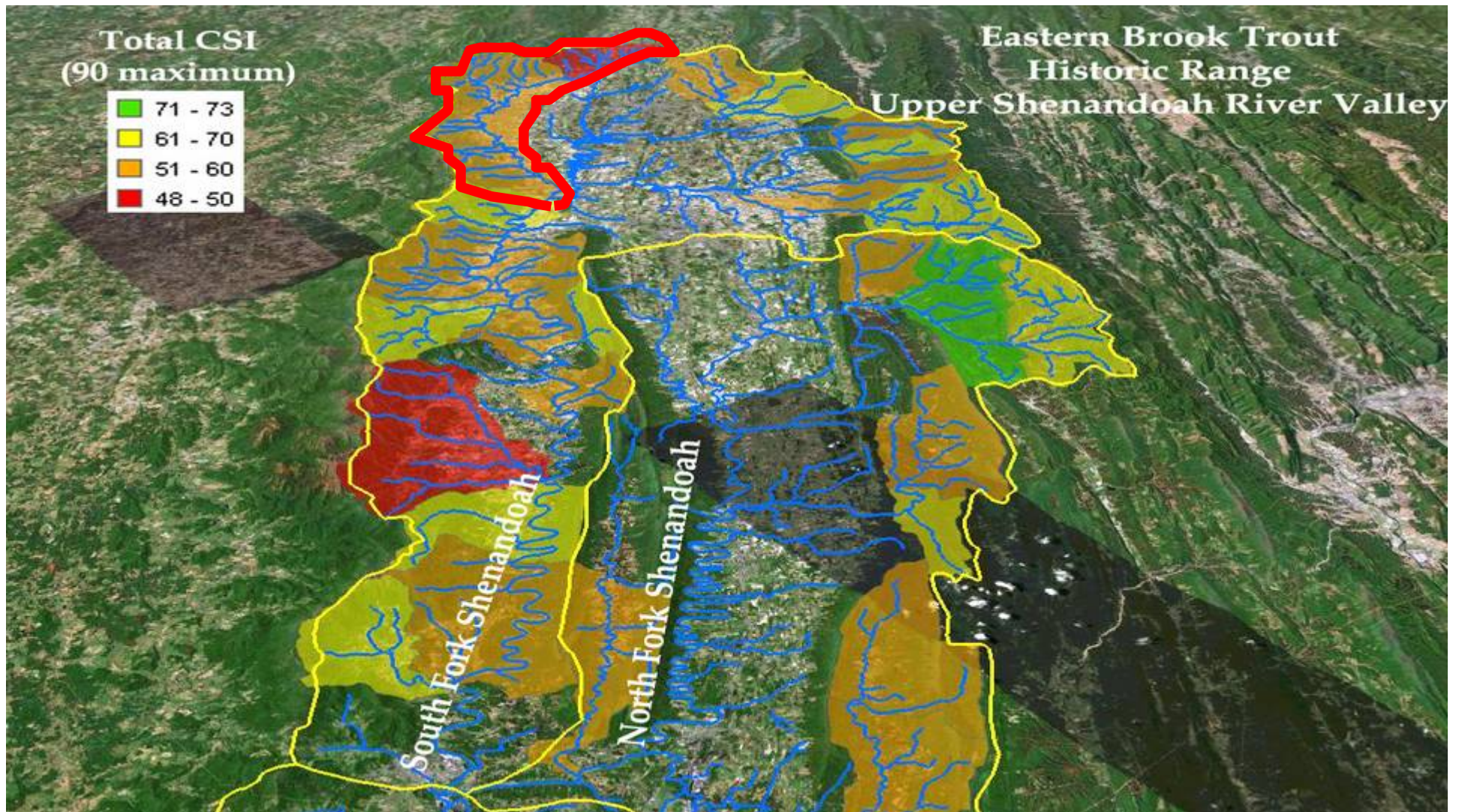


# Stream Temperature Studies on South River in Augusta County and Waynesboro for Targeting Trout Restoration Efforts



Thomas R. Benzing  
James Madison University  
Mountain Streams Symposium II  
September 21, 2013











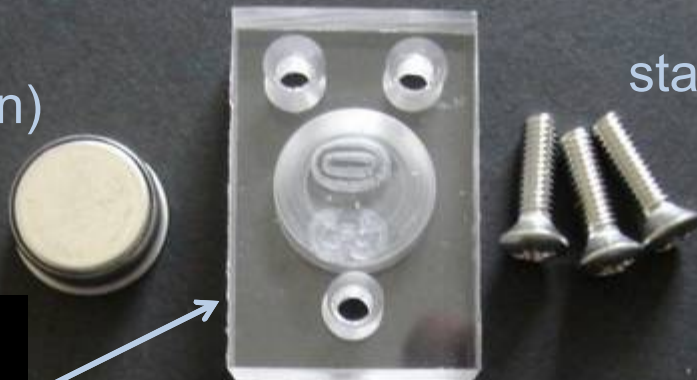
# Programmable temperature sensors (iButton)



Temperature  
Sensor (iButton)

