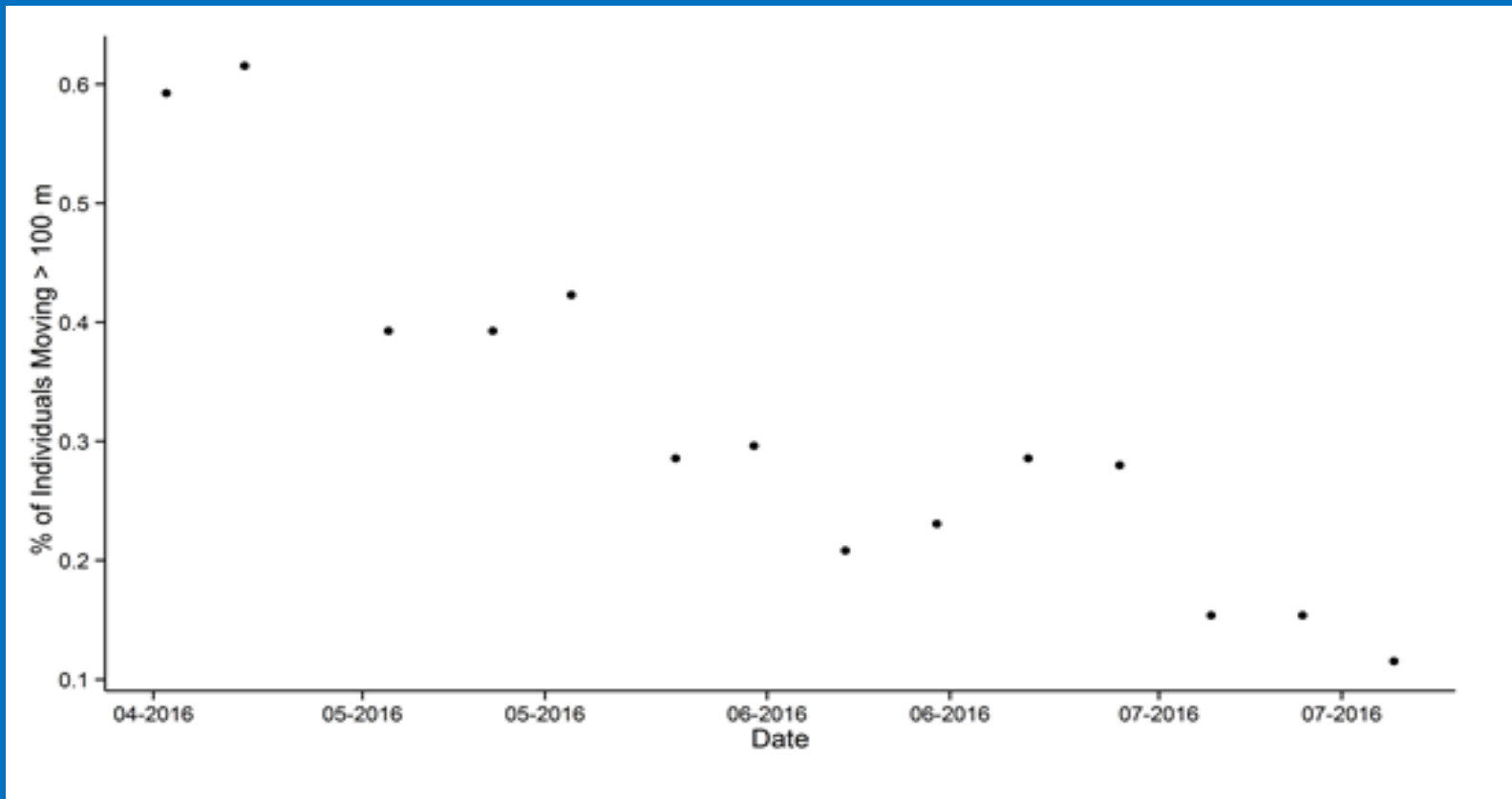
# Results: Movement

- Fish were located 381 times over 14 weeks
- 4 tagged fish left the tracking reach
  - 3 moved out of range
  - 1 moved by angler



