

LYCOMING COLLEGE **CLEAN WATER** INSTITUTE

BACKGROUND

- Most stream insects have aquatic larval and terrestrial adult life stages
- Climate change can alter phenology and cause populations to decrease due to changes in: a) dispersal, b) emergence, and c) mating
- Daily weather should alter adult activity; e.g., • Windy & rainy = low activity
 - Warm & low wind = high activity
- Briers et al. (2003) found that adult activity increased with temperature and decreased when windy
- Observed variation can be used to indicate potential responses of aquatic insects to climate change
- Different life history processes occur in different vertical strata of riparian forests
- Adults stay near the stream (Smith et. al., 2009), but may stay at ground level or move into the canopy
- Previous studies use adult abundance as a proxy for activity
- We compared the abundance of Plecoptera (stoneflies) and Trichoptera (caddisflies) in the canopy and ground level to:
- Water temperature • Wind Speed • Air temperature Precipitation

We hypothesized that:

- 1. Water temperature will have no effect on activity
- 2. Adult activity will increase with high air temperatures
- 3. Adult activity will decrease with high winds
- 4. Adult activity will decrease with high precipitation

METHODS

- Sampling was done at 4 reaches on 3 different streams in the Mosquito Creek Watershed (Figure 1)
- One malaise trap and one canopy trap were set for each reach Malaise traps were set up just above the surface of the
- stream Canopy traps were set up about 5.7-7.4m from the surface of the stream
- Malaise and canopy traps were set June 27 to July 11, 2019 (14 days of collections)
- A sample represents a 24 hour period from about noon to noon
- Air and water temperature sensors and wind speed and direction loggers were set up at each site (Figure 2)
- One rain gauge was set up at the most centrally located site (site 2; Figure 2)
- Specimens of Plecoptera, and Trichoptera were collected daily, returned to the lab, enumerated, and identified to order
- Measures of stream depth, width, habitat, and substrate were performed in the summer 2017
- Preliminary analysis presented here are linear regressions of abundance with each environmental variable done using MS Excel

Table 1: Catchment characteristics and stream habitat conditions at the 4 sample sites (V=aquatic vegetation; B=undercut bank; LW=loose woody debris; LP=leaf pack).

					Dominant	
	Catchment	Catchment	Average	Average	benthic	Dominant
Site	size (km²)	% forest	depth (cm)	width (m)	substrate	habitat
2	19.1	89%	27.6	5.2	Boulder (70%)	V, B, LW
3	1.6	100%	13.4	3.9	Cobble (80%)	B, LW, LP
4	16.4	88%	28.1	5.7	Boulder (90%)	B, LW
5	6.3	100%	20.5	4.1	Cobble (60%)	V, B, LW

RESULTS

- Streams were small, (Table 1)

- (Figure 4) Generally, adult abundance was not wind speed, or
- - (Figure 5)



Figure 2. LEFT: Wind sensor, air temperature sensor, and malaise trap; MIDDLE: Rain gauge; RIGHT: Canopy trap.

Effect of climate on adult stonefly and caddisfly activity Jenna N. Tasker, Bailey A. Schwenk, Ruric O. Bowman, and Robert F. Smith Lycoming College Clean Water Institute

forested, and had cobble or boulder substrates

No relationship between water and air temperature during the study (Figure 3) Caddisflies were more abundant than stoneflies

related to air temperature, precipitation (Figure 5) Water temperature was not related to abundance in the canopy (Figure 5) Adult abundance for the ground level malaise traps was related to water temperature (Figure 5) Trichoptera displayed a negative relationship Plecoptera displayed a positive relationship



Figure 3. Plot to show the absence of a relationship between water and air temperature measured in degrees Celsius.







Figure 1. Map of study locations in the Mosquito Creek Watershed



Figure 5. Series of regression plots for adult abundance for canopy and malaise traps versus each environmental variable measured. Rsquared values indicate how well the abundances were related to the environmental variables. Abundance at ground level was the only measure to show a strong relationship to water temperature.



DISCUSSION

- The lack of relationship between adult abundance and all terrestrial weather was unexpected Results suggested that adult abundance is driven by patterns of emergence; important because: Suggests abundance is not a good proxy for activity or habitat preference Suggests re-interpretation of studies that demonstrate adult affinity for stream channels; see Sode and Wiberg-Larsen 1993

- Adult activity may be related to seasonal weather, but not weather over short time periods Currently analyzing a 2nd year of samples References

ACKNOWLEDGEMENTS

We thank the WMWA and Dana Springman for permission to sample on their property. This work was supported in part by the Provost's office of Lycoming College. This work was also supported in part by the George B. Gaul Endowed Student-Faculty Research Program and the Washington **Biologists Field Club**