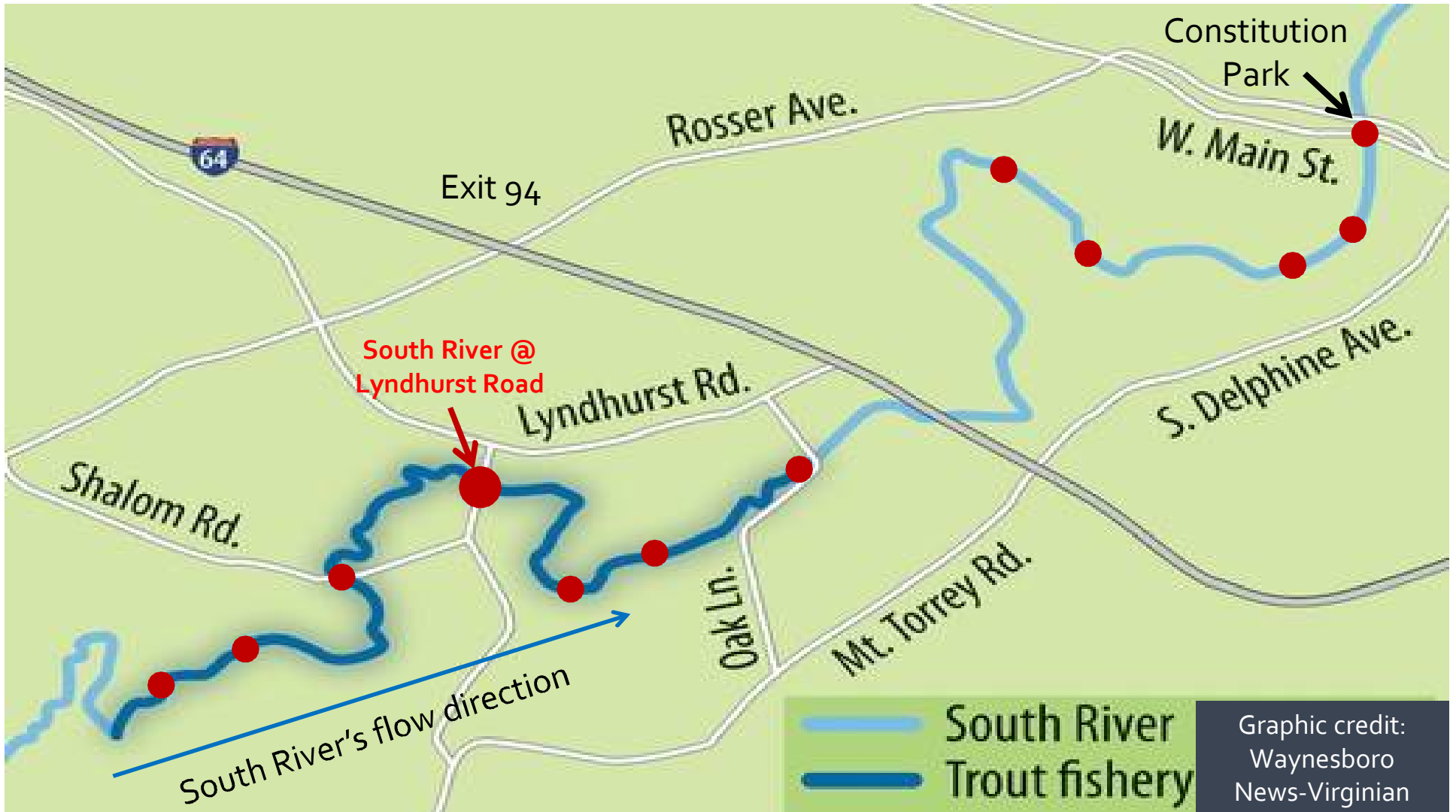
stainless steel  
screws

Polycarbonate  
plastic capsule  
cover (top) and  
back (bottom)

