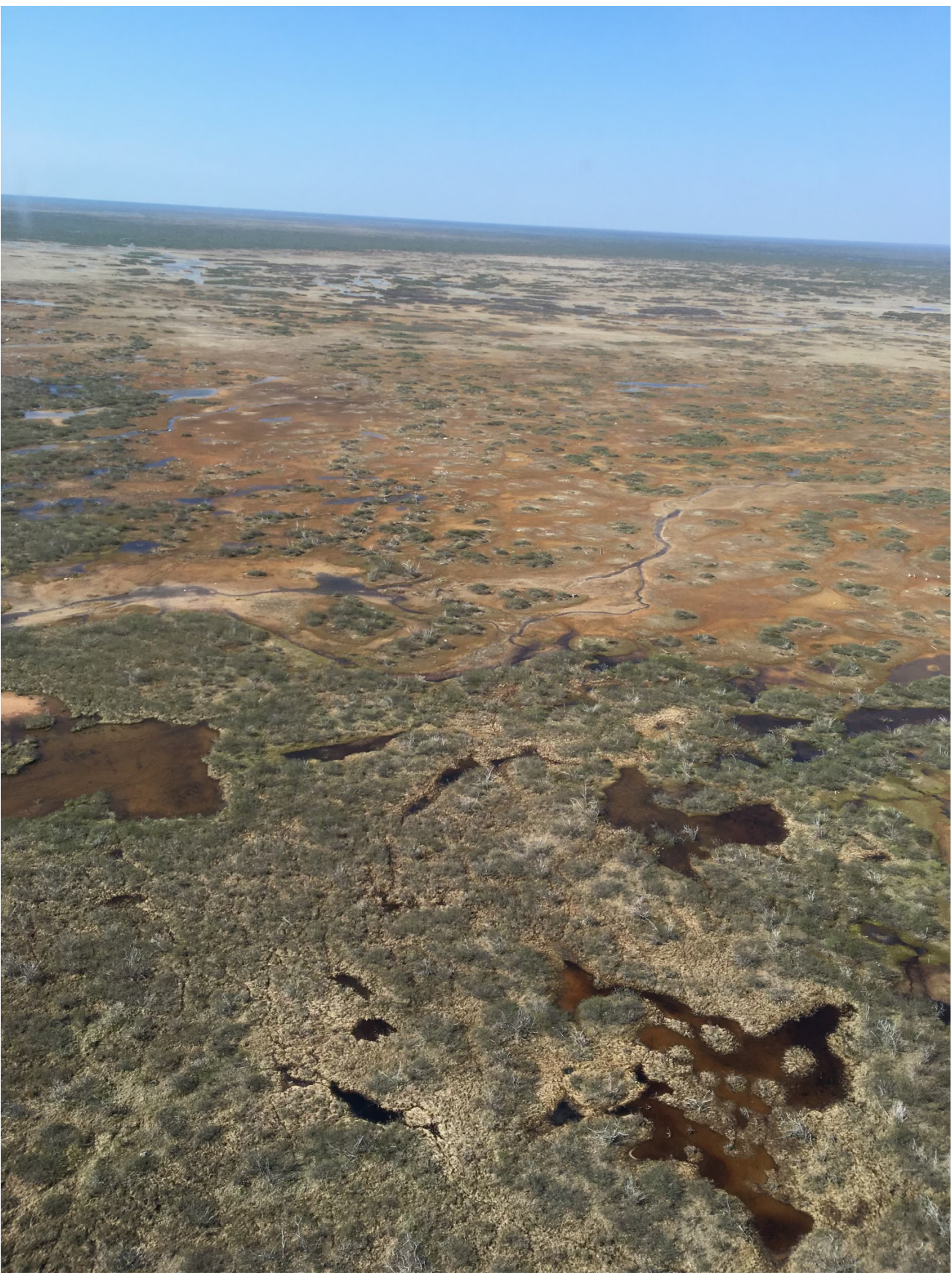


# The effect of changing substrate on Arctic Aquatic Invertebrates abundance

Thomas Dolman<sup>1</sup>, Rachel A. Hovel<sup>1</sup>, Robert F. Rockwell<sup>2</sup>  
1. University of Maine at Farmington 2. The Hudson Bay Project

## Background Information

- Climate change is having severe impacts on the sub-arctic landscapes contributing to the loss of permafrost and potential erosion leading to sedimentation in the rivers and streams (1).
- Snow Goose foraging patterns have also led to habitat degradation and increased erosion along the Mast River (2).
- Aquatic invertebrates are an indicator of habitat quality, and their abundance can often correlate with the changing habitat around them (1).
- Aquatic Invertebrates have been sampled and studied in Wapusk National Park since 2003 (3).
- These aquatic invertebrates are an important potential resource for migrating, staging and breeding waterfowl as well as shorebirds(3).



