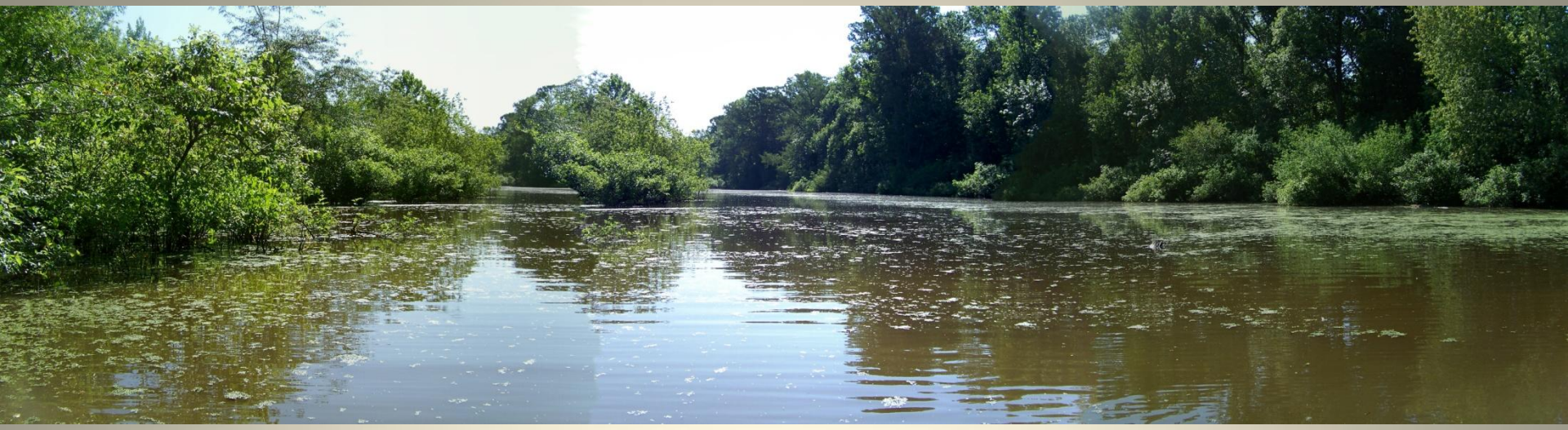
10-2010

Predicting Ecological Responses to Reconnection of the Cache River

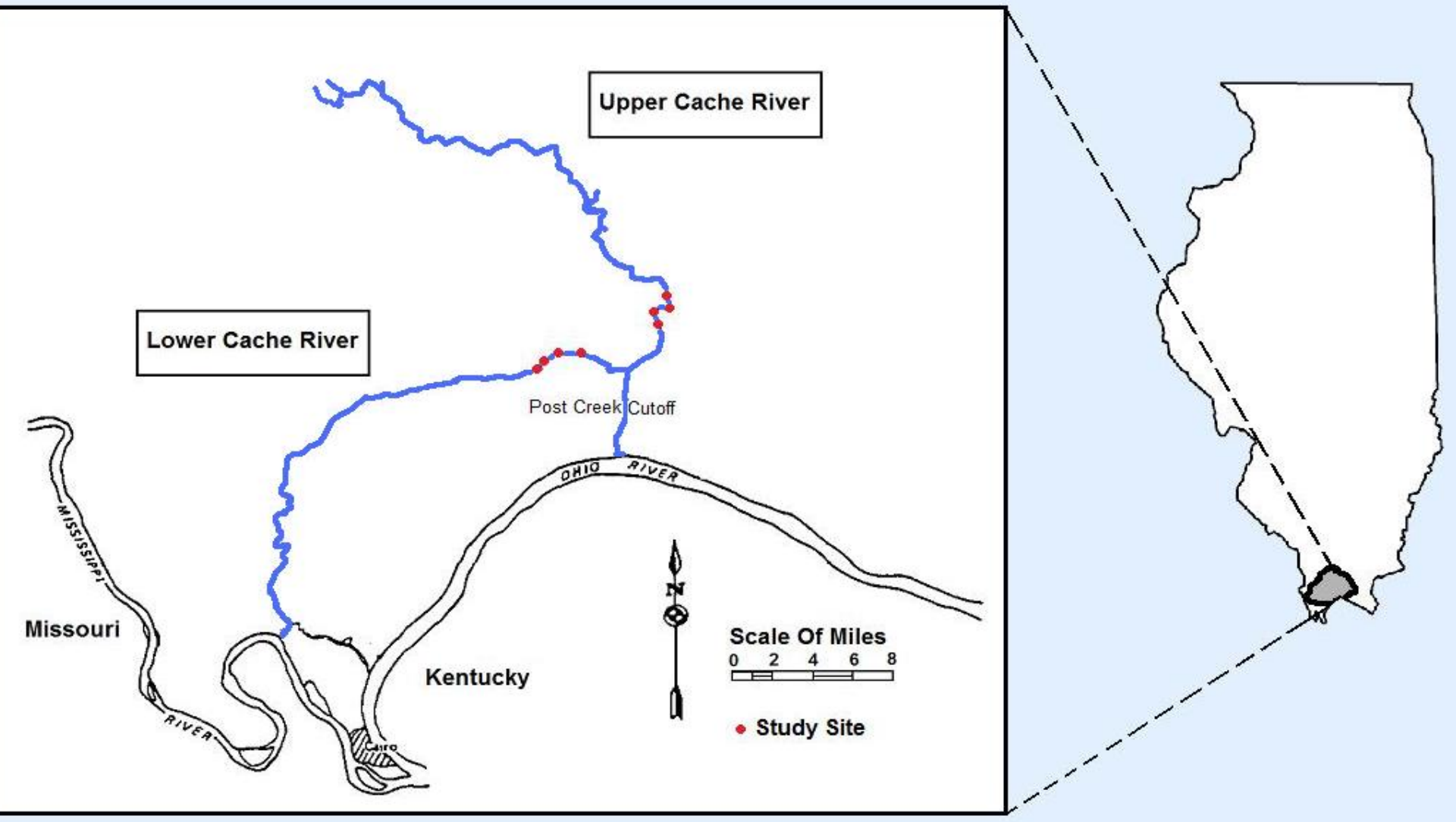
Heidi Rantala
Southern Illinois University Carbondale