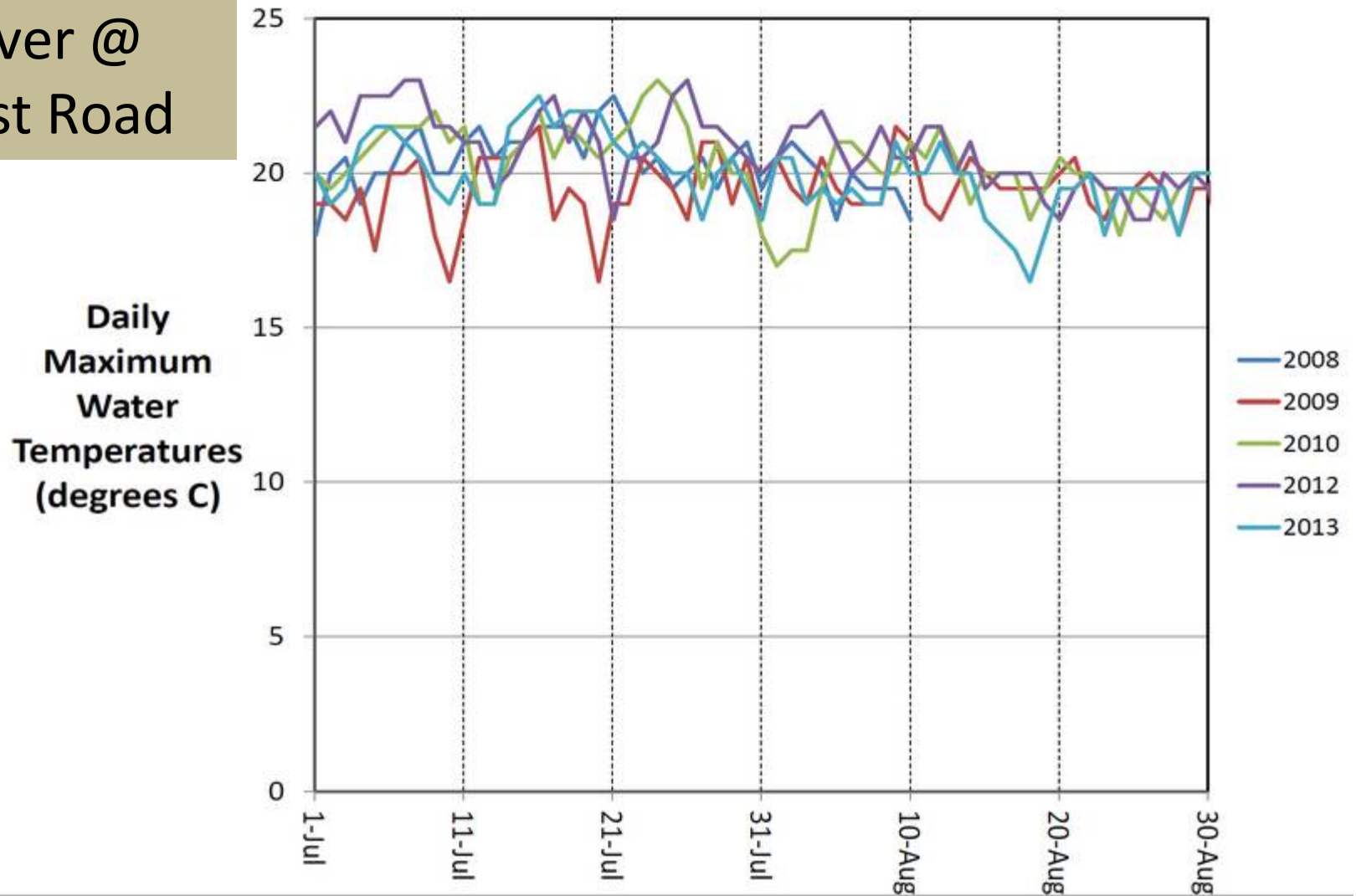


Attached to  
tree root  
underwater

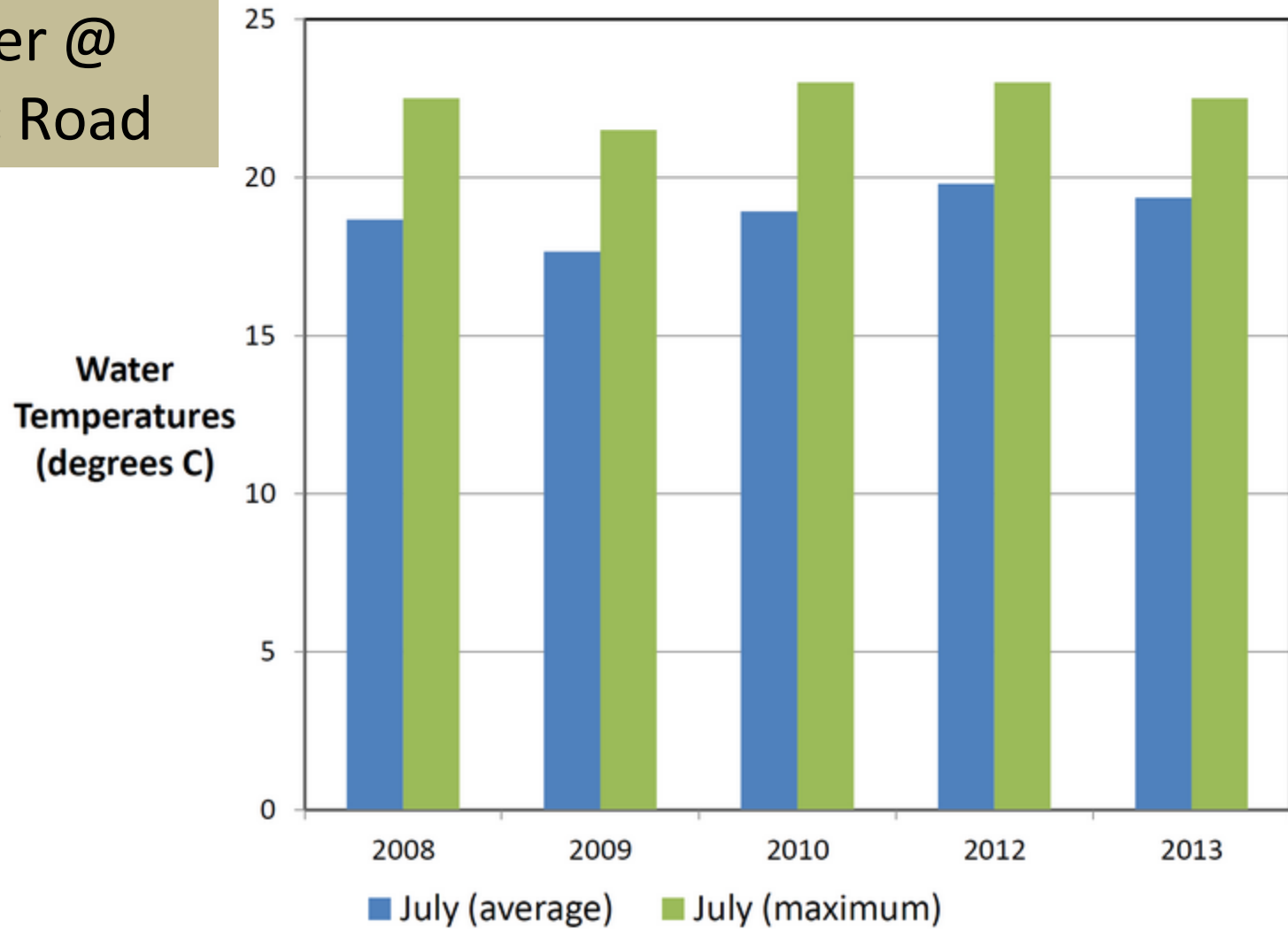




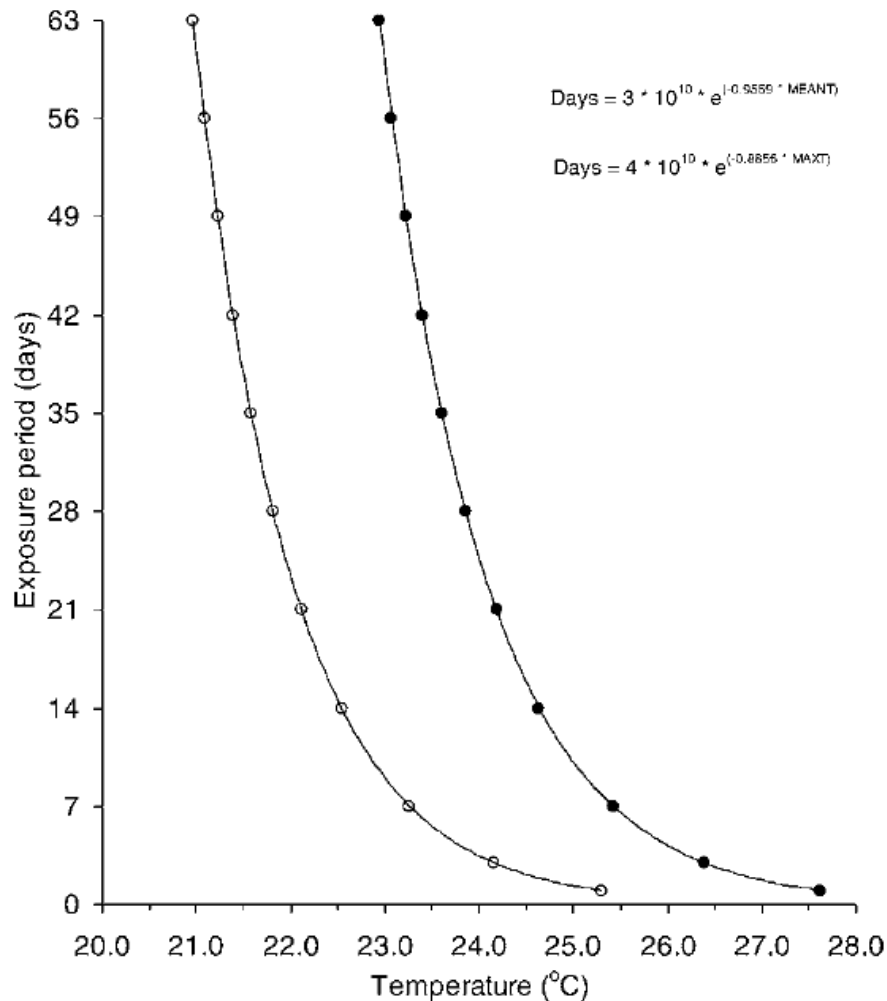
# South River @ Lyndhurst Road



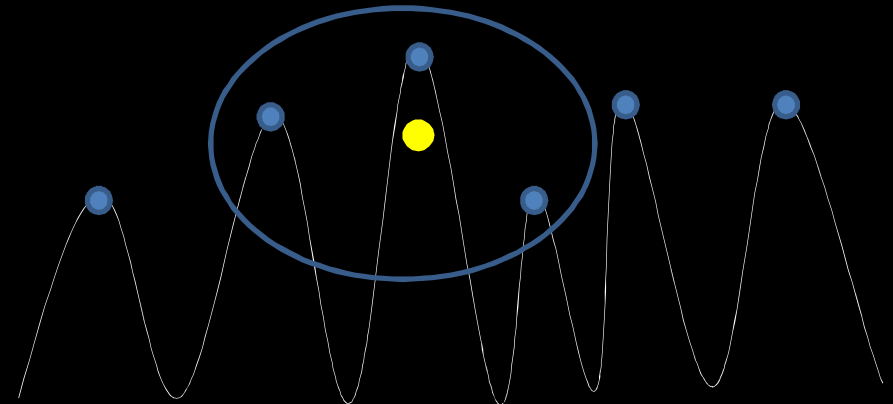
# South River @ Lyndhurst Road



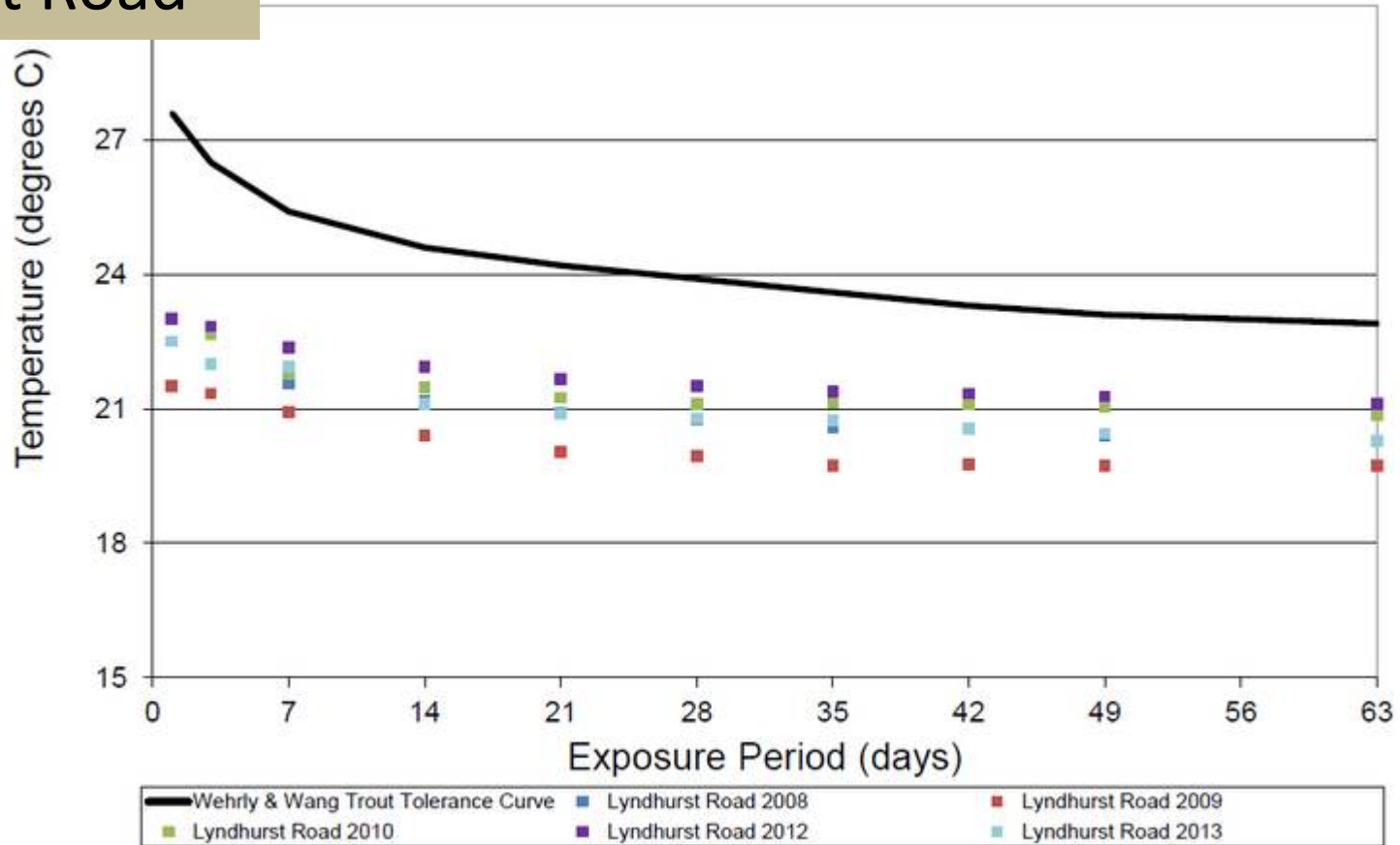
# Thermal Tolerance Curves



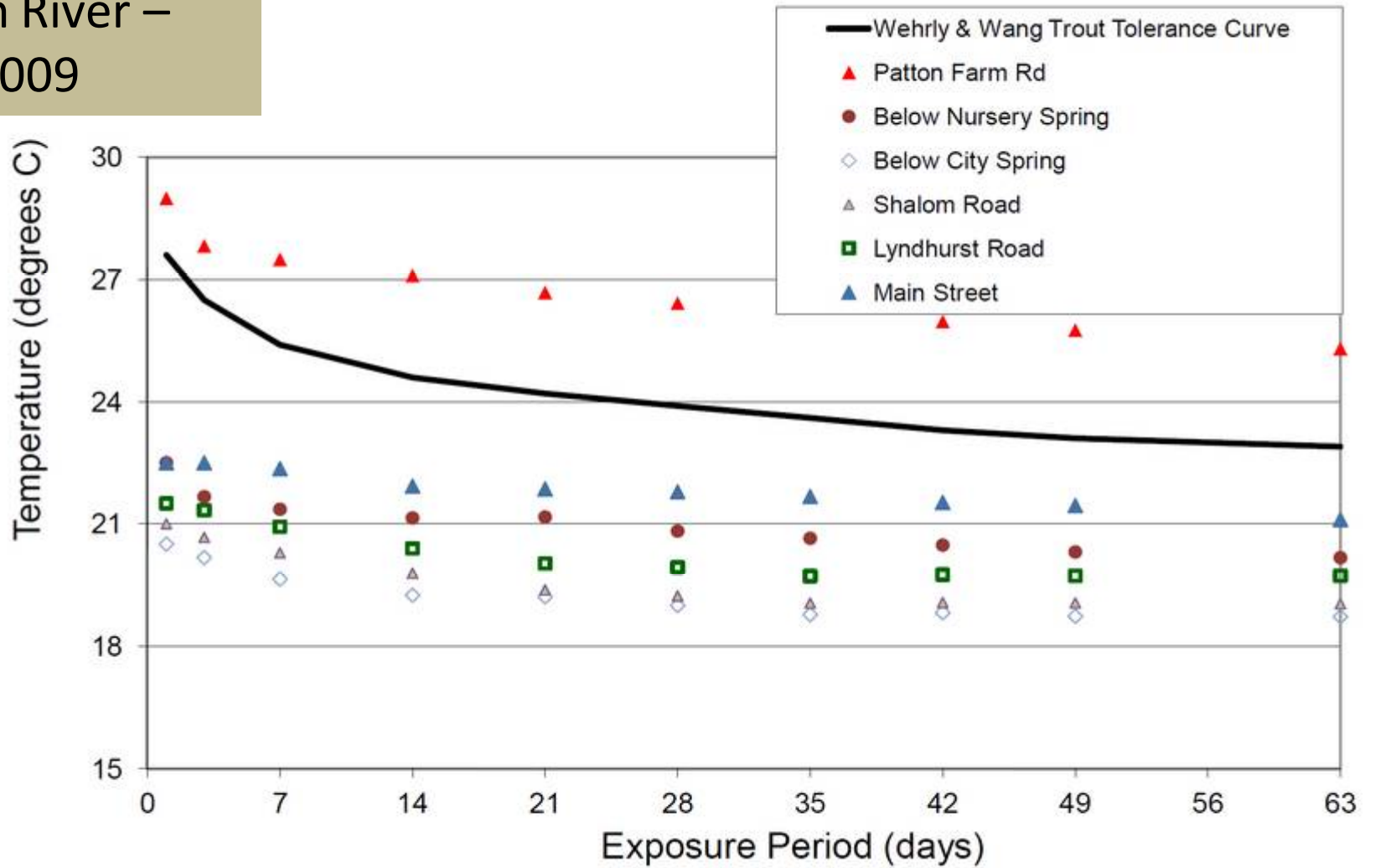
- Wehrly & Wang. 2007. "Field-Based Estimates of Thermal Tolerance Limits for Trout: Incorporating Exposure Time and Temperature Fluctuation" *Trans. Amer. Fisheries. Soc.* **136**: 365-374.
- Identify daily maximum temperatures
- Calculate rolling averages for:  
3, 7, 14, 21, 28, 35, 42, 49, 56, + 63-day periods



