

The Effect of Precipitation on Macroinvertebrate Biodiversity

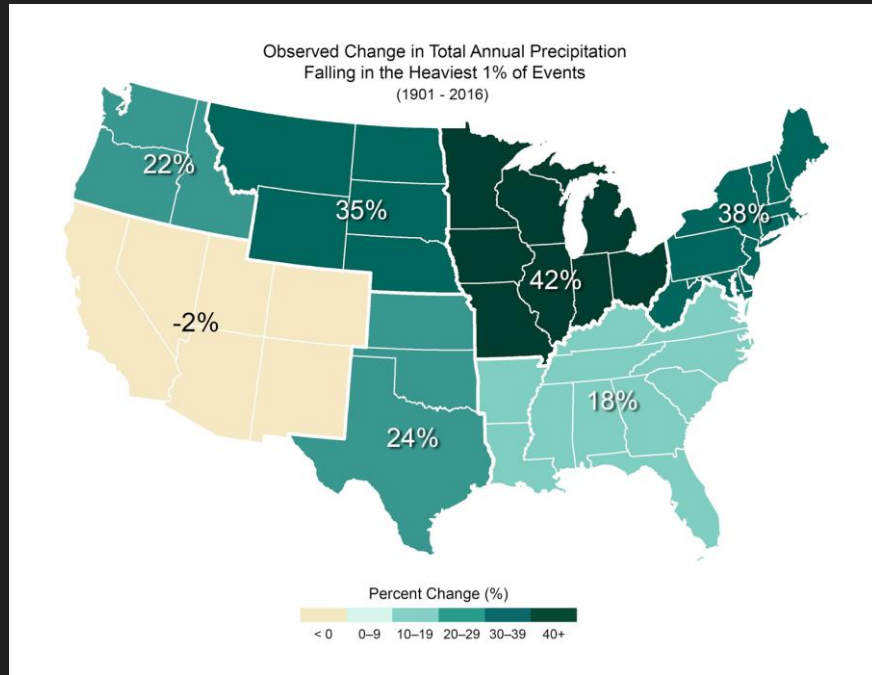
Molly Duncan and Oliver Bijur



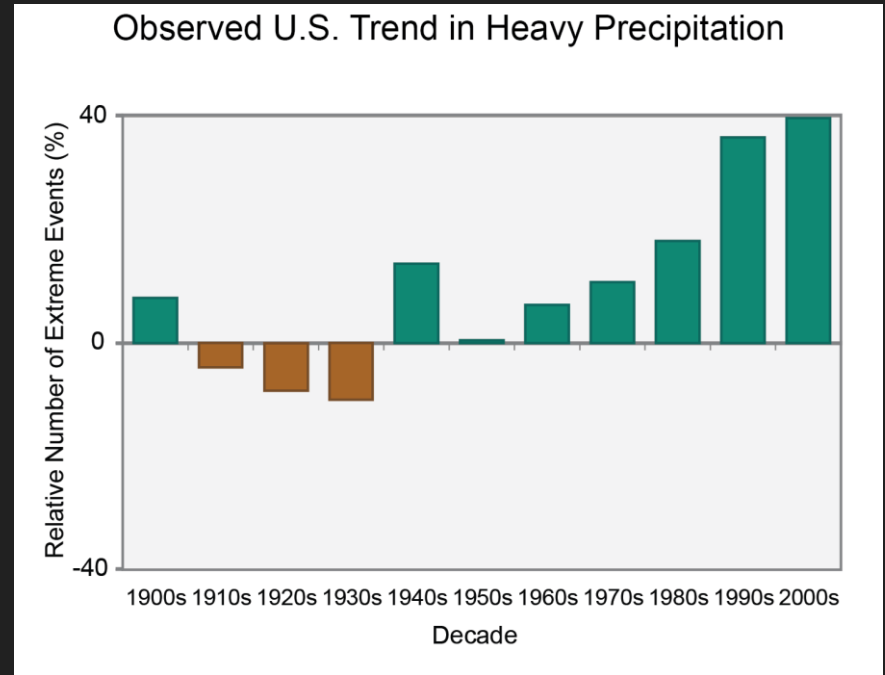
Hypothesis

Large changes in precipitation lead to a decrease in macroinvertebrate biodiversity within stream communities.