Arial image demonstrating the degradation of habitat at La Perouse Bay due to Snow goose foraging behavior

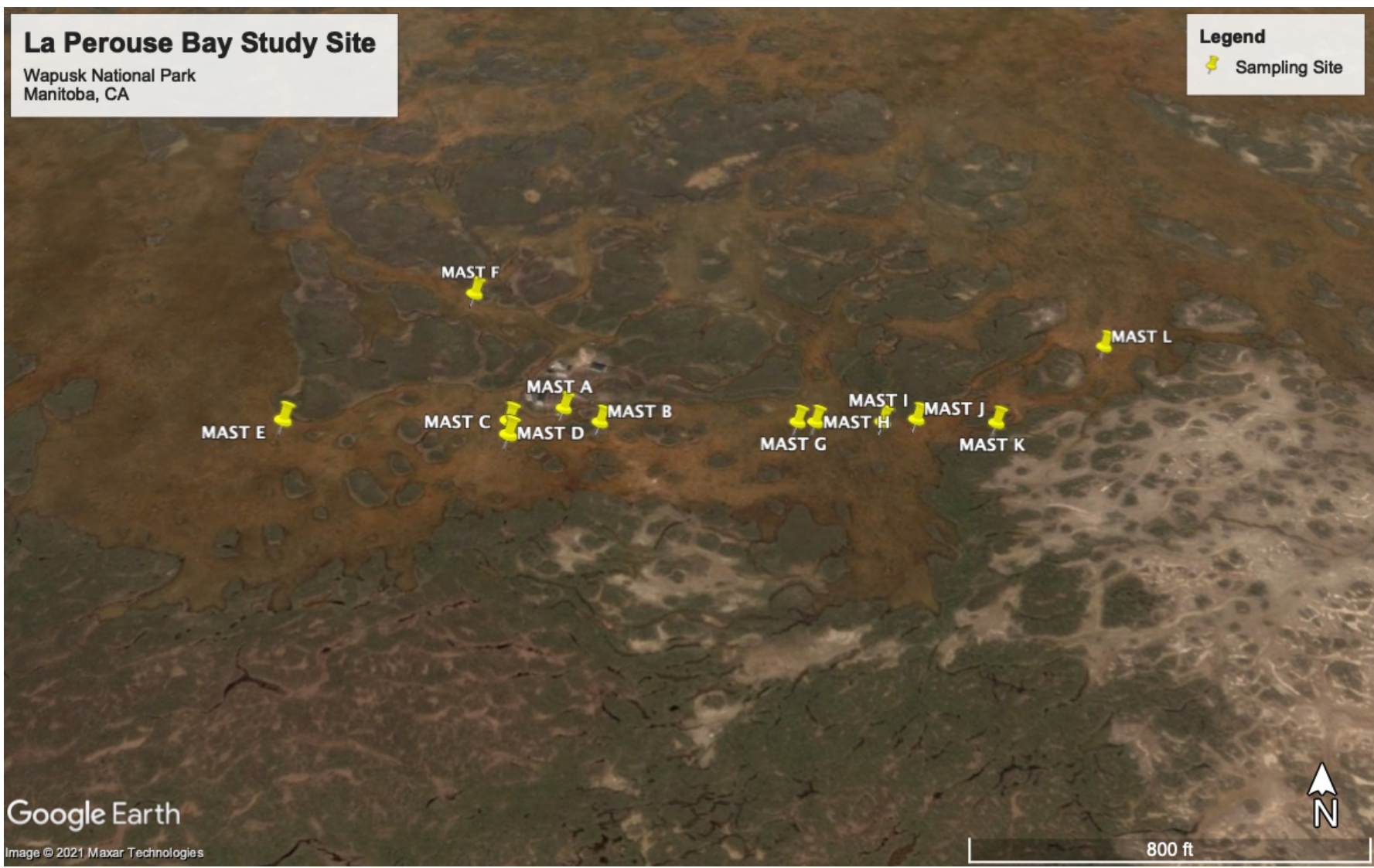
## Questions/Approaches

- The loss of permafrost as well as Snow Goose foraging patterns have led to erosion of the banks of the Mast River and increased sediment load in the river. We believed that invertebrates which are sensitive to this kind of substrate, and which are an important potential resource to the migratory birds who make their way through Wapusk National Park, are declining due to this sedimentation.
- Sampling was performed along 12 historic sampling sites (2003-2004, 2016-2017) using a Surber samplers in the summer of 2019 (1,3,4).
- Characteristics such as flow, vegetation type and coverage, sediment coverage, and substrate type was assessed over two month at each study site.
- Samples were then sorted into 15 functional groups (1).

# This study investigated the impacts of sedimentation, erosion, and habitat loss on vital resources within a sub-arctic ecosystem.

