

Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 24-25, 2016

Agenda Item

Aquatic Foodbase of the Little Colorado River

Purpose of Agenda Item

This will be a scientific presentation about an ongoing research project on the food resources available to the largest population of endangered humpback chub in the Colorado River Basin.

Action Requested

Information item only; we will answer questions but no action is requested.

Presenter

Jeff Muehlbauer, USGS Research Ecologist

Previous Action Taken

N/A

Relevant Science

N/A

Summary of Presentation and Background Information

The Little Colorado River (LCR) provides critical spawning and juvenile rearing habitat for the largest remaining population of endangered humpback chub in the Colorado River Basin. Yet surprisingly little is known about the condition of the aquatic foodbase of invertebrates in the LCR that provide food for chub and other fish species. For the past three years, our group has been sampling the aquatic invertebrate community of the LCR, four times per year, throughout its entire 21-km, perennial reach. This presentation will focus on the results of this effort, especially the pronounced seasonal and spatial patterns in aquatic invertebrate density and availability throughout the LCR. Specifically, we found that invertebrate availability peaked in spring and was otherwise low throughout the remainder of the year. We also found that light availability, as influenced both by canyon shading and turbidity, exerted a strong spatial control on invertebrate densities. These results may provide insight into chub behaviors and distributions throughout the LCR in both time and space.



Aquatic Foodbase of the Little Colorado River

Jeff Muehlbauer

Grand Canyon Monitoring and Research Center
Southwest Biological Science Center

U.S. Department of the Interior
U.S. Geological Survey



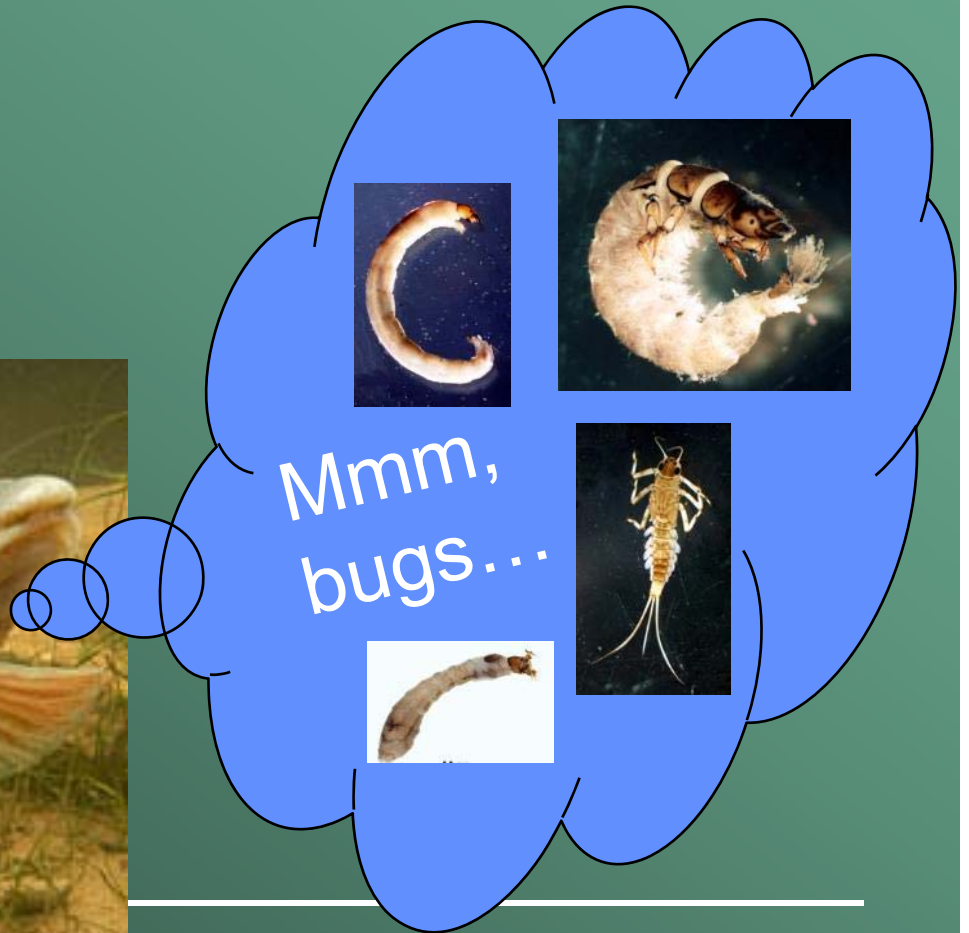
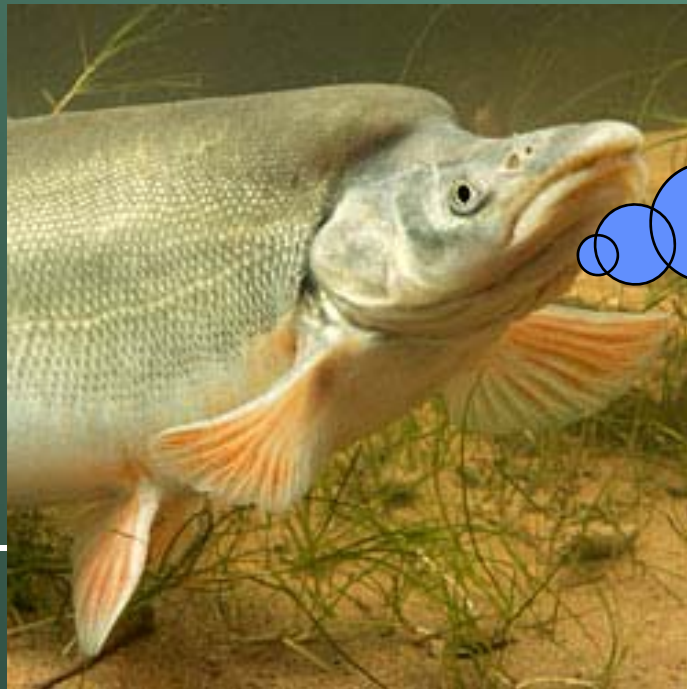
Why you should care