Climate Change & Precipitation



<https://www.globalchange.gov/browse/indicators/heavy-precipitation>



<https://nca2014.globalchange.gov/highlights/report-findings/extreme-weather#graphic-20984>

Biodiversity

- Diversity indicates overall productivity, sustainability, and resilience
- Productive ecosystems provide ecosystem services
- Measured using a diversity index



Methods - Data Collection



Methods - Precipitation Analysis

Annual Precipitation (inches):



Stream Depth (meters):



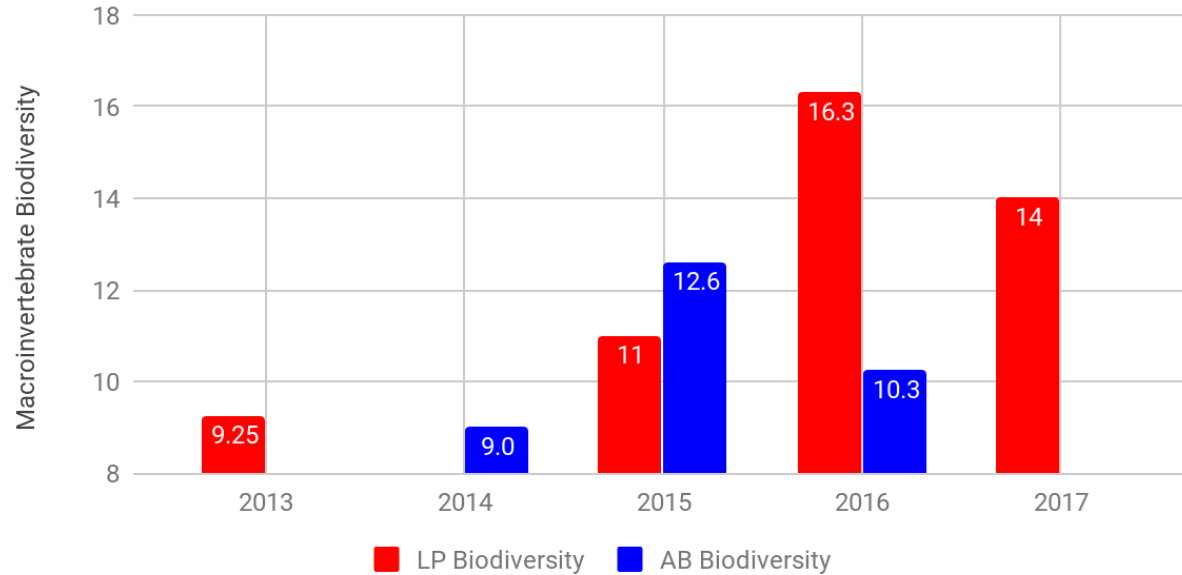
Biodiversity Analysis

$$H' = - \sum_{i=1}^S p_i \ln p_i$$

H	Shannon's diversity index
S	total number of species in the community (richness)
p_i	proportion of S made up of the i th species
E_H	equitability (evenness)