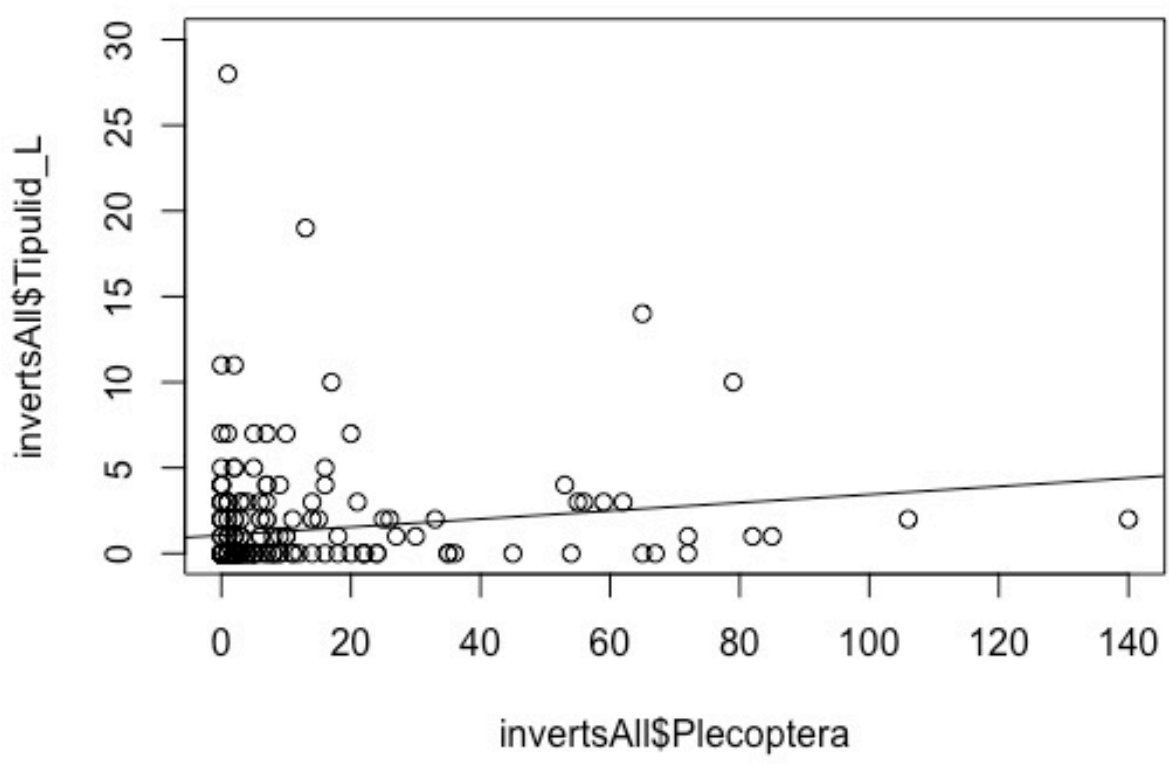
## Findings

- Multiple regression analyses were used to compare functional group abundances to sample site characteristics (substrate, flow, vegetation).
- Chironomids, Trichoptera and Ephemeroptera demonstrated significant, negative relationship with silt coverage.
- Ephemeroptera demonstrated a significant relationship with water depth suggesting that water depth also plays a large role in the habitat selection of these invertebrates
- When comparing functional groups, Tipulids S, Tipulids M, and Tipulids L showed significant positive relationships with