Heidi Rantala received her PhD in Biological Sciences with Alex Huryn at The University of Alabama in 2009. Her dissertation research focused on secondary production, leaf litter breakdown, and macroinvertebrate community structure in Arctic tundra streams across a glacial chronosequence. She completed an M.S. in Water Resources Science at The University of Minnesota and B.S. degrees in Biology and Geology from The University of Wisconsin-Eau Claire. Heidi's interests include the ecology of stream macroinvertebrates, landscape ecology, stream restoration, and paleolimnology. She is especially interested in the biology of aquatic flies and their role in ecosystem processes. She is also interested in role of lakes on stream community structure and ecosystem processes. She is currently a post-doctoral fellow at SIUC working with Matt Whiles, in Zoology, and Greg Wilkerson in Civil and Environmental Engineering. They are working on a project in the Cache River watershed, predicting the ecological benefits of a proposed reconnection of the lower part of the Cache River to its headwaters.



Predicting ecological responses to reconnection of the Cache River

Heidi M. Rantala, Eric Scholl, Matt Whiles, Greg Wilkerson, and Cameron Bencini



Impairments to lower Cache River

Altered stream-side vegetation
Sedimentation and siltation
Loss of instream cover
Dissolved oxygen concentrations
Alterations to the flow regime

Dissolved Oxygen Profiles, Cache River, IL
July 18-20, 2010

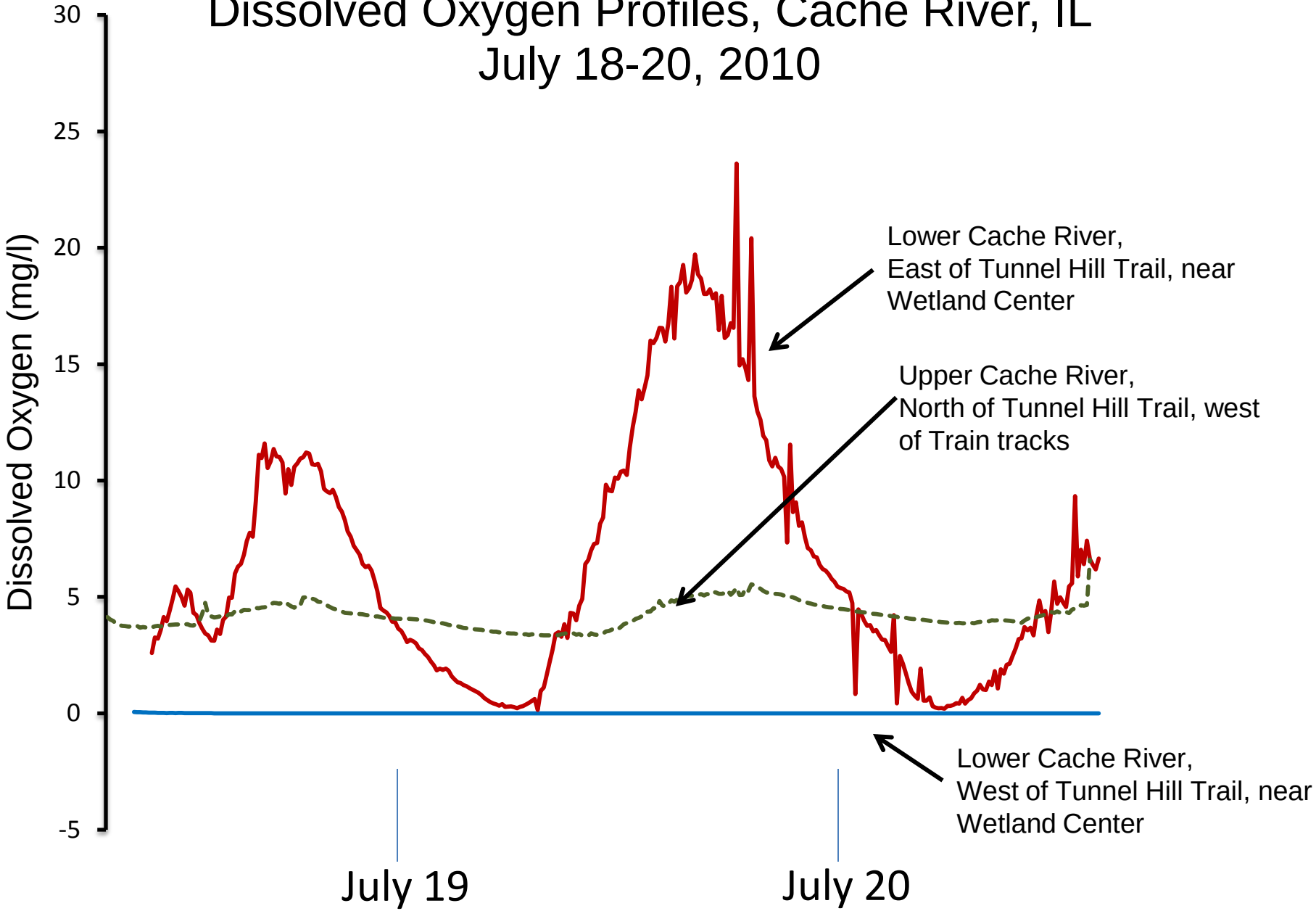
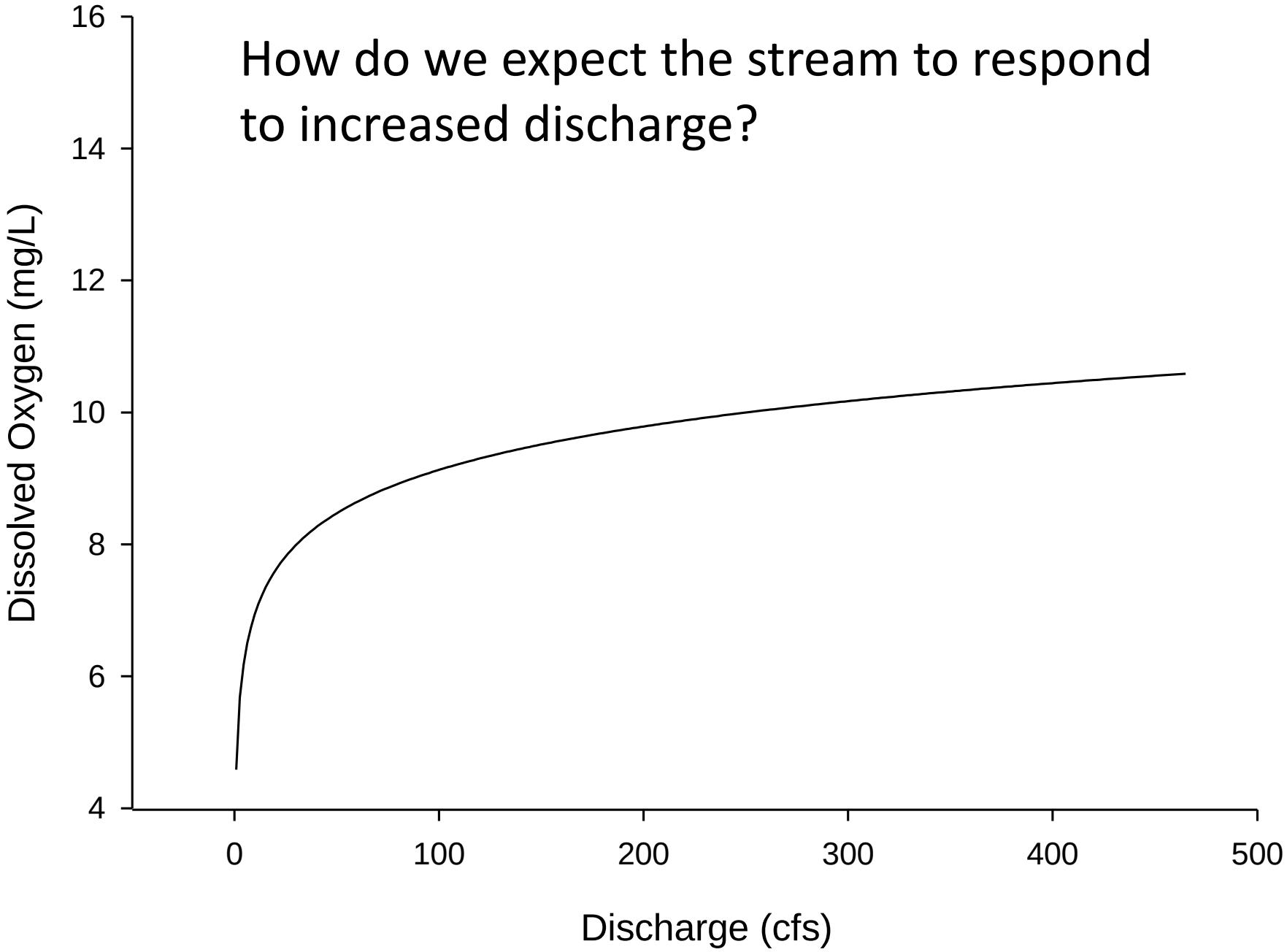