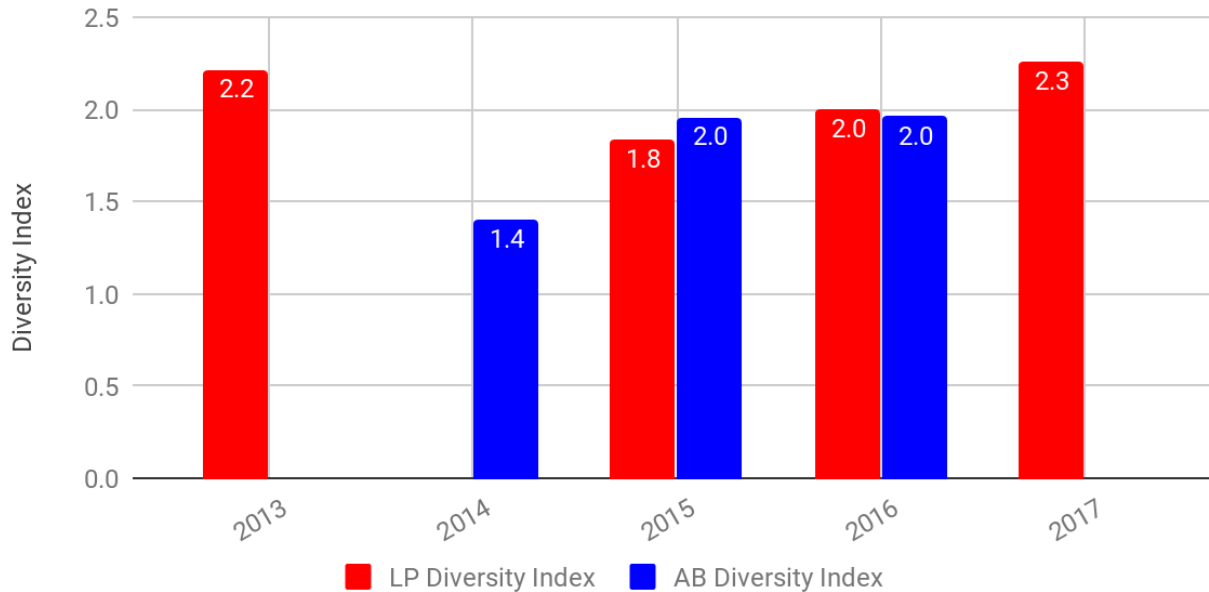
Results

Macroinvertebrate Diversity in LaPlatte River (LP) and Allen Brook (AB) Test Sites



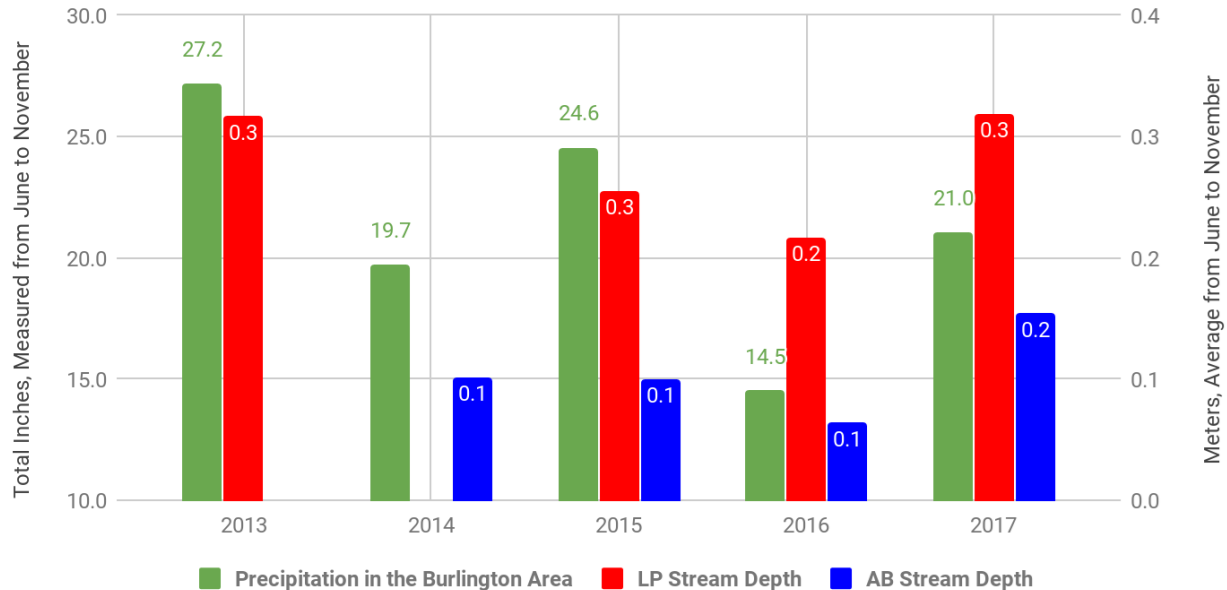
Results

Shannon Diversity Index of Macroinvertebrate Communities at LaPlatte River (LP) and Allen Brook (AB)