Plecoptera. Tipulid XL demonstrated a significant positive relationship with Ephemeroptera.
- Our data suggests that increased silt coverage, possibly due to climate change and habitat degradation, could have a negative impact on a number of aquatic invert groups (Chironomids, Trichoptera, and Plecoptera). Plecoptera is also positively related to Tipulid abundance in our study. This could be due to the fact that both Plectoptera and Tipulidae share similar habitat requirements.



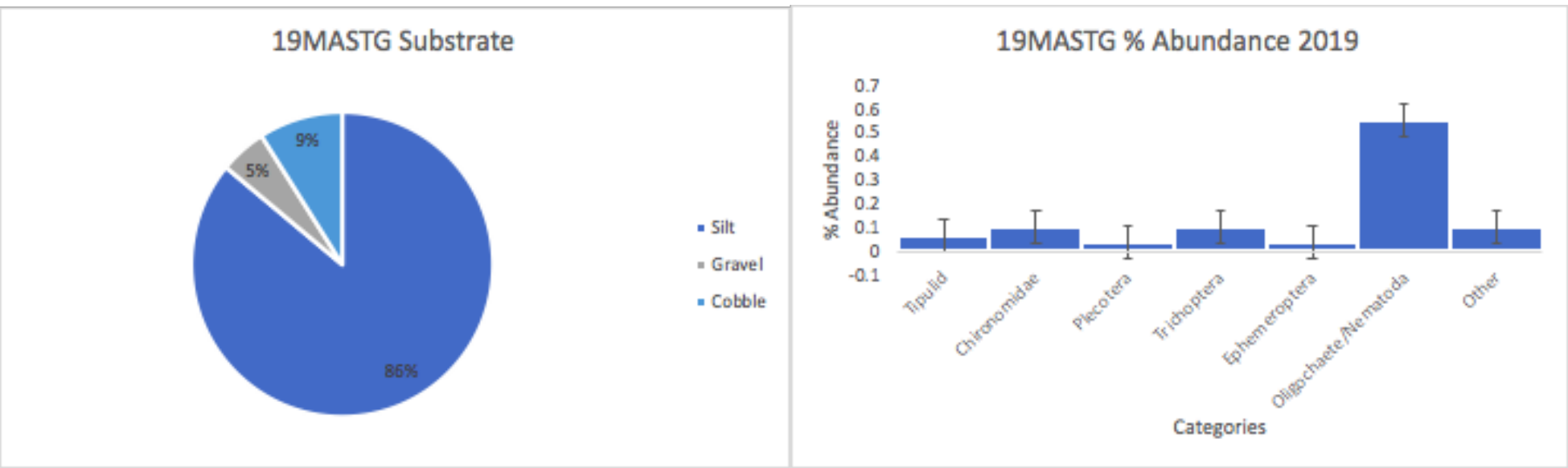
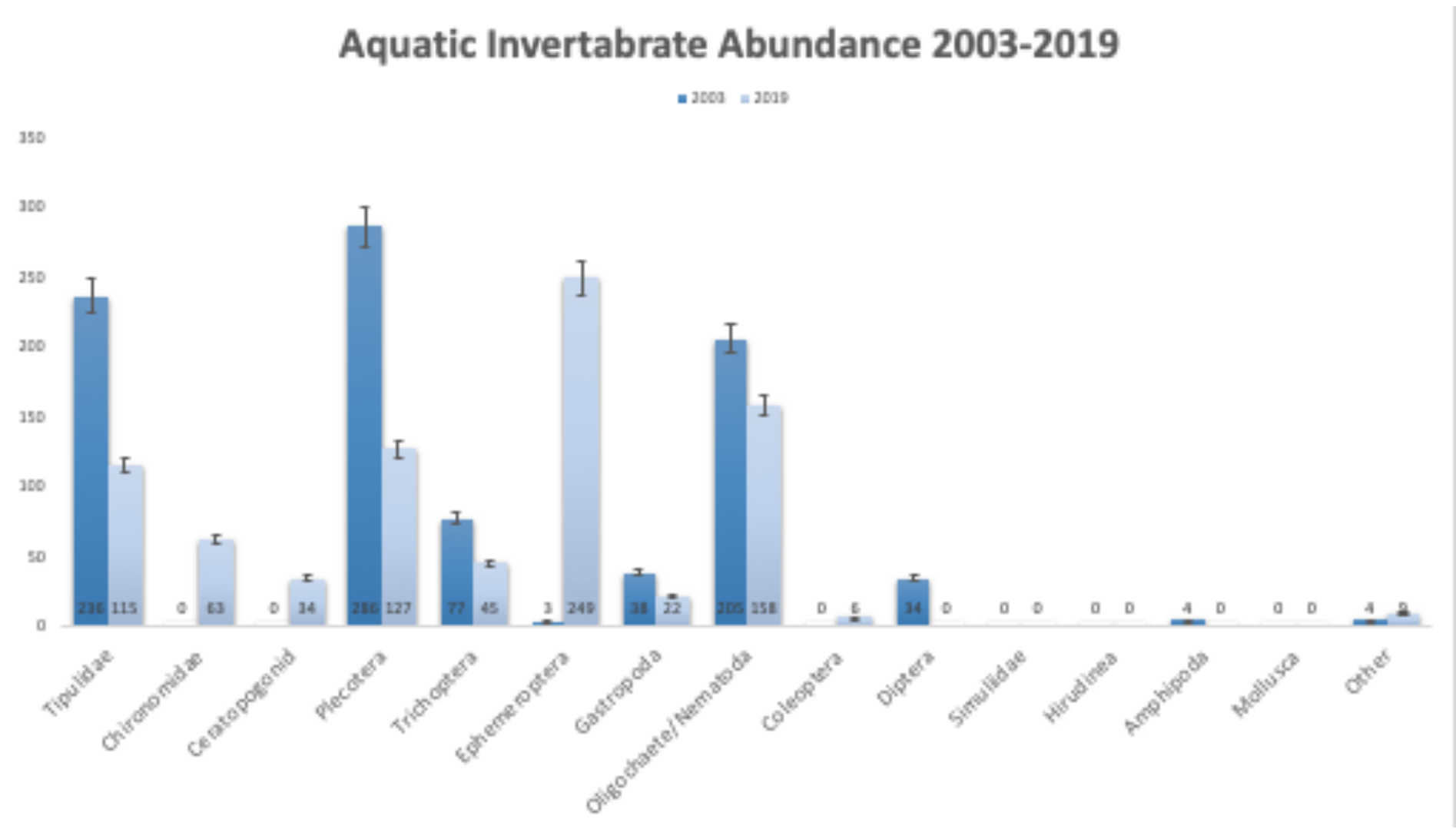
Map of the mast river study site