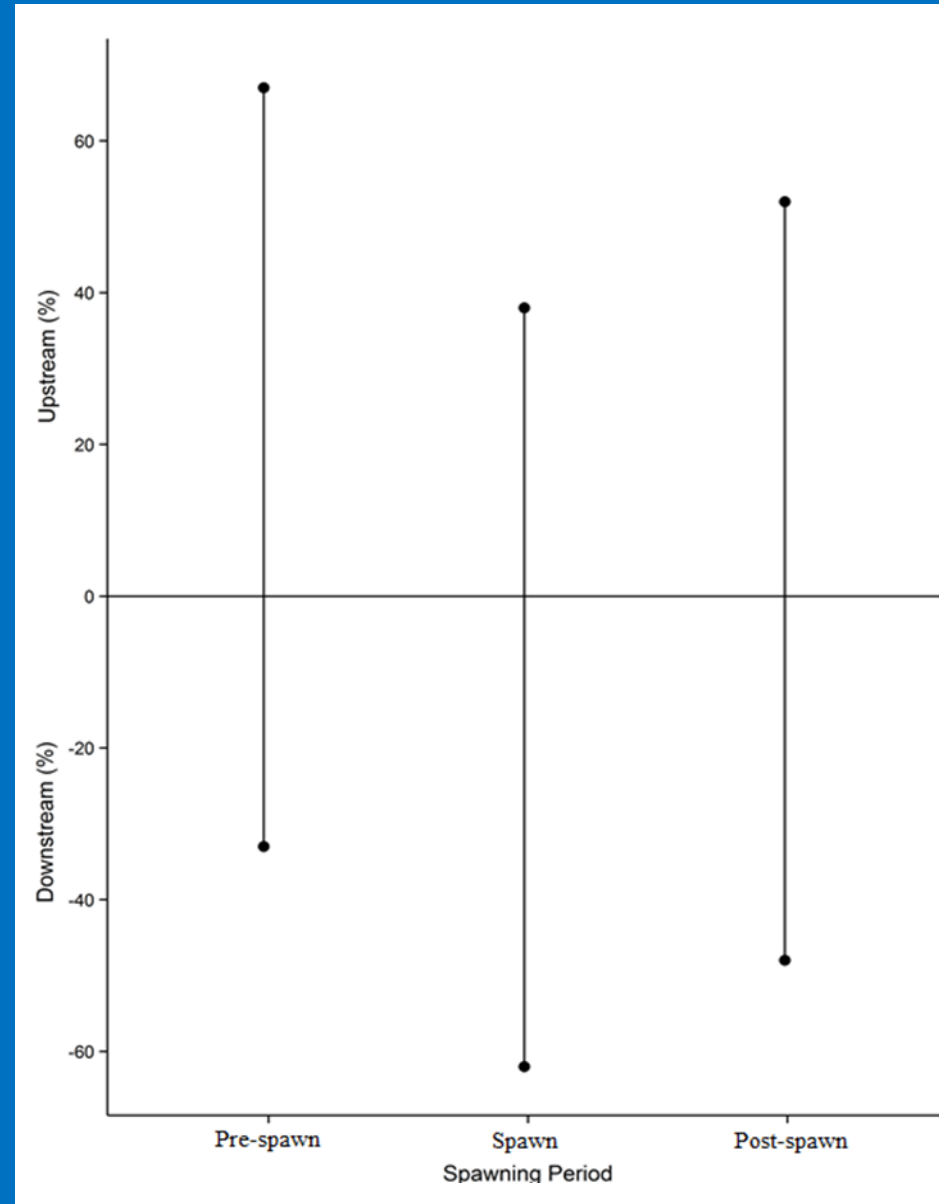
# Results: Movement

- Highest in April (62% of located fish moved > 100m)
- Lowest in July (12% of located fish moved > 100m)