- LCR: Home to endangered humpback chub



Why you should care

- LCR: Home to chub
- Chub eat bugs
“drift-feeding fish”



Why you should care

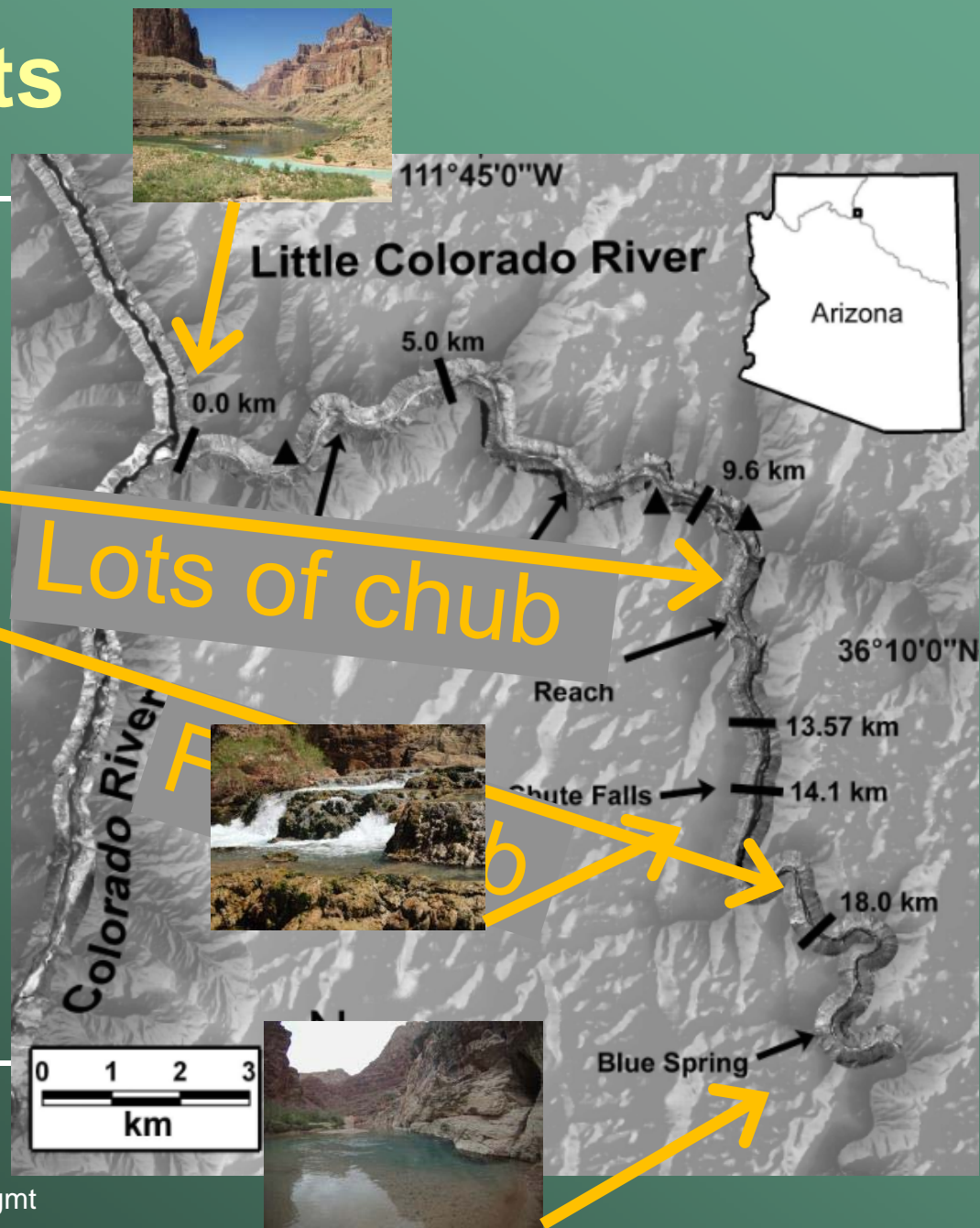
- LCR: Home to chub
- Chub eat bugs
- More bugs = More/fat chub?



Chub hang outs



- But why?
(possibly food?)



