Title

Surveying Macroinvertebrates to assess health of a wetland restoration site in western Montana

Introduction

Wetlands are areas where water covers the soil for at least a portion of the year, and wetland habitat consists usually of submerged aquatic plants, floating leaf plants, and emergent vegetation (cattails and bulrush). Wetlands are often viewed as vital boundaries between the land and aquatic ecosystems, as they play a role in nutrient retention and influence local hydrology (REF). Associated with the vegetation is the community of aquatic macroinvertebrates, often diverse, which functions to breakdown nutrients in organic detritus, thus playing a role in nutrient cycling in the wetland. Macroinvertebrates are commonly used as indicators of wetland health, as their residence is wetlands is for the long-term, and particular species can indicate the quality of wetland habitat if they have specific preferences for wetland vegetation and water quality. Macroinvertebrates are one of the most common groups of organisms used to access the health of aquatic ecosystem (Rosenberg and Resh, 1993). Some macroinvertebrates respond to specific change in water conditions and have become indicators of wetland health for aquatic ecologists (Sharma and Rawat, 2008).

The present study collected and analyzed baseline aquatic macroinvertebrate community composition, richness, and diversity at a wetland restoration site located in Moiese Valley, Montana, near the National Bison Range.

Categorizing the diversity and structure of macroinvertebrates in the selected nine wetland sites will help to determine the overall richness and abundance of the macroinvertebrates living within

the wetlands. This includes arthropods, mollucus, annelids, nematodes, and Platyhelminthes. The objective of sampling in 2016 is to establish baseline information on the aquatic macroinvertebrates communities at each of the nine wetland sites. In addition, I will use various metrics (species richness).

Materials and Methods (Species collected, Data Collected, Statistical Analyzed)

Study Area

The Moiese Wetland is a channel of waste water that flows from the Moiese waste irrigation. This irrigation flows through four settling ponds and one irrigation ditch to catch the silt and gravel that the flow carries. Most of the creek flows through new beds of riparian plants to absorb the nutrients delivered by the second ditch (Missoulian, 2013). The first channel was cut so deep that it wasn't able to flood, and now the spread is shallow enough to overflow every two-three years.

Sample collection

I used a D-frame net-150 mesh to collect the aquatic invertebrate samples, three sweeps per site, at twelve different sites. I had done two rounds of sampling, one round in late June and the second round in late July. During the first round of sampling I was not able to collect data for C3 because that site was dry (see figure??).

The samples were then placed into plastic containers with ninety-five percent ethanol and taken back to the lab. In the lab, the samples were picked for macroinvertebrates and then identified under the microscope. I identified them to level of family using the key (Voshell, 2002), and macroinvertebrates were only included in abundance counts if the heads were attached to the body.

I also surveyed the emergent vegetation at each of the 12 sites by estimating percent coverage of the emergent plants. I randomly tossed three square quadrats at each of the twelve sites (N=36), and estimated percent cover of cattail, bulrush, forb, grass, stem litter, and open water.

Data analysis

I calculated percent composition of the major macroinvertebrate groups (Ephemeroptera, Trichoptera, Mollusca, Diptera, Annelida, Coleoptera, and Hemiptera). This was done in Microsoft Excel 2016. Prior to all the statistics analysis my data were screened for normality, and my data were very non-normal, so analyses wereq limited to non-parametric approaches. We analyzed percent composition in the "mvabund" package of the R statistical software program (R Core Team, 2016). I ran a generalized linear model in R to test for significant difference in the macroinvertebrates community composition between months and sites. I also created an ordination in R to visually represent my samples. In SYSTAT 13 I performed a cluster analysis and factor analysis on the percent composition data.

Plants:

I analyzed the percent vegetation cover at each of the 12 sites using ordination in R and factor analysis in SYSTAT 13.

Result (look at the Pie Charts)

Generalized linear models showed a significant difference in the Macroinvertebrate community sites (deviation=452.7,P-Value=0.01) and not the dates (deviation=55.6,P-Value=0.35). The pie graph of percent composition of MC2 (Figure1a) showed that half of the graph is Diptera(true flies) and a fourth of Trichoptera (caddisflies).

The percent composition of the major aquatic macroinvertebrates groups of the lower Moiese Valley sites (Figure1b) shows nearly equal percent between three groups of species, Diptera, Mollusca, and Crustacea. Mollusca being a large phylum invertebrate such as, Snails, and Clams. Crustacea an arthropod of the large, mainly aquatic group, such as crab, lobster, and shrimp.

Pie graph of percent composition of major Aquatic Macroinvertebrate of MC1 (Figure1c). This graph shows that nearly fifty percent of it is Diptera and a fourth being Crustacea. The pie graph of percent composition of major aquatic macroinvertebrates of the upper Moiese Valley sites (???) (figure1d). this graph shows seventy-two percent coverage of Mollusca, and the rest of the graph is equal with the rest of the species.