# Results: Movement

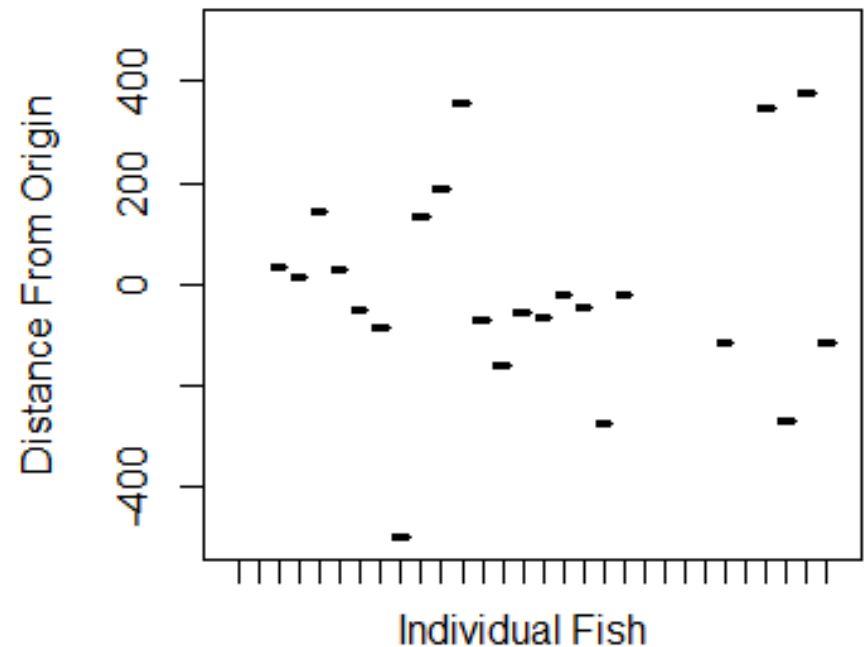
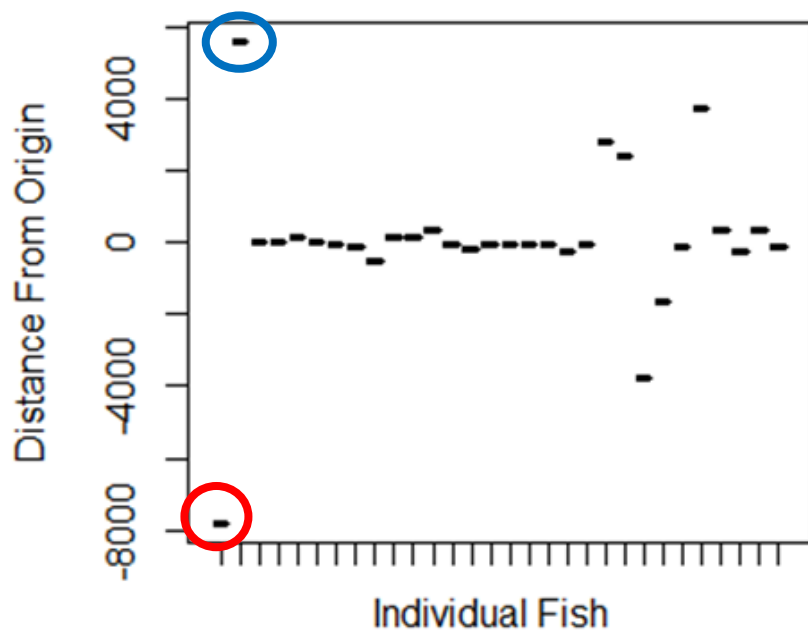
- Overall weekly movements were small
- Cumulative movements differed between time periods. ( $P < 0.05$ )
- No difference in directionality