Map from Van Haverbeke
et al 2013. J. Fish Wild Mgmt

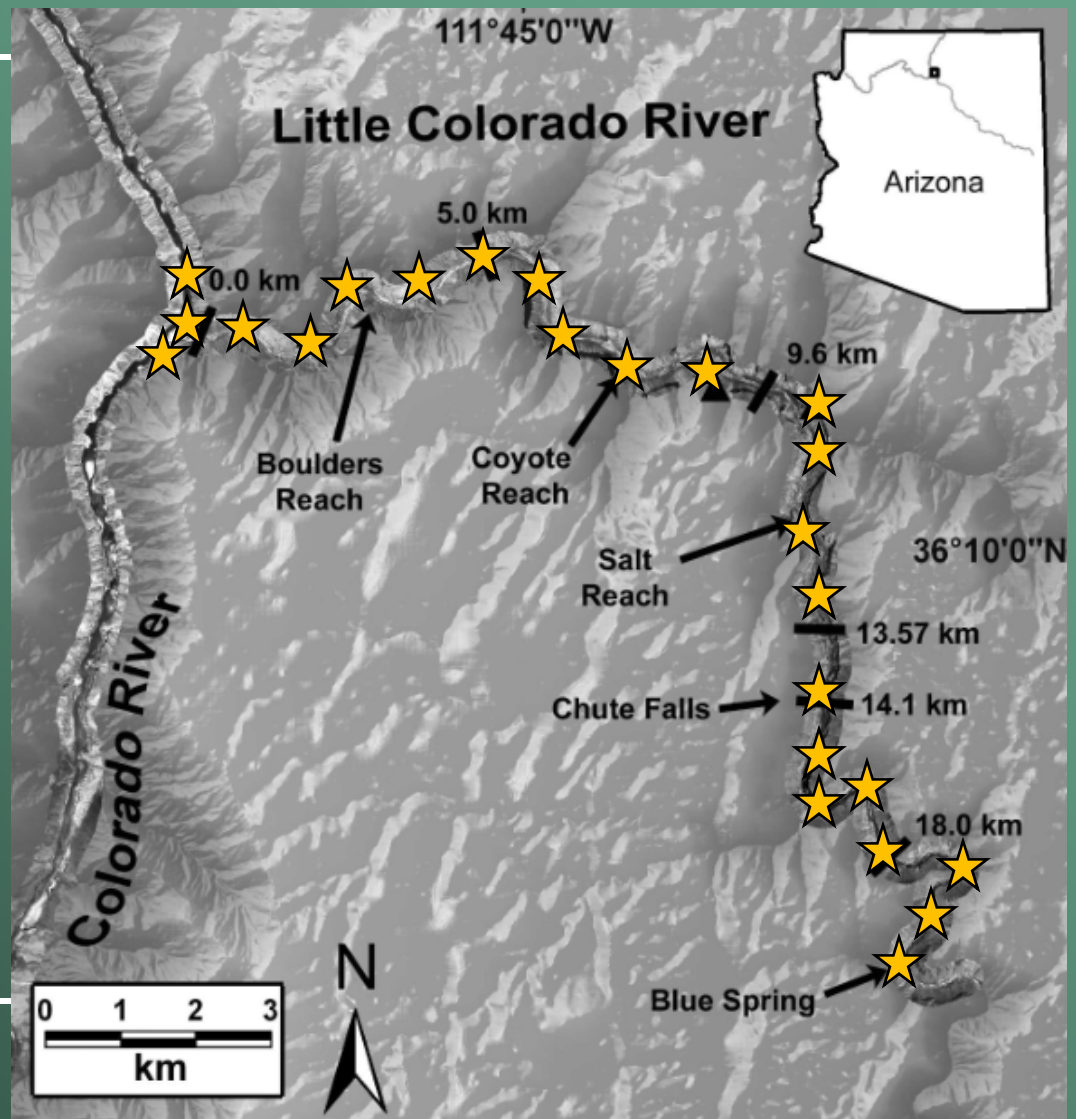
Insect sampling

- Sticky traps
 - Surrogate for what's in the water



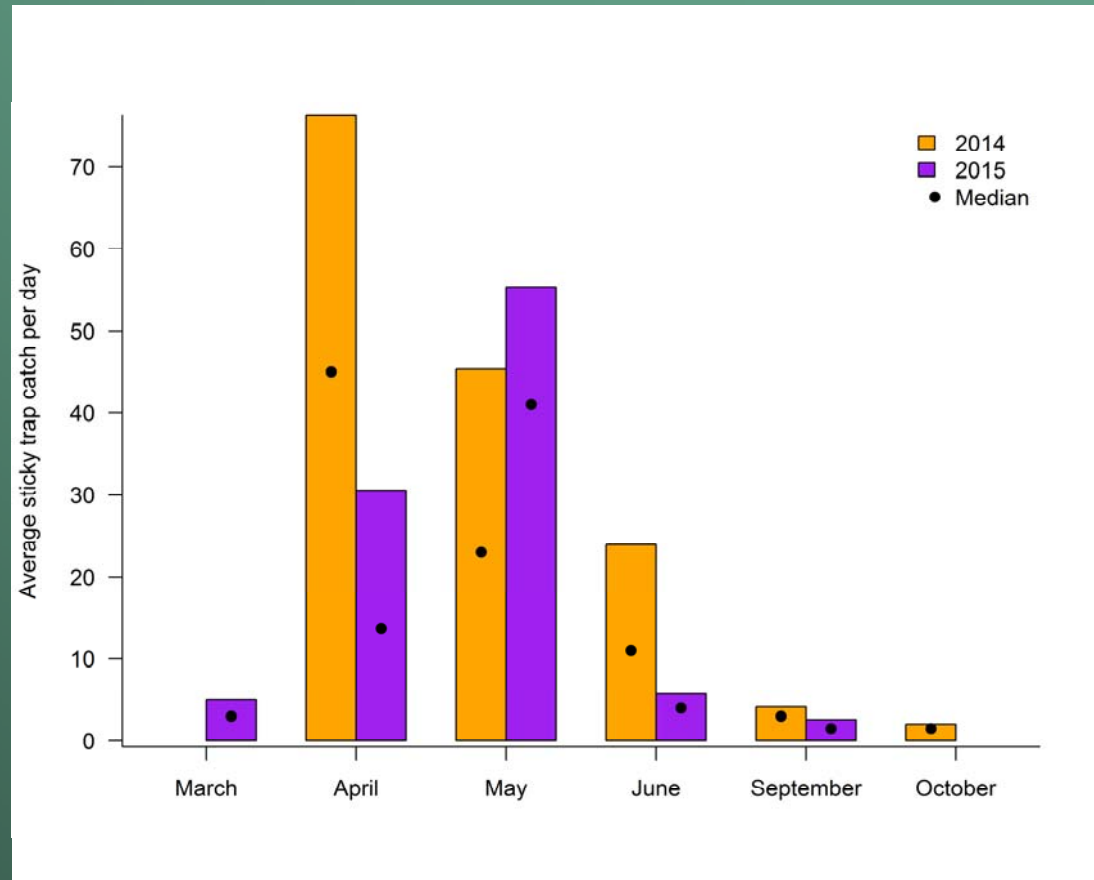
Insect sampling

- Sticky traps
 - Surrogate for in-water densities
 - Every river km, 5x per year