Photo courtesy of Kristen Pitts

Data from IEPA and USGS



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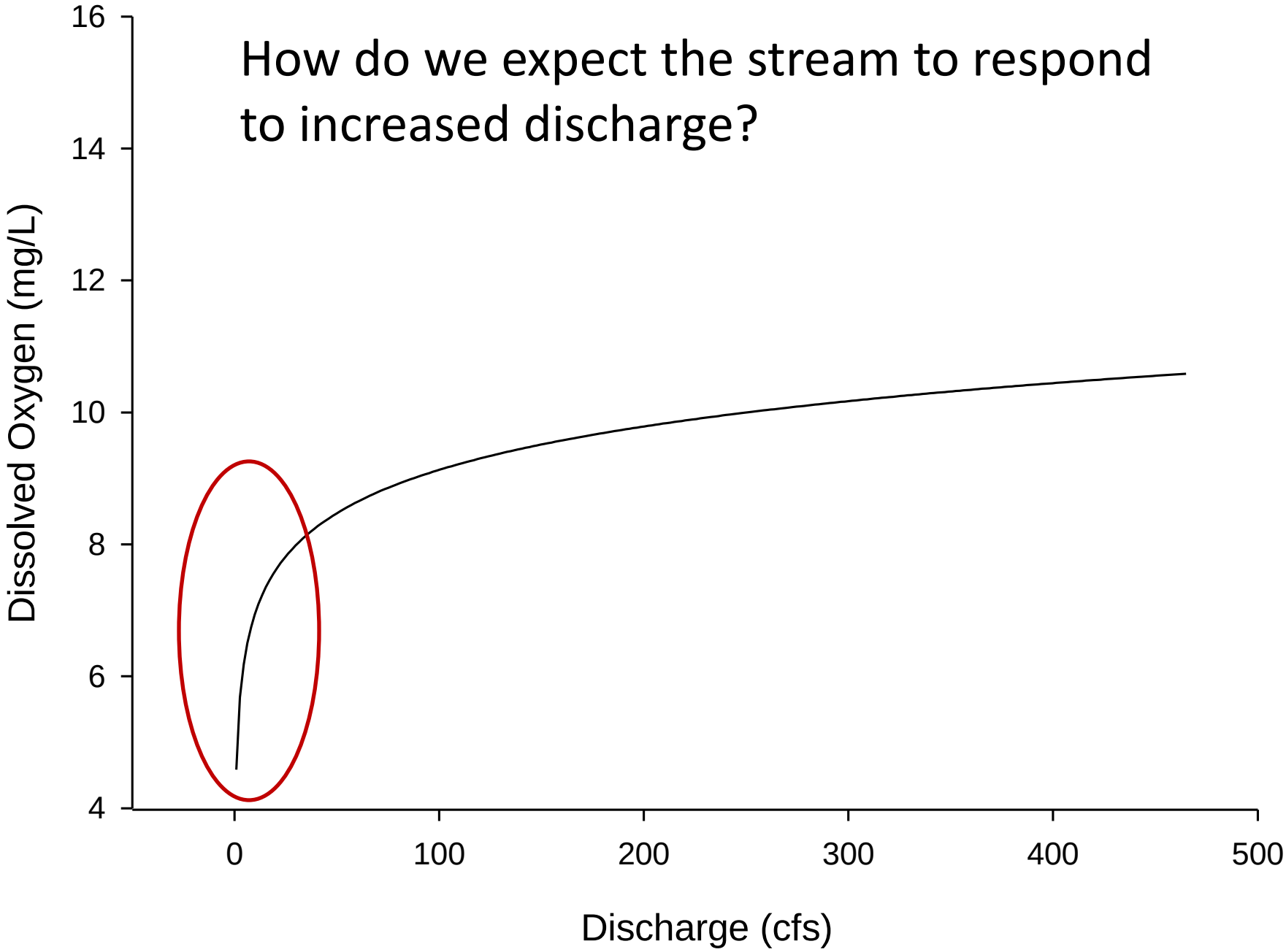
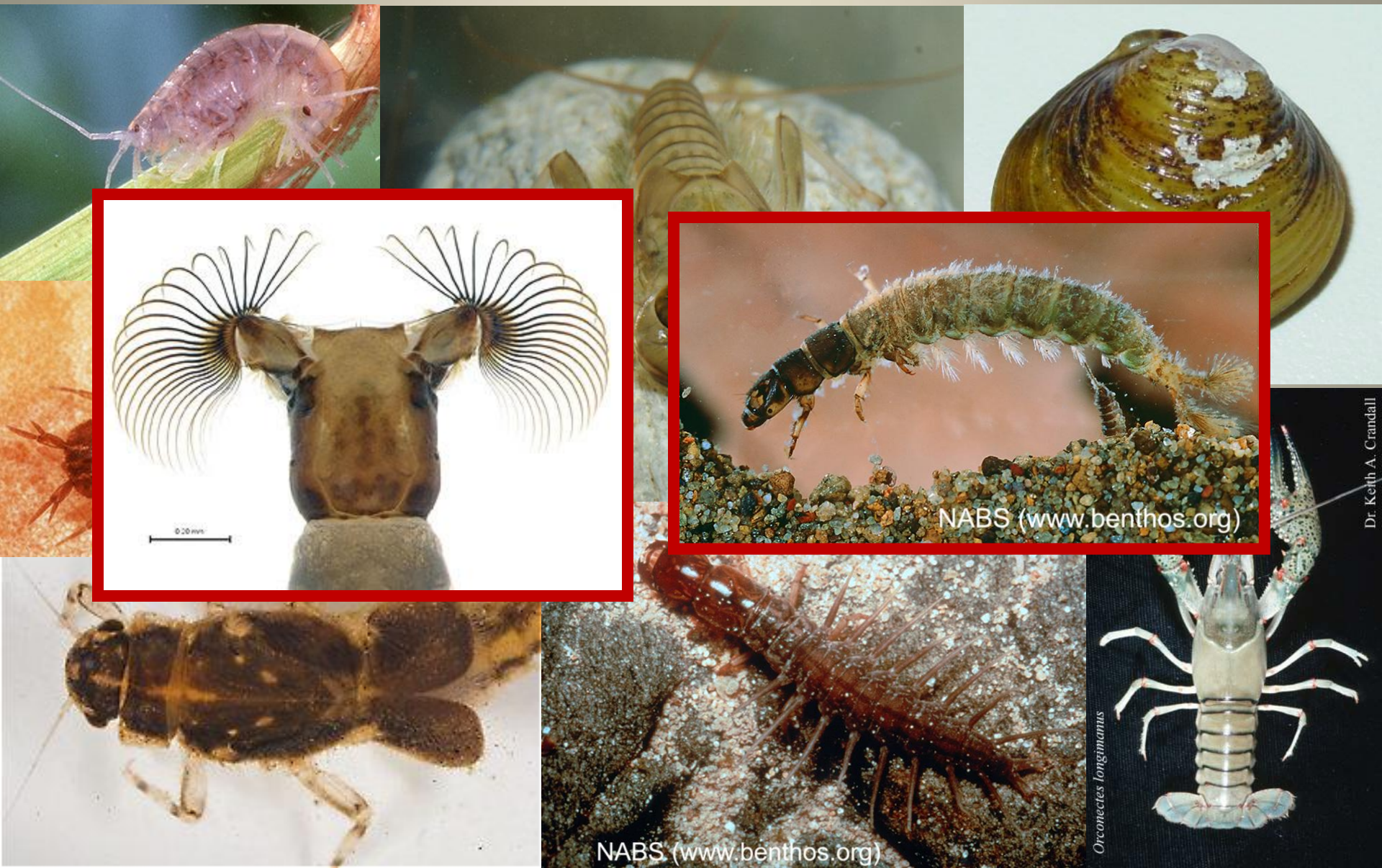
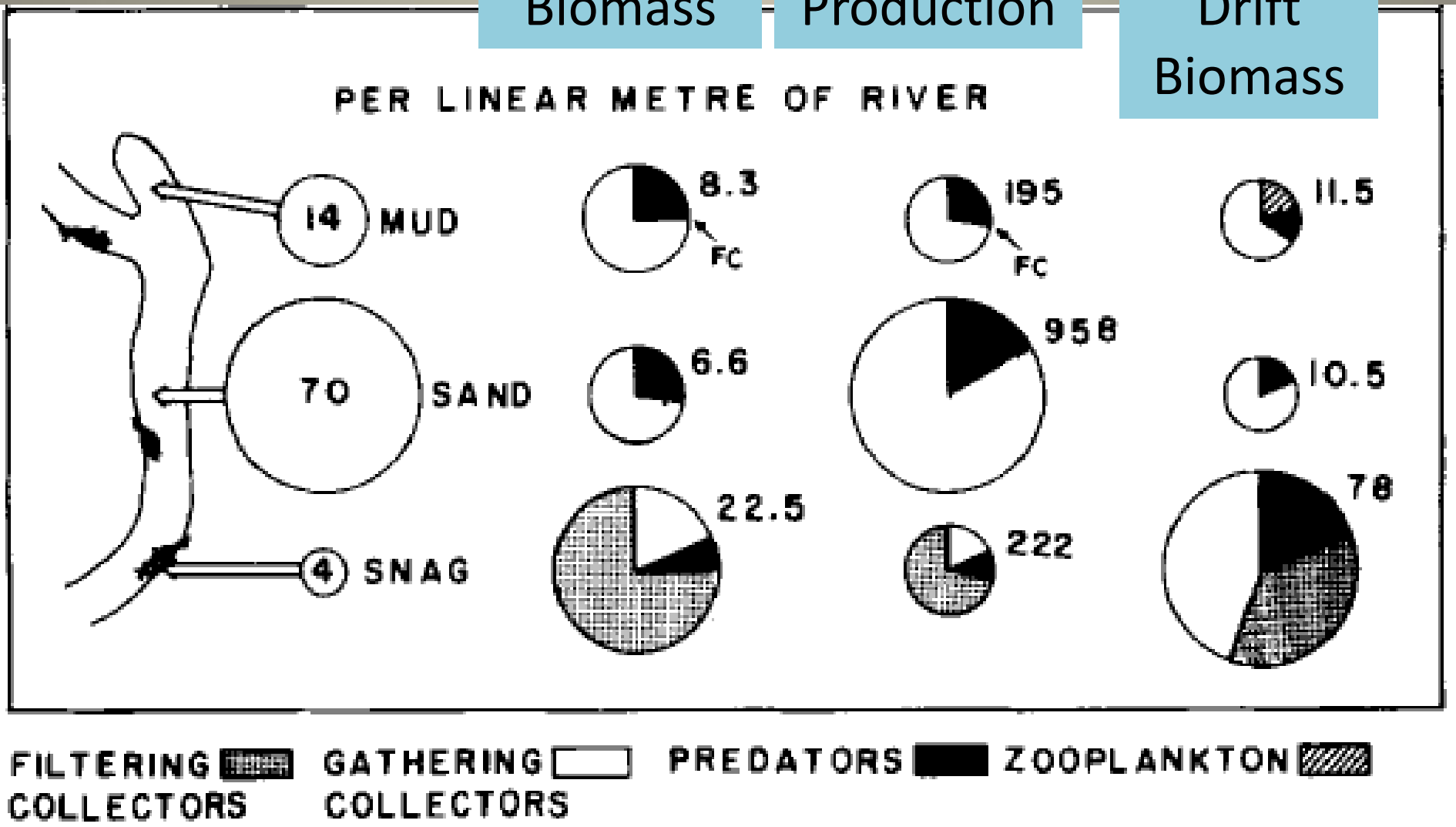