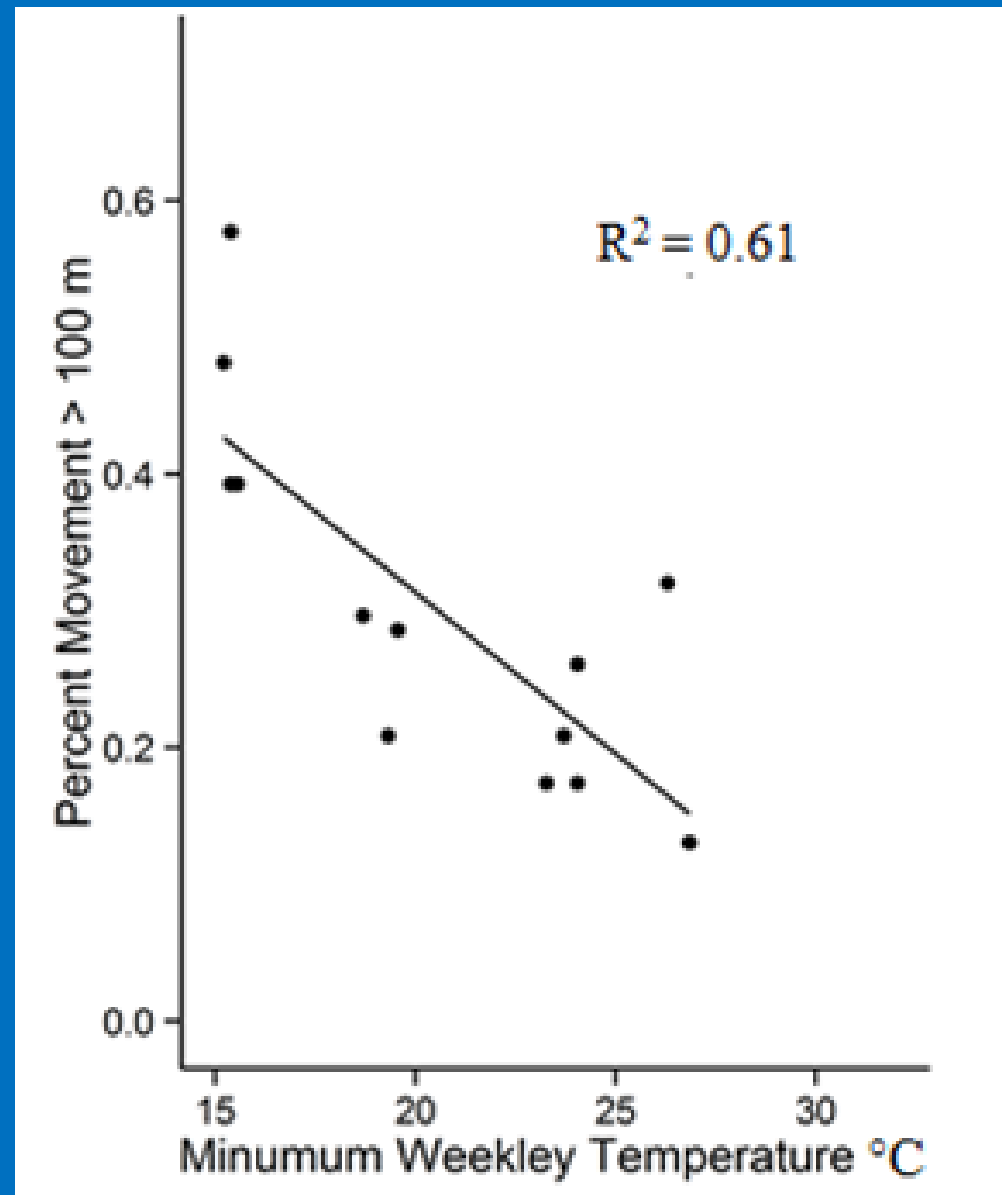
# Results: Movement

- 77% of fish remained within 1km of capture location
- 56% of fish remained within 200m of capture location
- Median net movement was 89 m
- Possible home pool fidelity?



# Results: Movement

- Minimum weekly temperature was the best temperature model ( $P < 0.01$ )
- No models for discharge were significant ( $P > 0.05$ )



# Discussion

- Successful spawning occurred over 17 days. Numerous other studies have noted a prolonged duration of at least 3 months. Extreme environmental conditions during this time (e.g. unusual streamflow) could constitute a threat to recruitment
- The range of temperatures that spawning occurred in was noticeably higher and narrower than ranges observed for *M. d. dolomieu* (12-23 C)
- Understanding how hydrologic regime and temperature affect spawning could aid managers in estimating recruitment

# Discussion

- Overall movements were small and did not appear to be directional. In addition, for most fish, they were based around a central location.
- Fish that did make long distance movements left the tracking reach which led to them being located less than more sedentary fish. This caused an underestimation of movement.