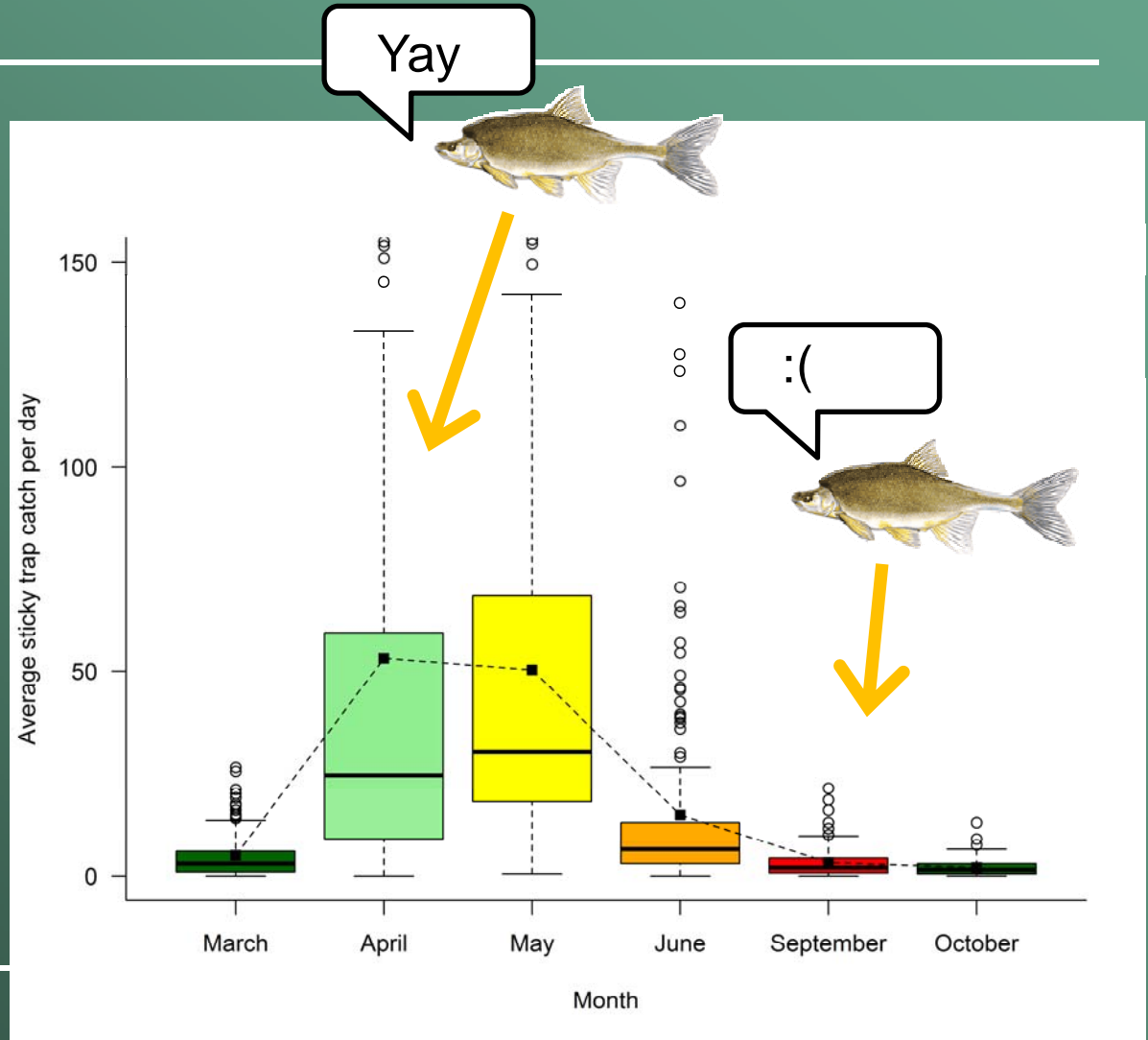
Insect sampling

- Sticky traps
 - Surrogate for benthic densities
 - Every river km, 5x per year
 - Prodigious catch rates



Results: Seasonal feast or famine

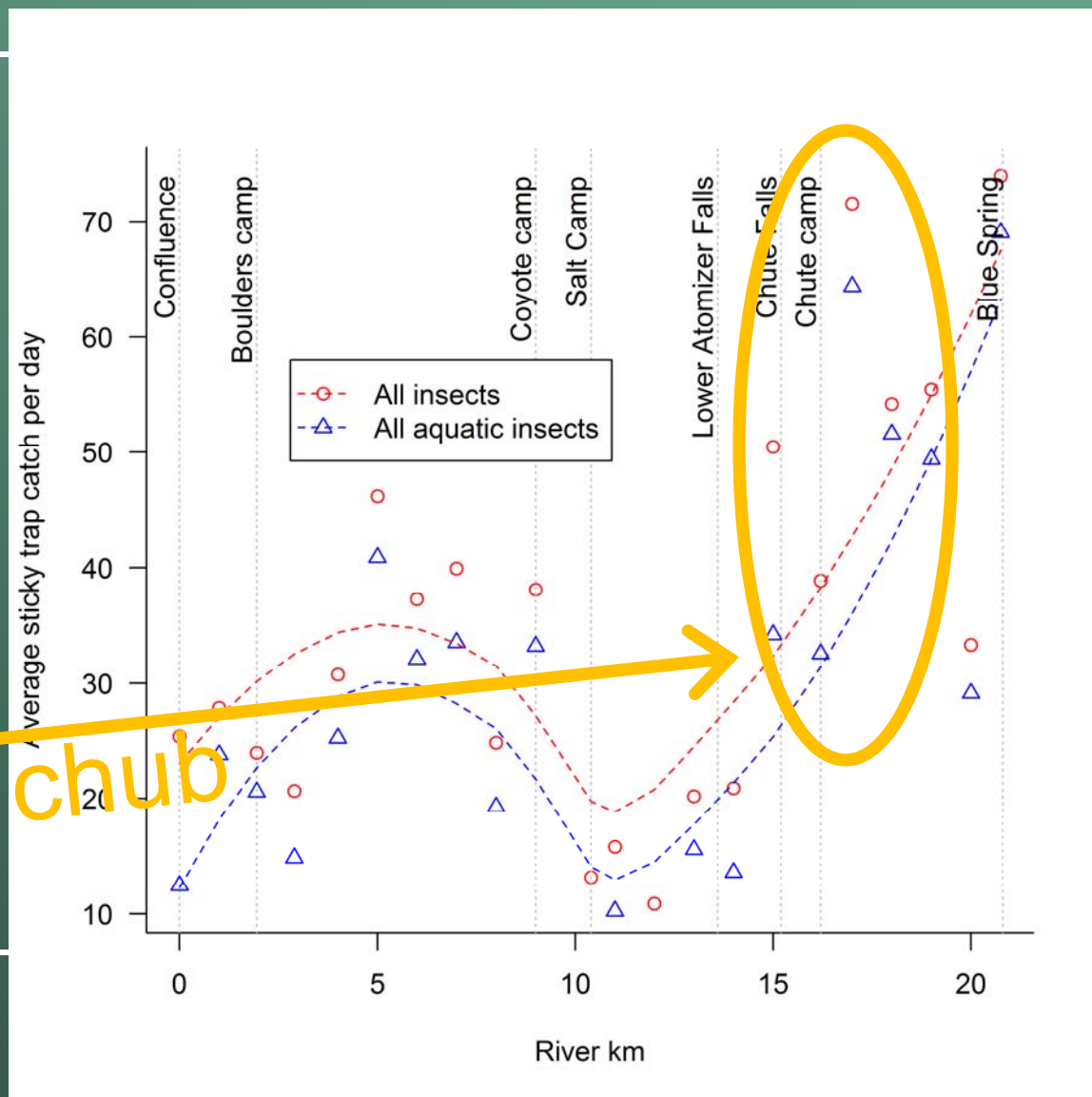
- **Slim pickings outside of April/May**