Macroinvertebrate Community

Macroinvertebrate Community

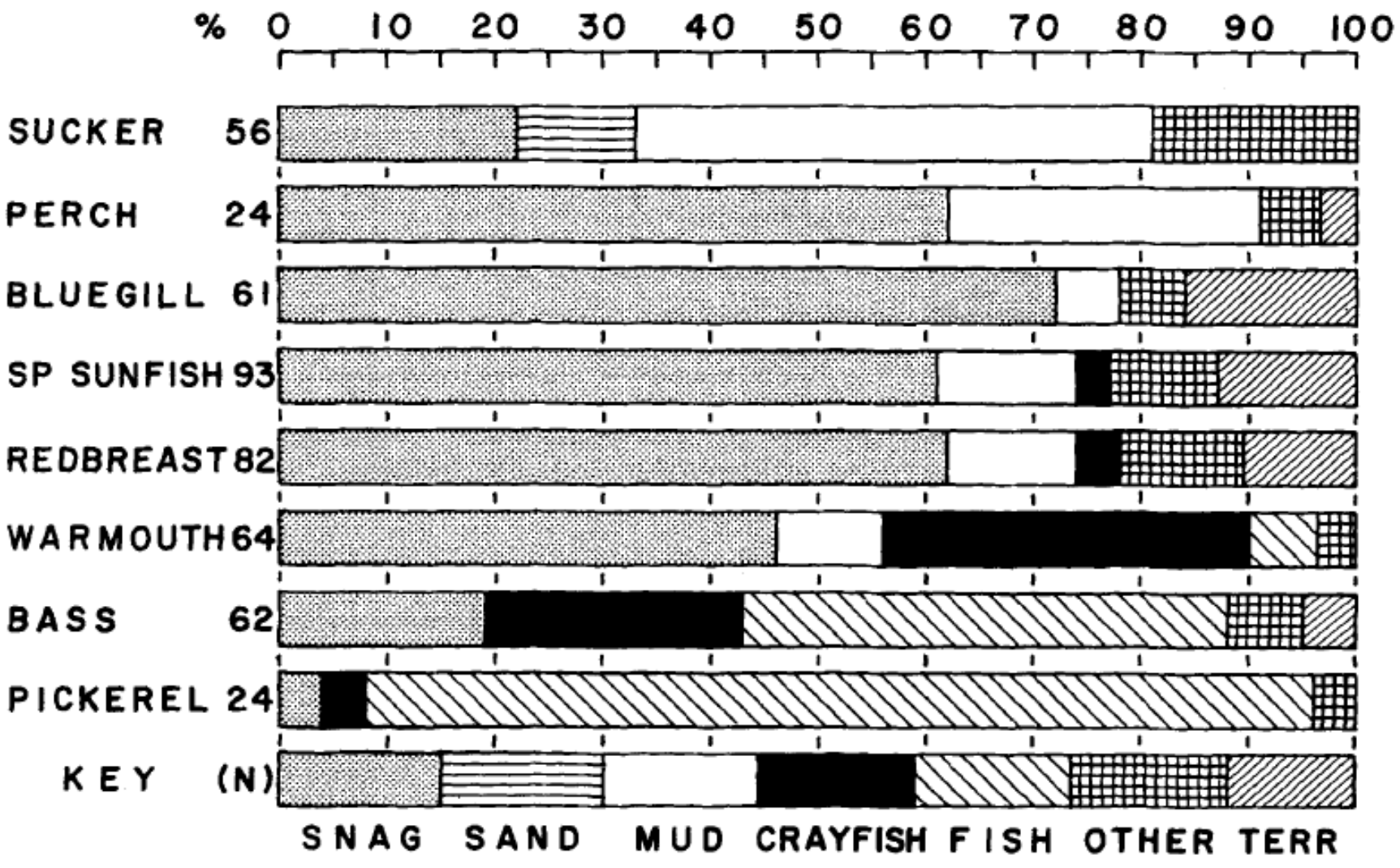


Biomass | Production | Drift Biomass



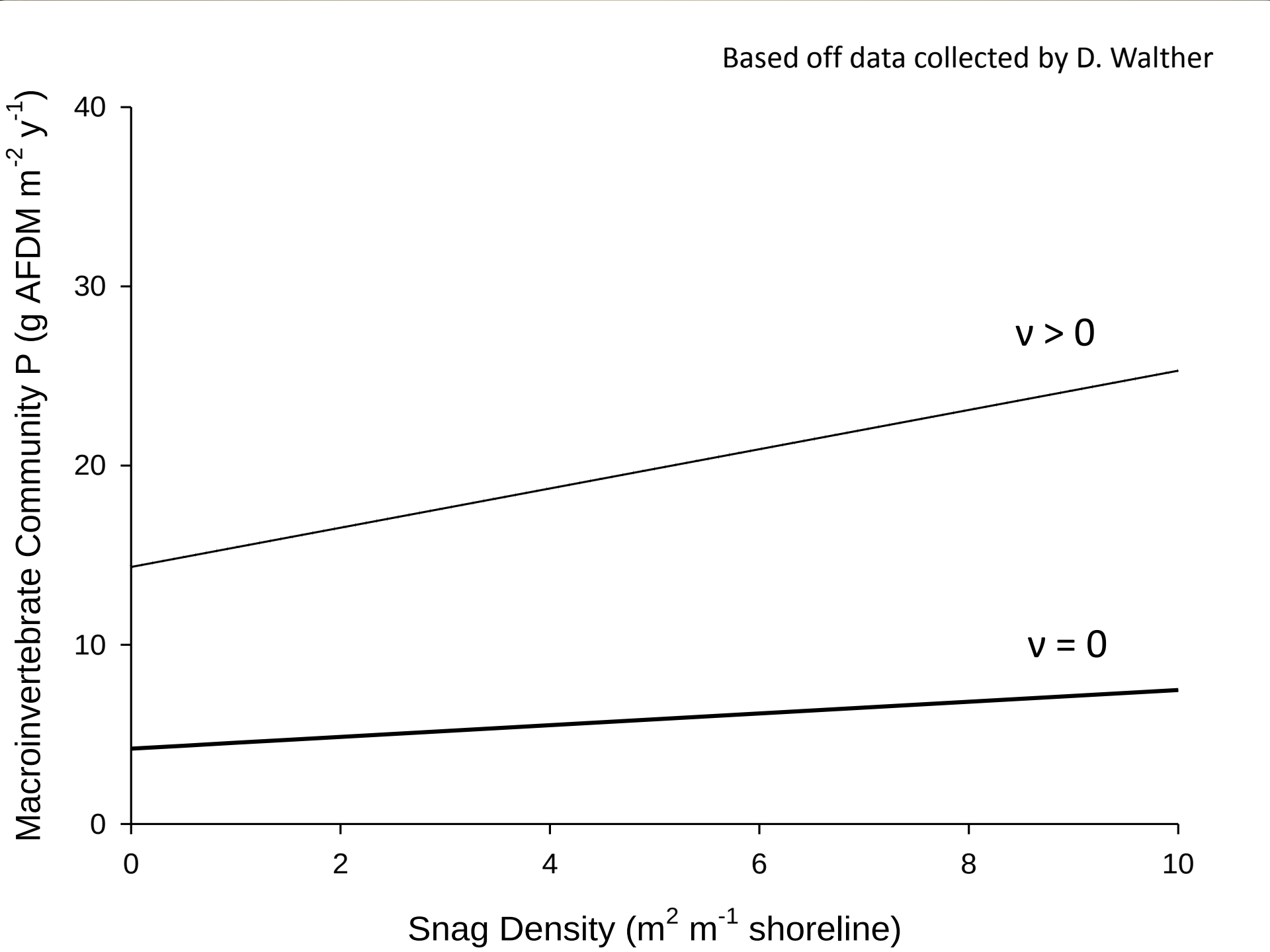
Filter-feeding insects are a major component of production on snag habitats and drift biomass

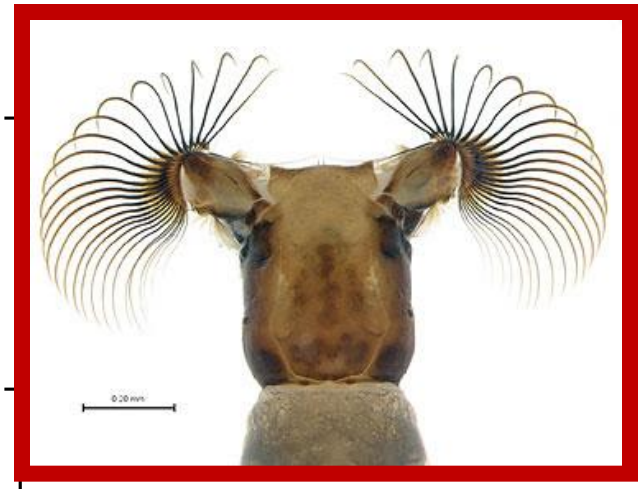
From Benke et al. 1985



Invertebrate production on sang habitats is an important resource for fish

From Benke et al. 1985


Based off data collected by D. Walther
Macroinvertebrate Community P (g AFDM m-2 y-1)
40
30
20
10
0
ν > 0
ν = 0
0
2
4
6
8
10
Snag Density (m2 m-1 shoreline)