# Discussion

- Smallmouth Bass and Spotted Bass appear to be spawning at the same time and age-0 of both were collected in the same reaches.
- These two species are known to hybridize and produce viable offspring that can back-cross with either parent species.
- Introgression has been attributed to the decline of Smallmouth Bass in the Missouri Ozarks but further studies are needed to know if these concerns are warranted in this ecoregion.

# Discussion

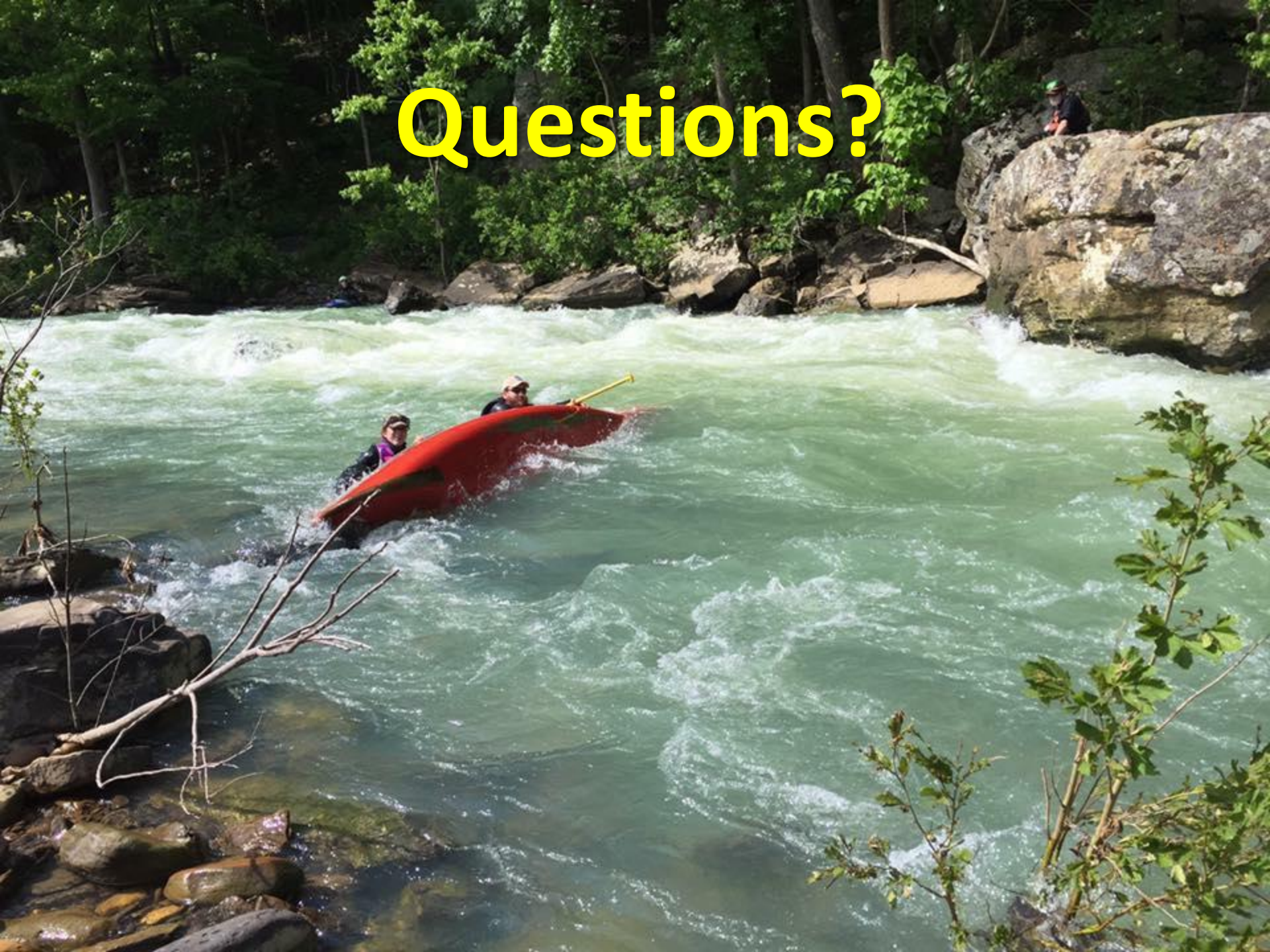
- A more focused study of daily movements centered around early June may be more appropriate for measuring movement associated with spawning
- Generalizing conclusions across the Boston Mountain ecoregion or Ozarks will require studying additional streams