Longitudinal patterns: All bugs



Fat chub



Longitudinal patterns: Fat, juicy bugs

■ (AKA EPT)

E:



Mayflies

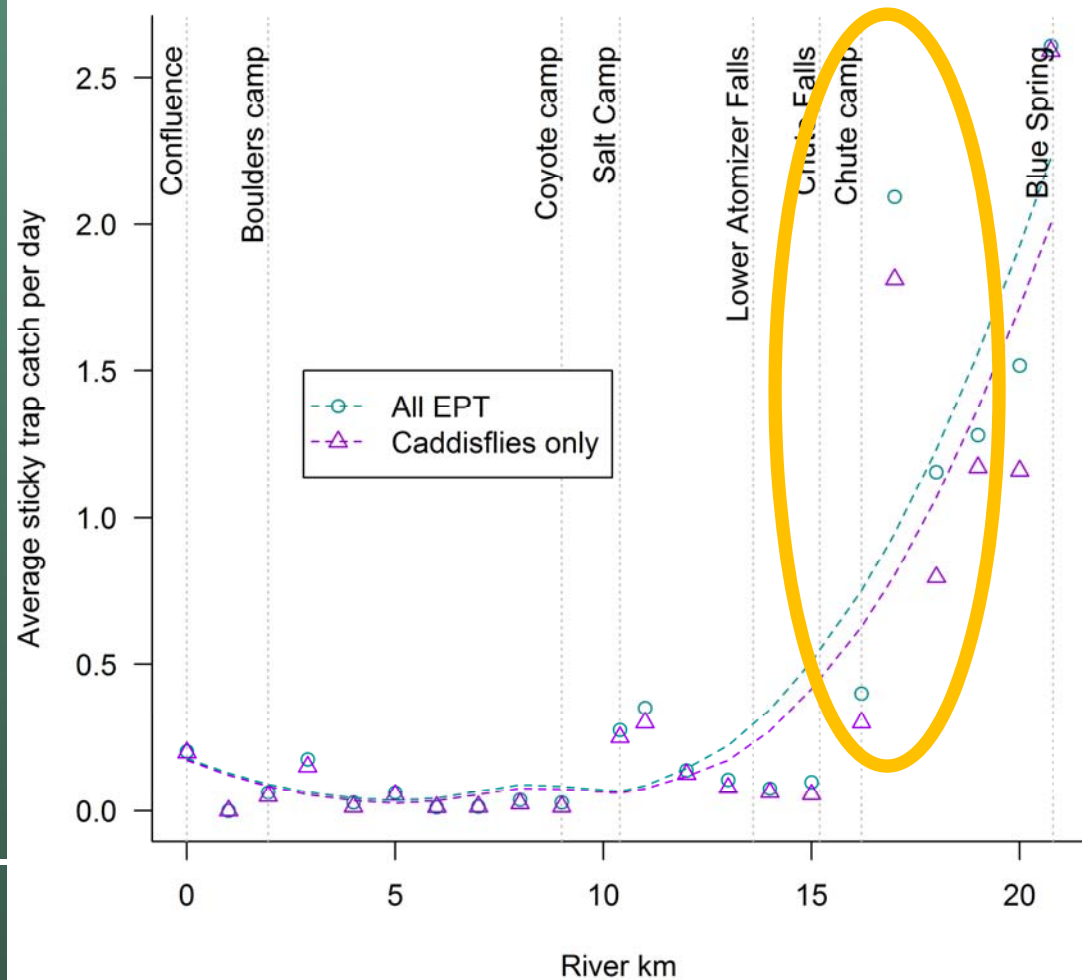
~~P:~~

Stoneflies

T:



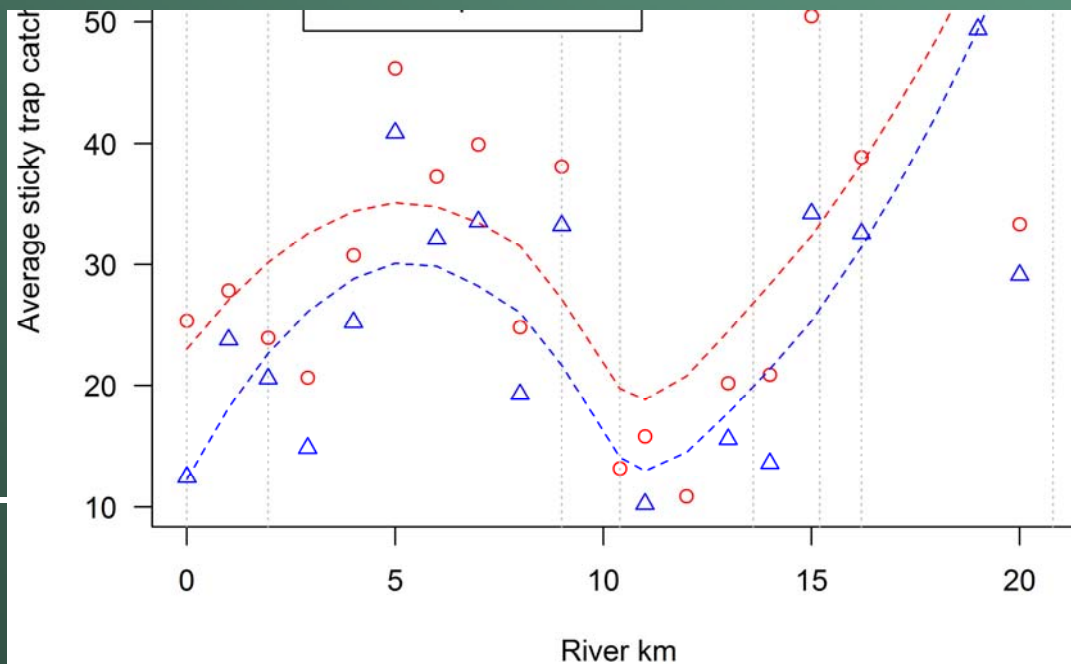
Caddisflies



Preliminary data, do not cite.

Digging (diving?) deeper

- So we've got a bug pattern...
- It may (partly) explain the chub...
- But what explains the bugs?