- Historical trends demonstrate declines in important aquatic invertebrate group abundance since 2003. Increased sediment load can be seen to influence presence of aquatic invertebrate species due to differing life history strategies.



Tipulid L and Plecoptera, p = 0.0143

- Future research will focus on comparing historic temperature and data to changes in invertebrate abundances as well as:
- Comparing historical Common eider nesting data and colony size with temperature and invertebrate data.
- Continue to monitor and record changes and mechanism of sedimentation within the Mast River watershed.



For more information, visit: <http://research.amnh.org/~rfr/hbp/>

**References** 1. Stechmann, Tanner J. "INFLUENCES OF NESTING BEHAVIORS IN COMMON EIDERS (SOMATERIA MOLLISSIMA SEDENTARIA) IN THE WESTERN HUDSON BAY." *University of North Dakota* (2019) 2. Milakovic, B., and R. L. Jefferies. The effects of goose herbivory and loss of vegetation on ground beetles and spider assemblages in an Arctic supratidal marsh. *Écoscience* 10:57-65 (2003) 3. Rockwell, Rober F. "Aquatic Invertebrate Inventory at Wapusk National Park." *Hudson Bay Project Annual Report* (2004) 4. Bogan, M. T., J. L. Hwan, K. Cervantes-Yoshida, J. Ponce, and S. M. Carlson. Aquatic invertebrate communities exhibit both resistance and resilience to seasonal drying in an intermittent coastal stream. *Hydrobiologia* 7999:123-133. (2017).