# Acknowledgements

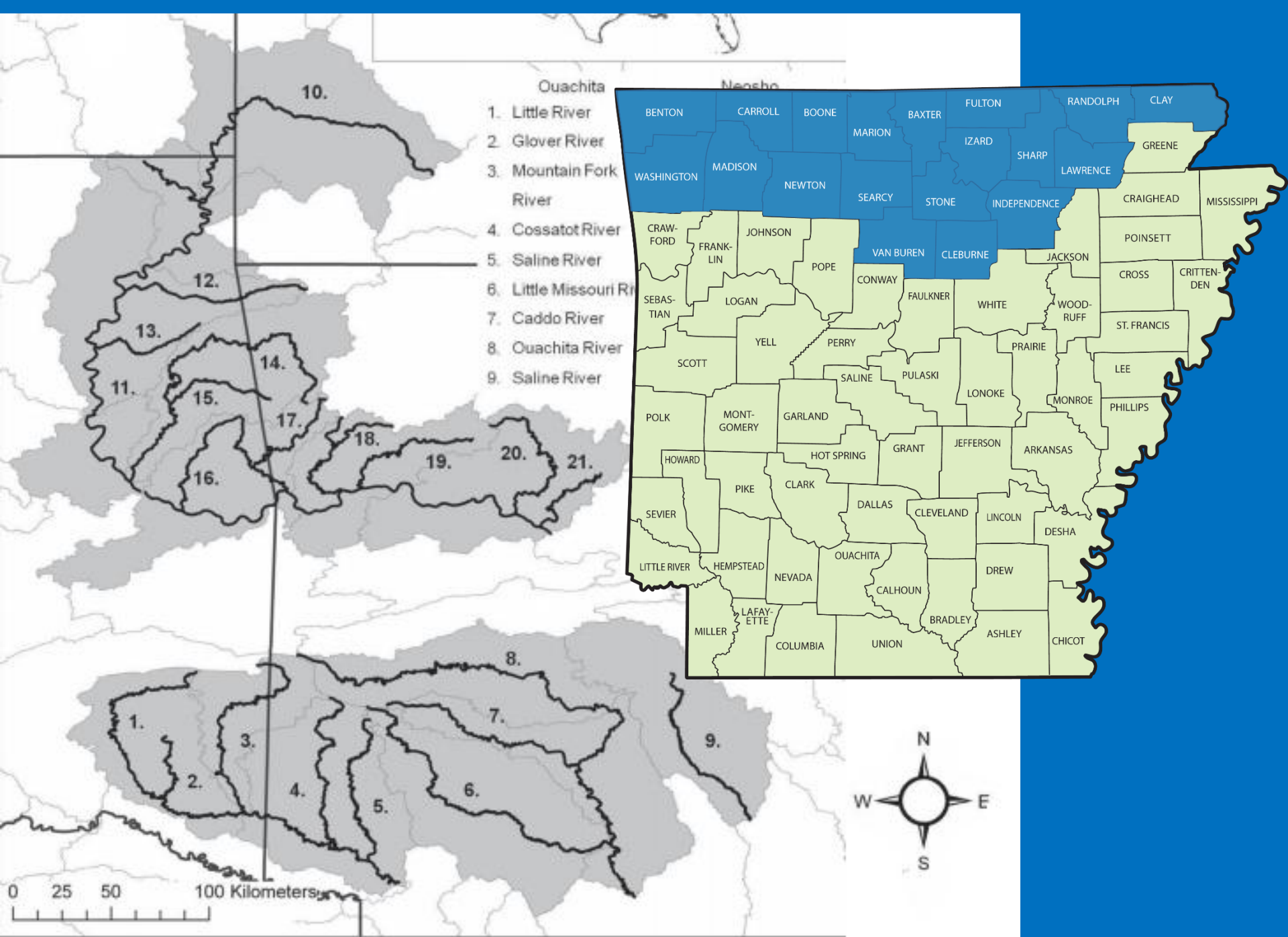
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  - Charlie Gagen
  - Technician: Jennifer Sloan
  - Volunteers