# South River @ Lyndhurst Road

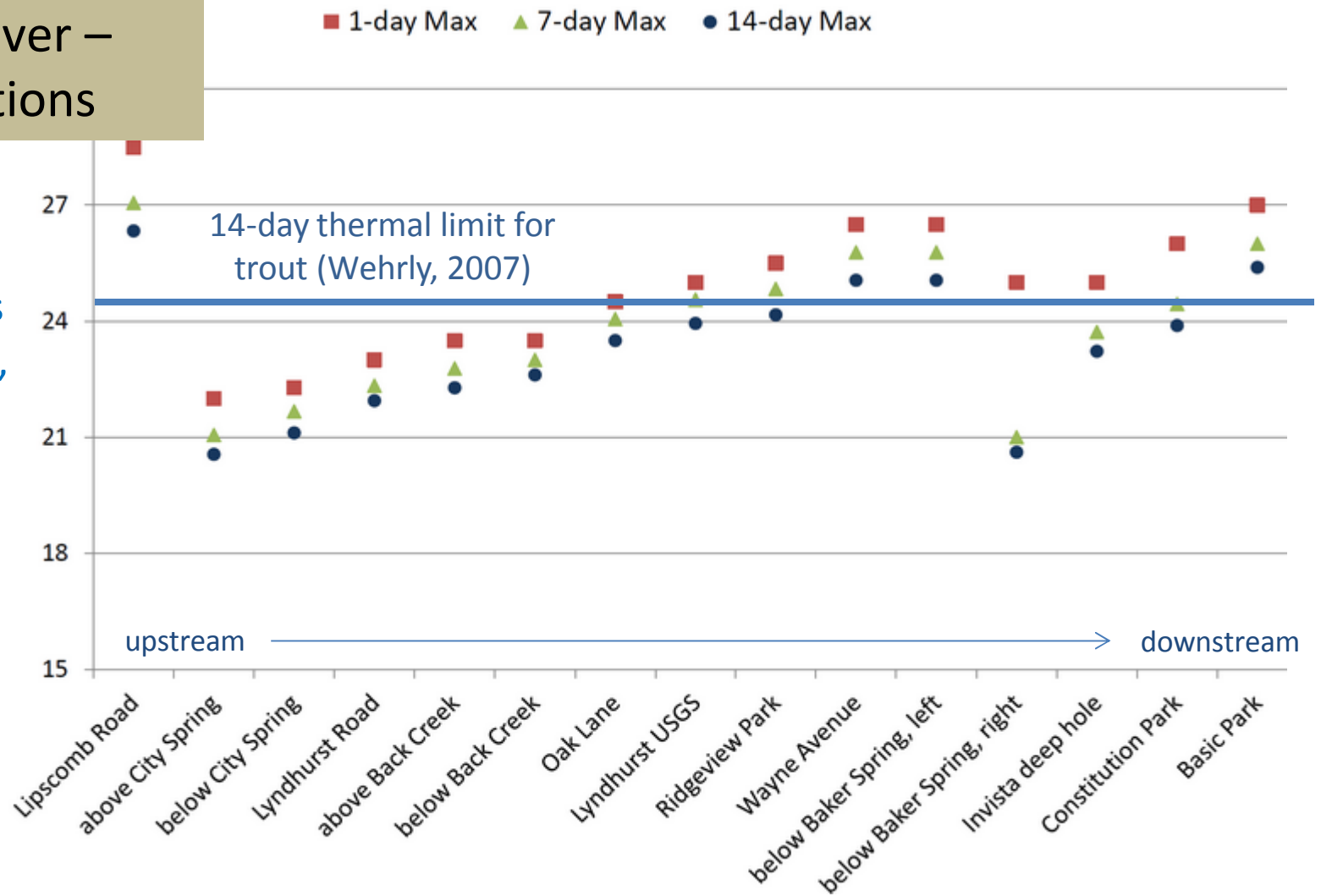


# South River – 2009



# South River – all locations

Temperatures in South River, 2012 (degrees C)



# Conclusions

- Springs significantly lower summertime water temperatures in South River
- Waters from the “springs complex” to Oak Lane bridge fall within trout tolerance limits (i.e. below Wehrly & Wang curve)
- Baker Spring acts as a thermal refuge for trout in downtown Waynesboro
- The removal of the Ramworks Dam (aka Rife Loth Dam) has increased diurnal fluctuations in water temperatures downstream
- Springs contain total dissolved gases above saturation (106-110%)
- Trout eggs incubated in Coyner Spring and Rife Loth Spring waters hatched and survived for at least two weeks







A photograph of a person wading in a river, likely collecting samples. The person is wearing a hat and a light-colored shirt, and is holding a long net. The river is surrounded by dense trees and foliage, with some fallen leaves on the banks. The water is clear, and the overall scene is a natural, outdoor setting.