Macroinvertebrate Community P (g AFDM m^{-2} y^{-1})

40
30
20
10
0

$\nu > 0$

Filter-feeding Invertebrate Production

$\nu = 0$

0 2 4 6 8 10

Snag Density (m^2 m^{-1} shoreline)

Conclusions

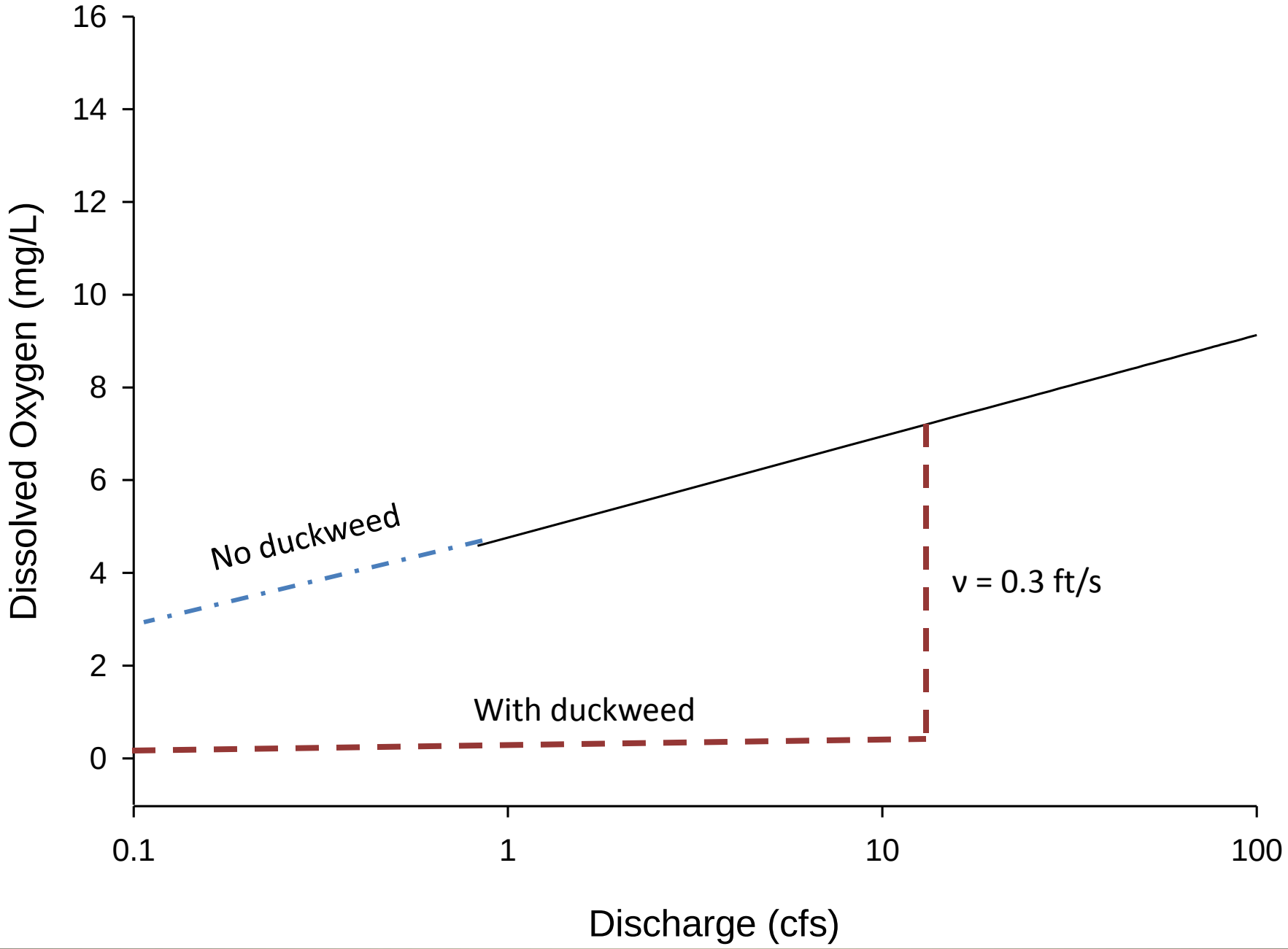
- Small increases in stream velocity may have large effects on dissolved oxygen
- Increased velocity will alter the structure and production of the macroinvertebrate community
- Potential direct and indirect effects on fish community

Summer 2011

- Simulated reconnection through pumping of small quantity of water into the lower Cache River
- Pumping during historically dry summer months of July-September
- Measuring ecological responses
  - Oxygen dynamics
  - Stream water temperature
  - Macroinvertebrate community on woody debris
  - Drifting of macroinvertebrates

Acknowledgements

- IEPA
- Tracy Fidler, JVP
- Mark Guetersloh, IDNR
- Jody Shimp, IDNR
- Mike Brown, USFW
- Big Creek Drainage District #2
- Whiles Lab


16
14
12
10
8
6
4
2
0
Dissolved Oxygen (mg/L)
No duckweed
With duckweed
v = 0.3 ft/s
0.1
1
10
100
Discharge (cfs)