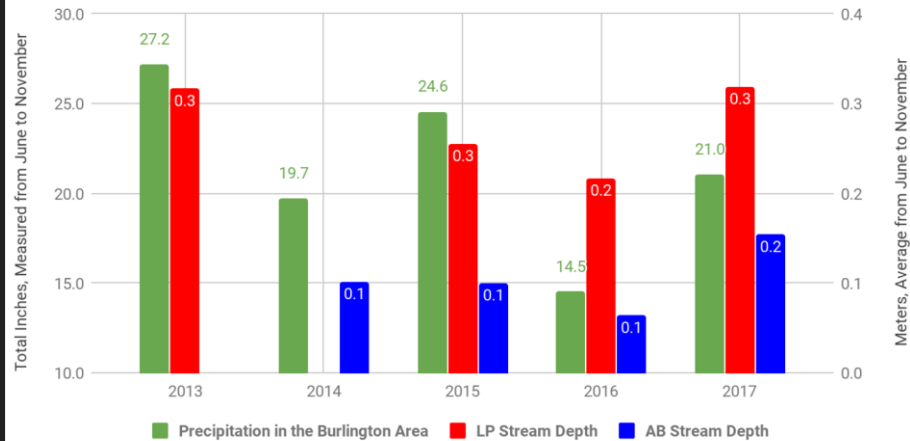
Results

LaPlatte and Allen Brook Total Precipitation and Stream Depth

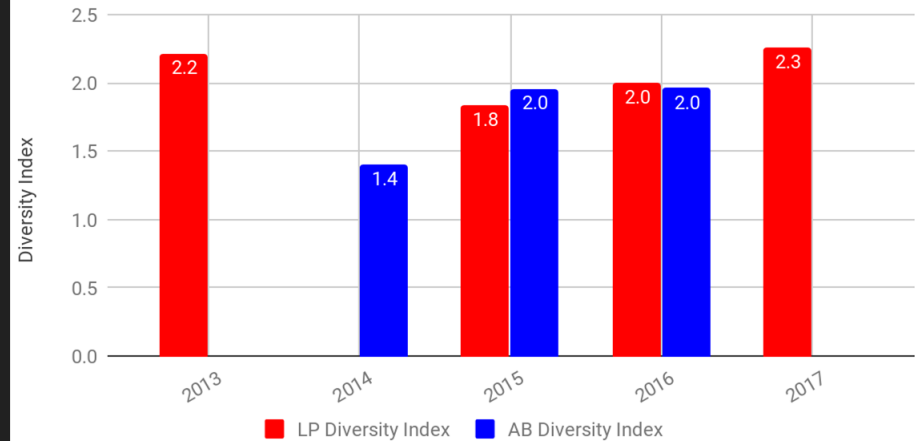


Results

LaPlatte and Allen Brook Total Precipitation and Stream Depth



Shannon Diversity Index of Macroinvertebrate Communities at LaPlatte River (LP) and Allen Brook (AB)



Conclusion

- Some events suggest a correlation between large changes in precipitation and macroinvertebrate biodiversity
- Overall large changes in precipitation do not consistently result in changes in macroinvertebrate biodiversity
- Missing data made it difficult to determine trends, a larger dataset would likely clarify connections

Further Research

- Continue to collect data to ensure continuity
- Analyze data from additional sites in Lake Champlain Basin
- Set up protocol to collect extreme precipitation event data



Acknowledgments

Funding provided by NSF OIA 1556770



Special thanks to...

- Janel Roberge
- Livia Donicova
- Declan McCabe



References

- "Diversity Indices: Shannon's H and E." The Institute for Environmental Modeling U of Knoxville Tennessee, M. Beals, L. Gross, S. Harrell, 2000, www.tiem.utk.edu/~gross/bioed/bealsmodules/shannonDI.html. Accessed 14 Mar. 2018.
- "Heavy Precipitation." *Global Change*, National Climate Assessment, www.globalchange.gov/browse/indicators/heavy-precipitation.
- "NOAA Online Weather Data." *Applied Climate Information System*, National Weather Service, 18 Dec. 2014, w2.weather.gov/climate/xmacis.php?wfo=btv.
- "Observed U.S. Trends in Heavy Precipitation." *Global Change*, National Climate Assessment, nca2014.globalchange.gov/highlights/report-findings/extreme-weather#graphic-20984.
- Zhang, Hui, et al. "The Relationship between Species Richness and Evenness in Plant Communities along a Successional Gradient: A Study from Sub-Alpine Meadows of the Eastern Qinghai-Tibetan Plateau, China." National Center for Biotechnology Information, doi:10.1317. Accessed 11 Mar. 2018.