# Thanks to...

Gordon Johnson

Brad Sullivan

David Keeling

Eric Jesse

Scott McNally

Jordan Cornell

Richard Landreth

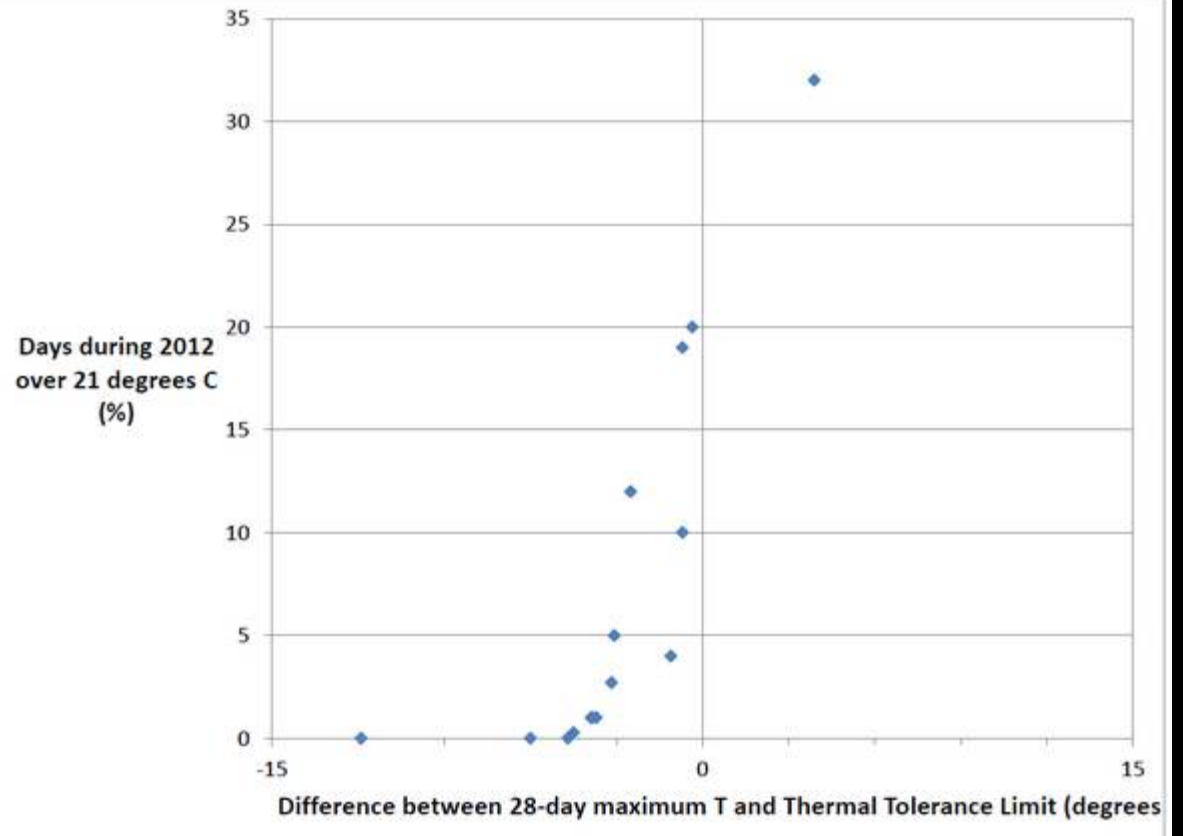
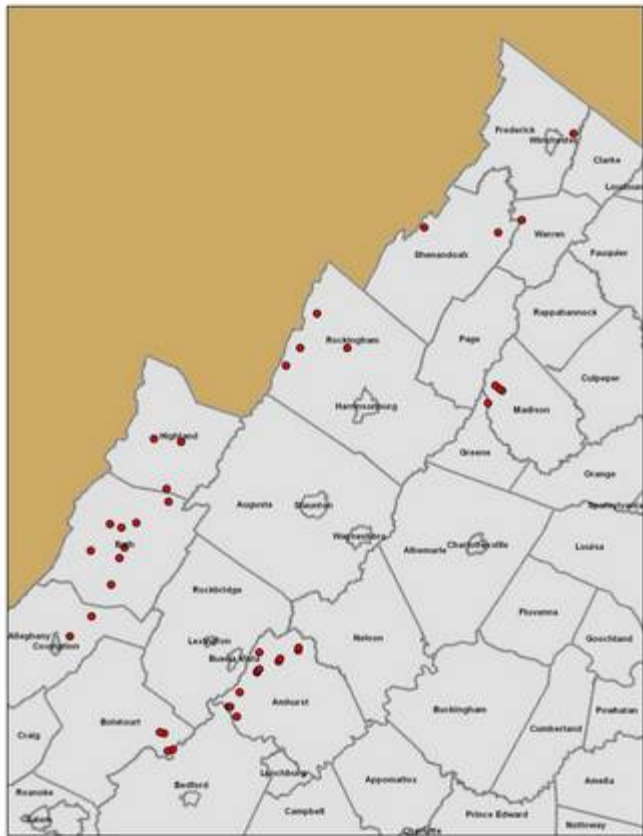
Urbie Nash