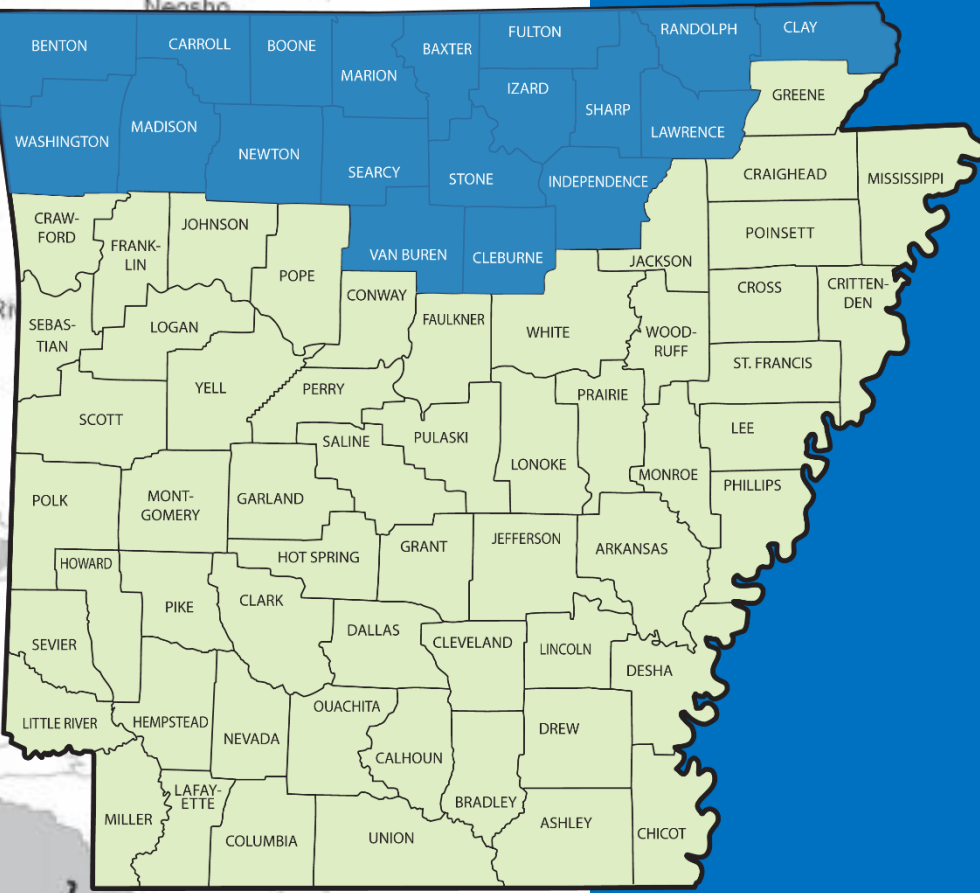
# Questions?







- Ouachita  
 Neosho
1. Little River
  2. Glover River
  3. Mountain Fork River
  4. Cossatot River
  5. Saline River
  6. Little Missouri R
  7. Caddo River
  8. Ouachita River
  9. Saline River



0 25 50 100 Kilometers