A travertine stream

- Crystal-clear at spring
- Increasingly turbid downstream

Spring



Midway

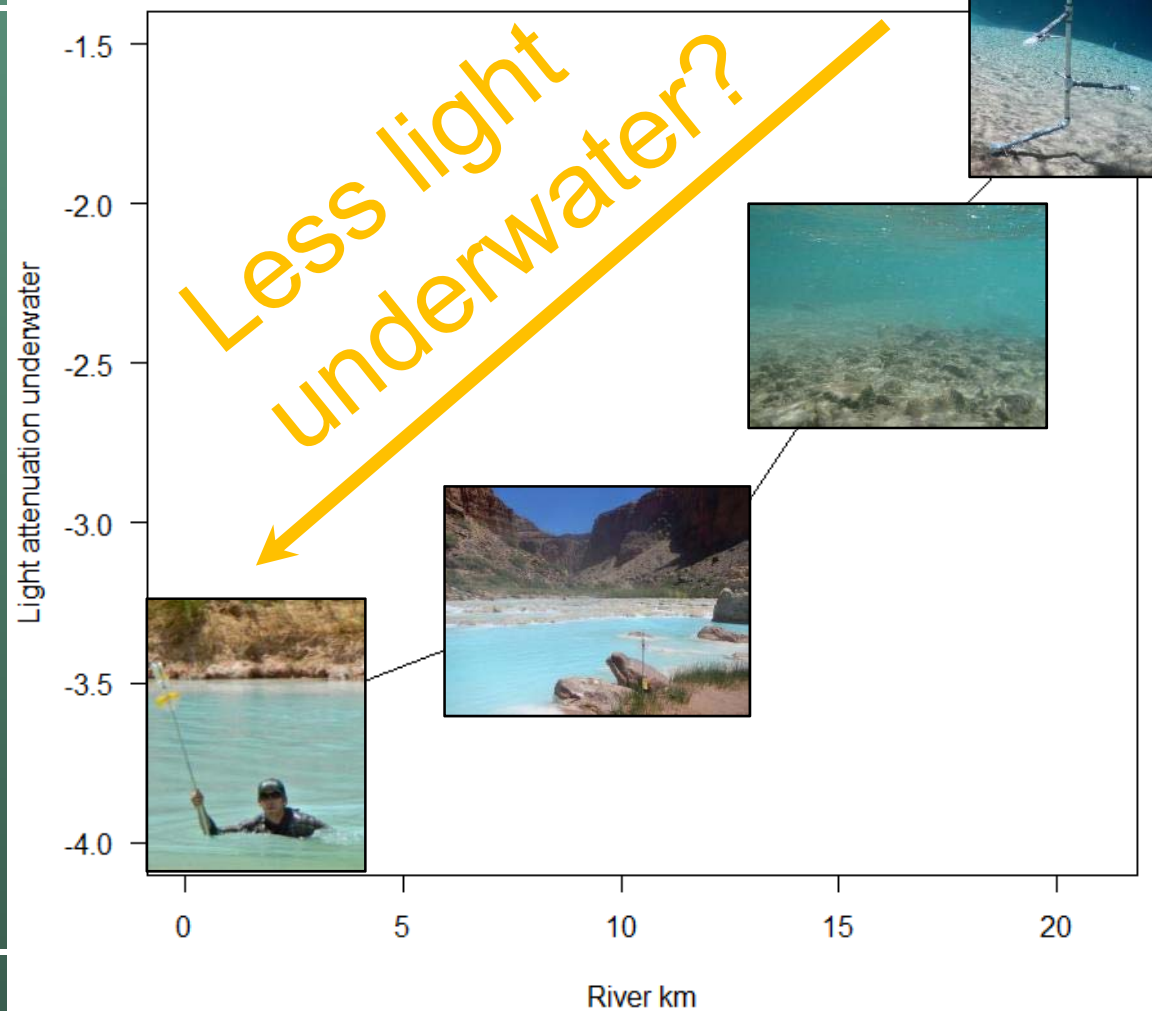


Confluence

Light penetration

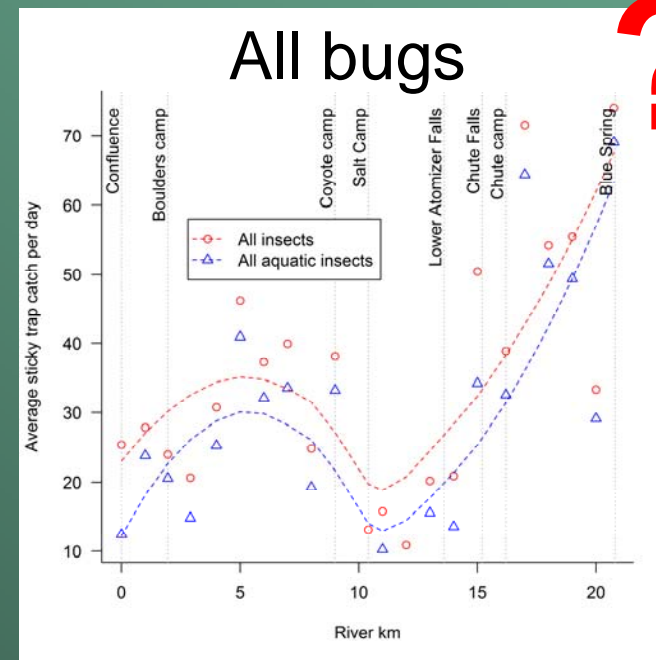
Spring

- Less light hits stream bed downstream?



Turbidity influences

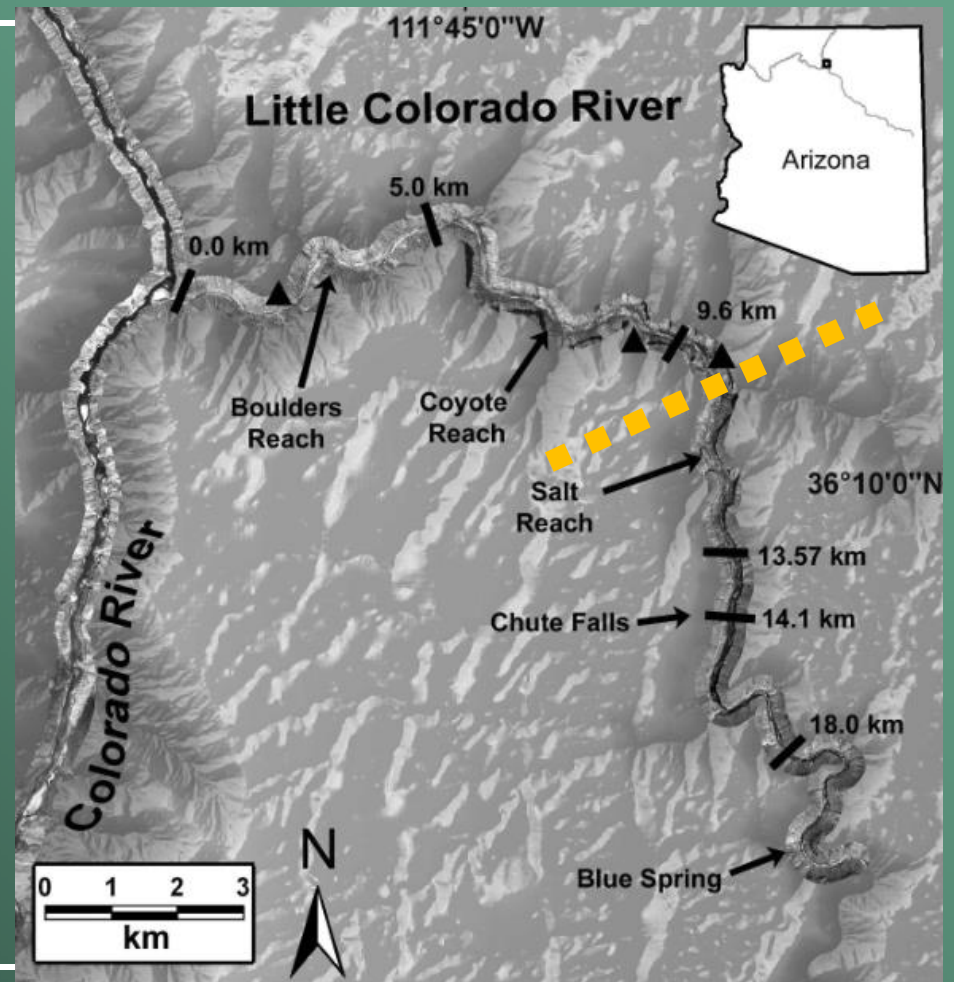
- So we'd expect fewer bugs downstream...



- But what about the rest of the pattern?