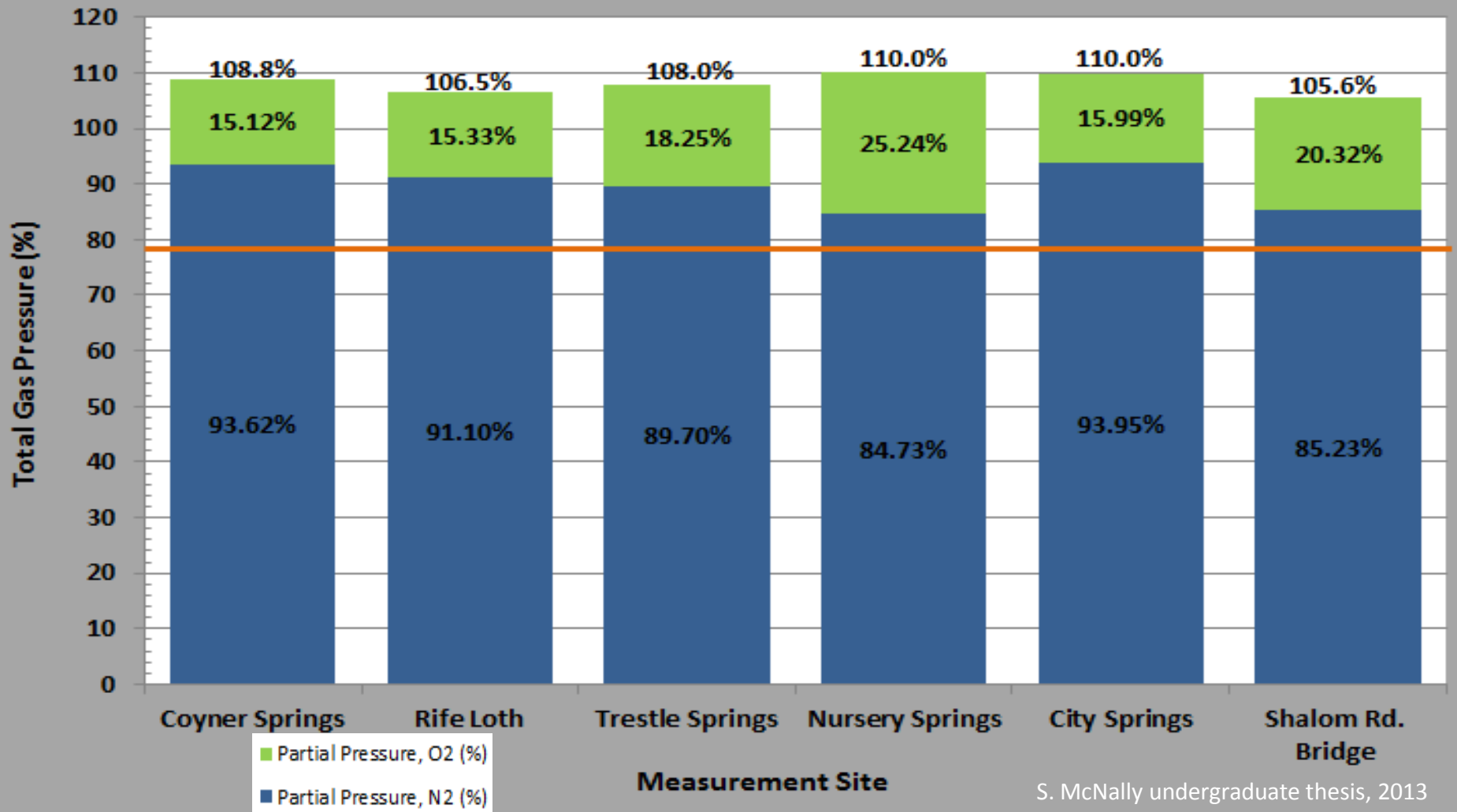
Jim Ridings

Brad Fink

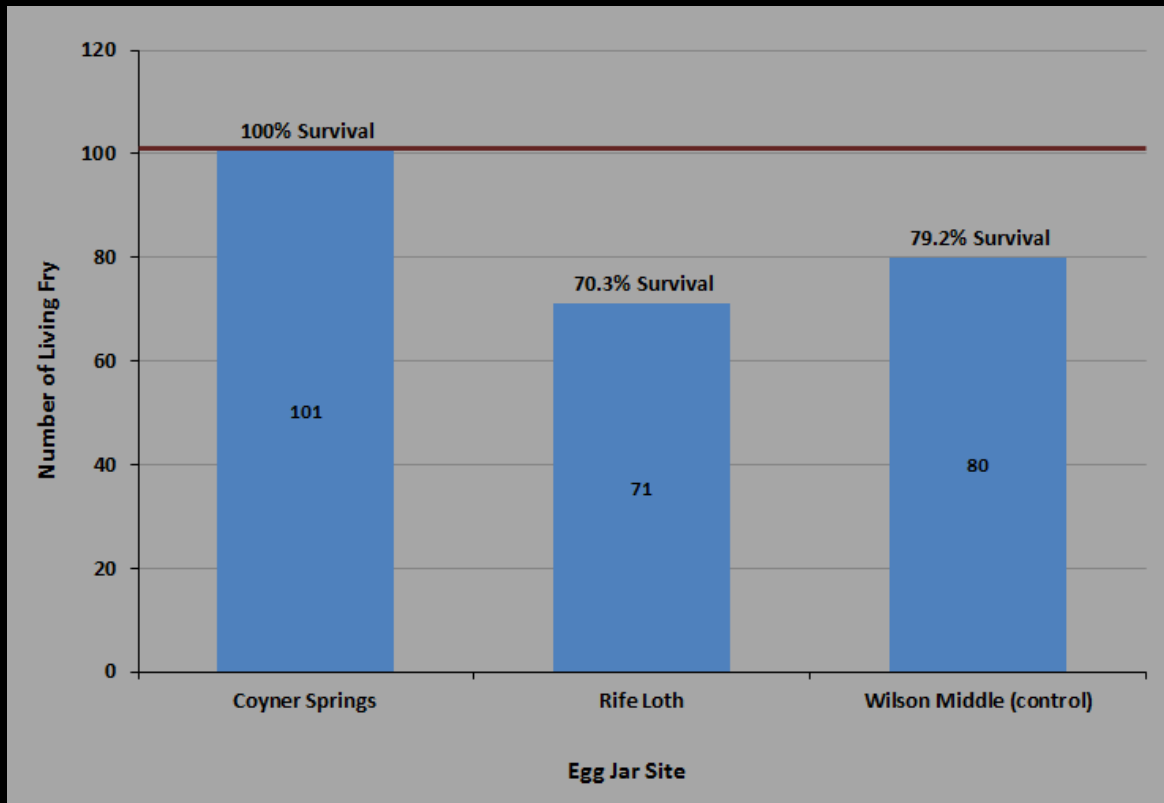
Pete Cooper

# DGIF Study





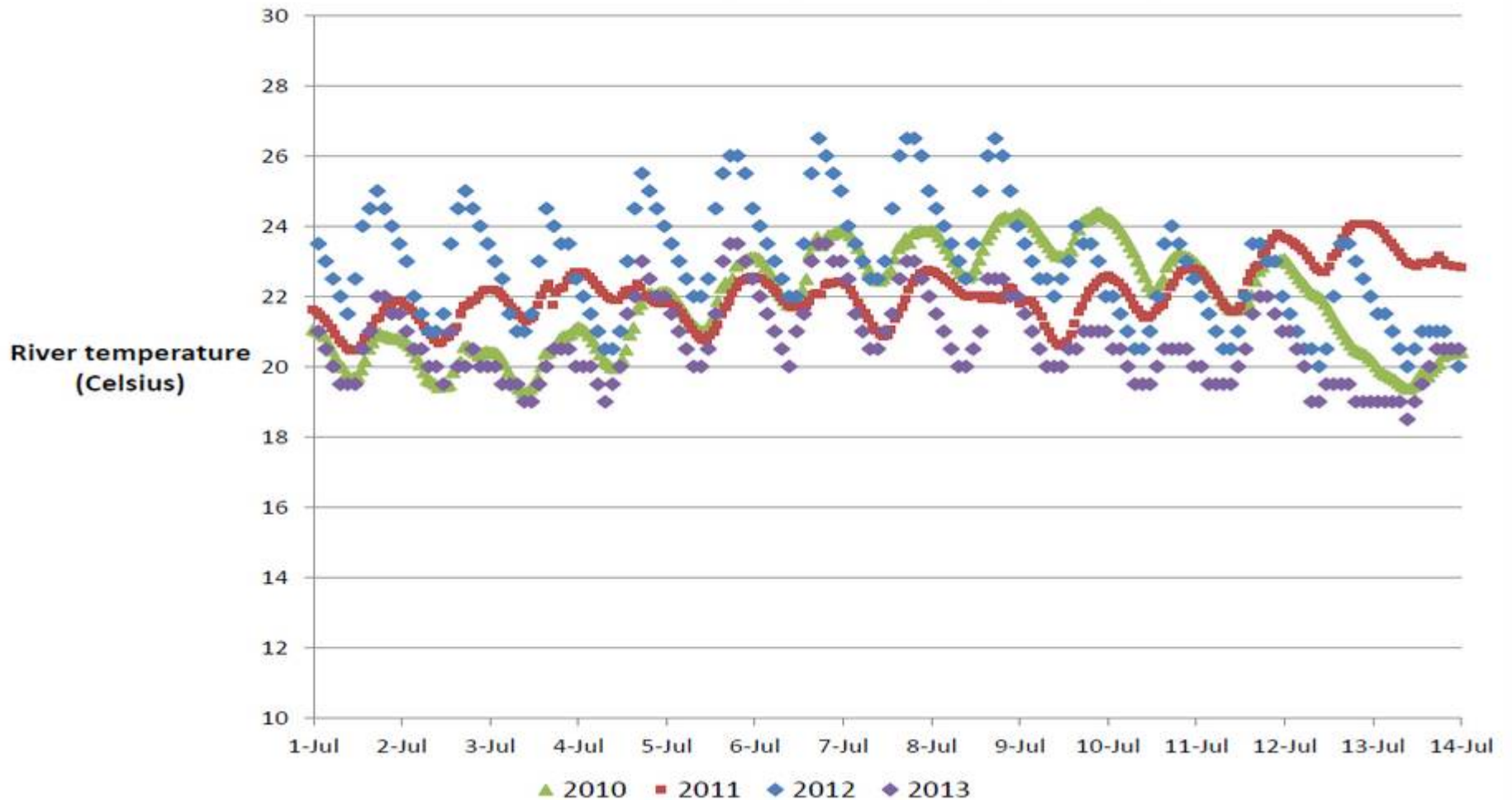
# Hatching Jar Experiments

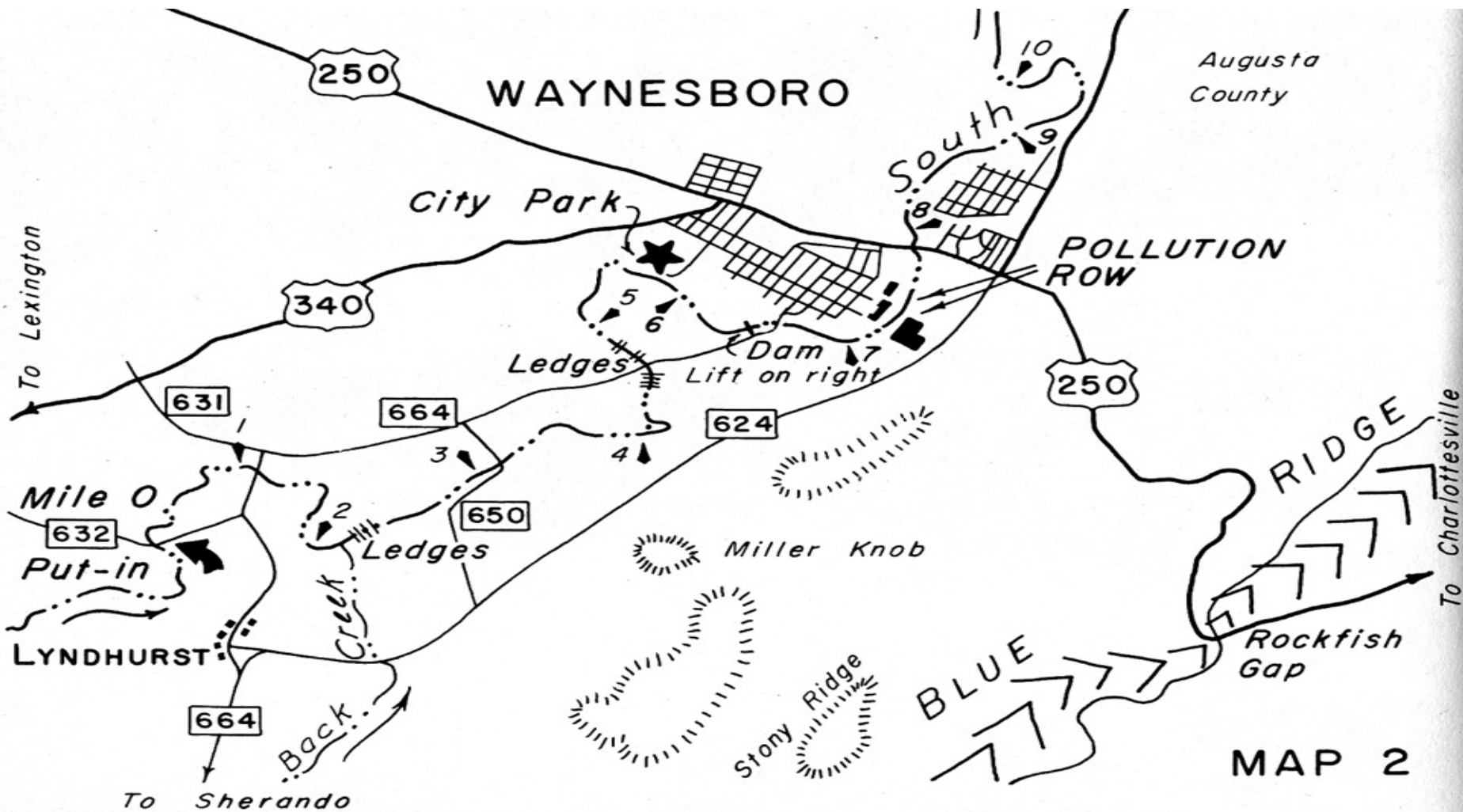


Scott McNally  
undergraduate thesis,  
2013



South River below Ramworks Dam, July water temperatures, 2010-2013





From Mataria, L.J. and O.S. Cecil, *An Illustrated Canoe Log of the Shenandoah River*, 1974.