Canyon geography

- Narrow upstream, widens downstream
- N/S upper half, E/W lower half



(Un)Made in the shade

Upper river

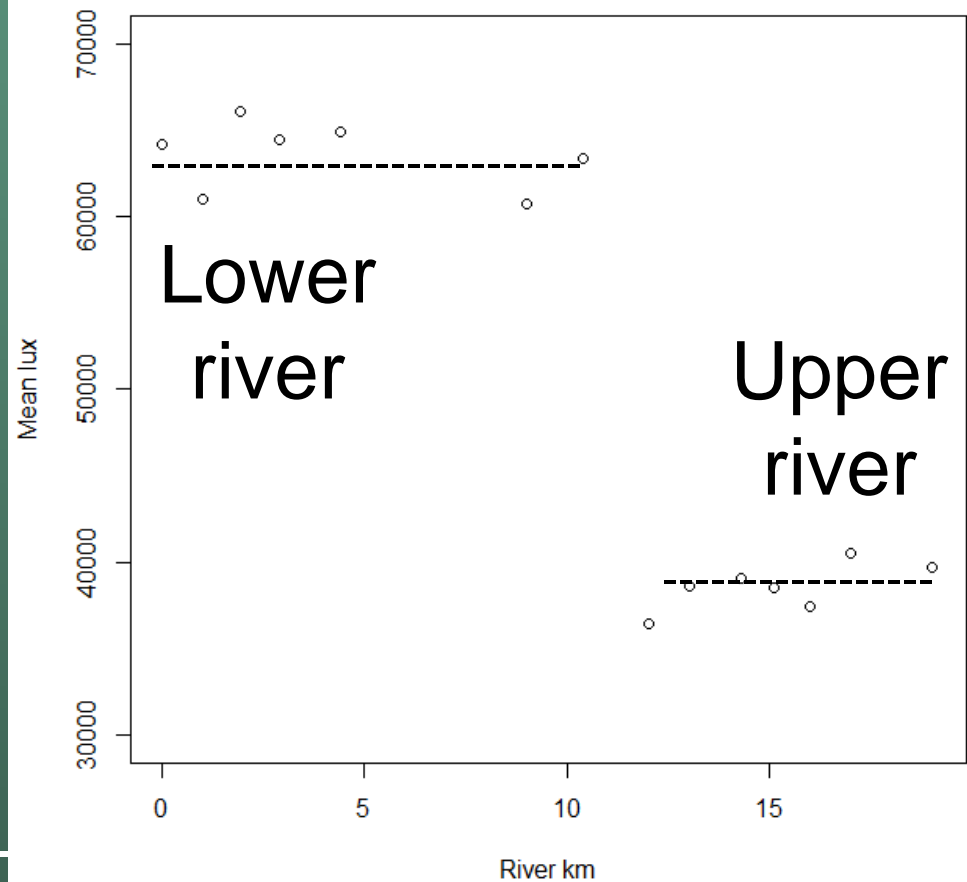
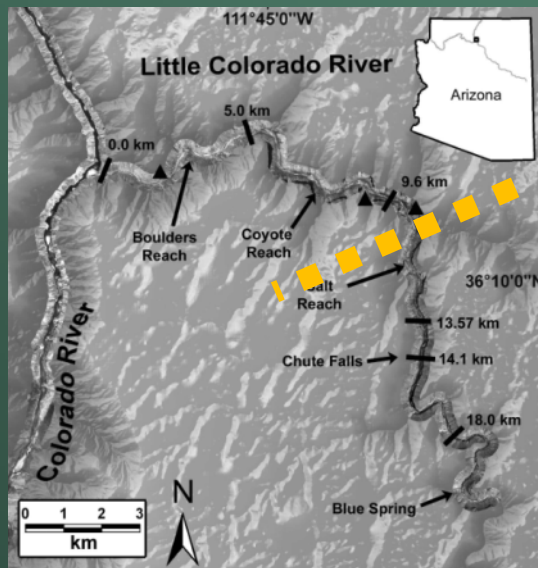


Lower river



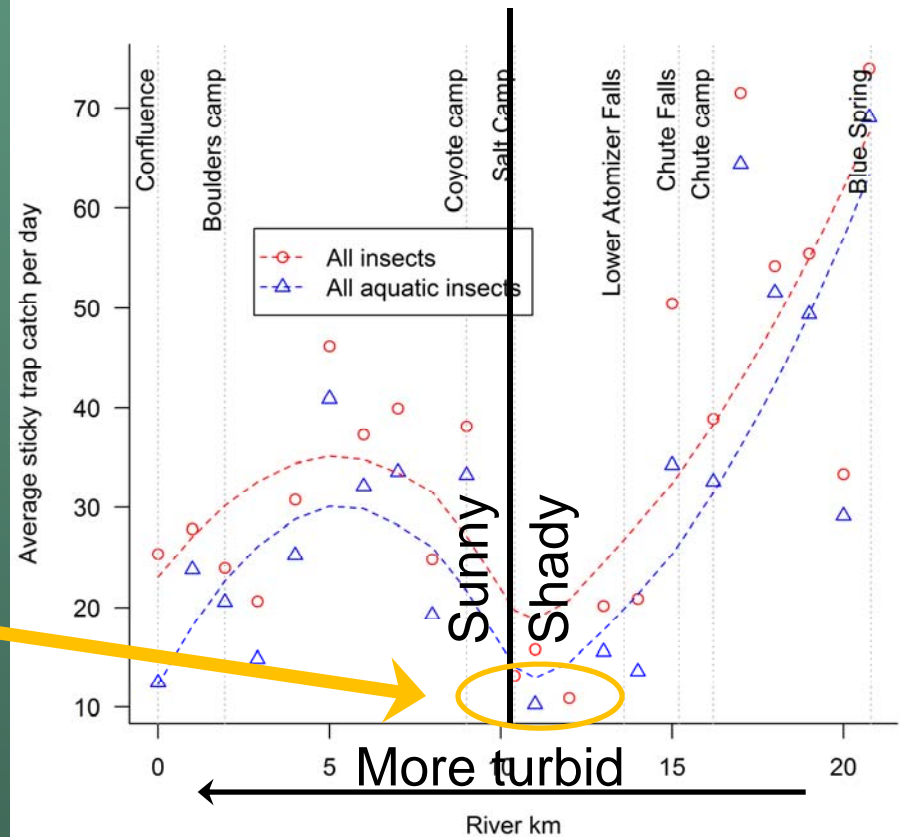
Light hitting the water surface

- 1.5x more light downstream than upstream



A light double-whammy

- Upstream:
 - Clear water, but shady
- Downstream:
 - Sunny, but turbid



Conclusion

- Dual controls on bug densities
- Both light-related: shading vs. turbidity
- Can be contrasting or complementary
- 2016:
Resolving patterns



Thanks. Questions?



- With assistance from Ted Kennedy, Eric Kortenhoeven, Josh Smith, Tom Quigley, Anya Metcalfe, Charles Yackulic, and others
- All samples painstakingly (yet cheerfully!) picked by student intern David Goodenough



Preliminary data, do not cite.