Pie chart of percent composition of the major aquatic macroinvertebrate groups of Coleman sampling site, being C2, C3, and N2 (Figure1e). show thirty percent coverage of Crustacea and twenty-five percent coverage Mollusca. Pie chart of percent composition of the major aquatic macroinvertebrates groups of the Moiese Waste way (Figure1f). Shows thirty-five percent coverage of Crustacea, twenty percent coverage of Mollusca and Hemiptera. A hemipteran is a true bug, they have mouthparts adapted to piercing and sucking.

Discussion (what does the results mean)

Talk about what the different sites have in terms of bugs. Why is this important. Baseline data for future studies etc.

Acknowledgement

I would like to thank the University of Notre Dame Environmental Research Center for funding my research, and letting me have another opportunity to experience their program. A big thanks to Katherine

Barret Bailey for all the helps she provided throughout the summer. Thanks to the Salish and Kooteni Tribe for letting me do Research on their reservation.

Literature Cited

Tables

Figures (Pie Charts here)

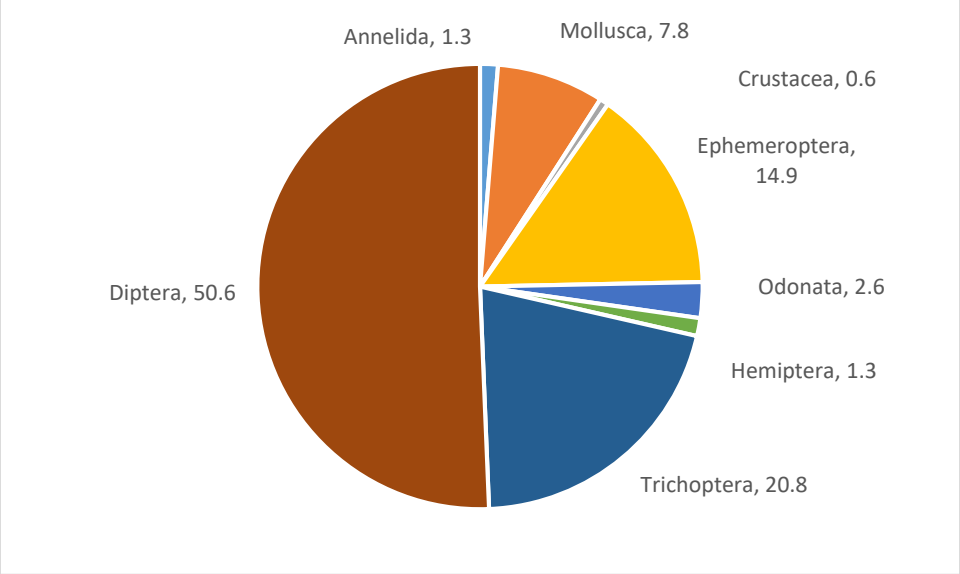


Figure 1a. Pie graph of percent composition of MC2.

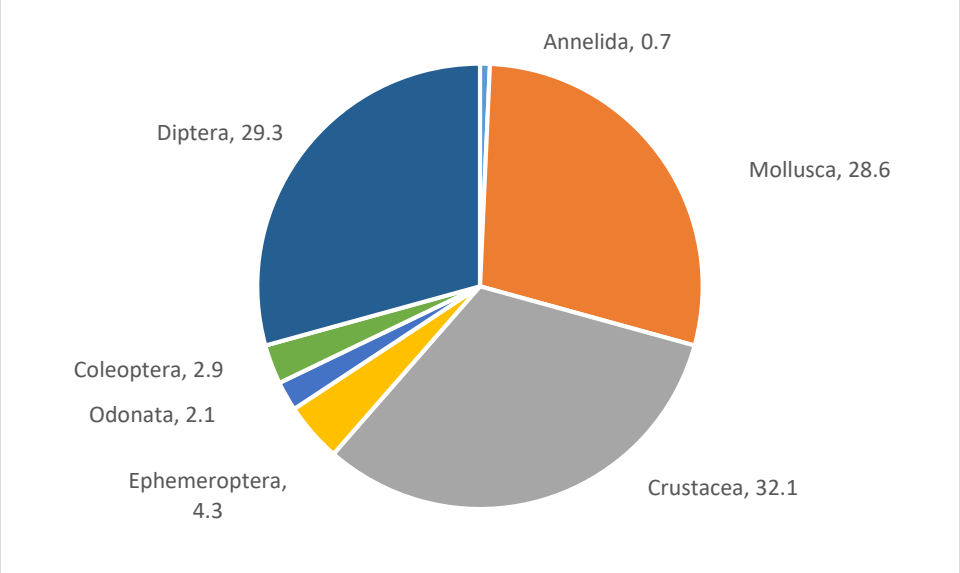


Figure 1b. Pie graph of percent composition of the major aquatic macroinvertebrate groups of the lower Moiese Valley sites.

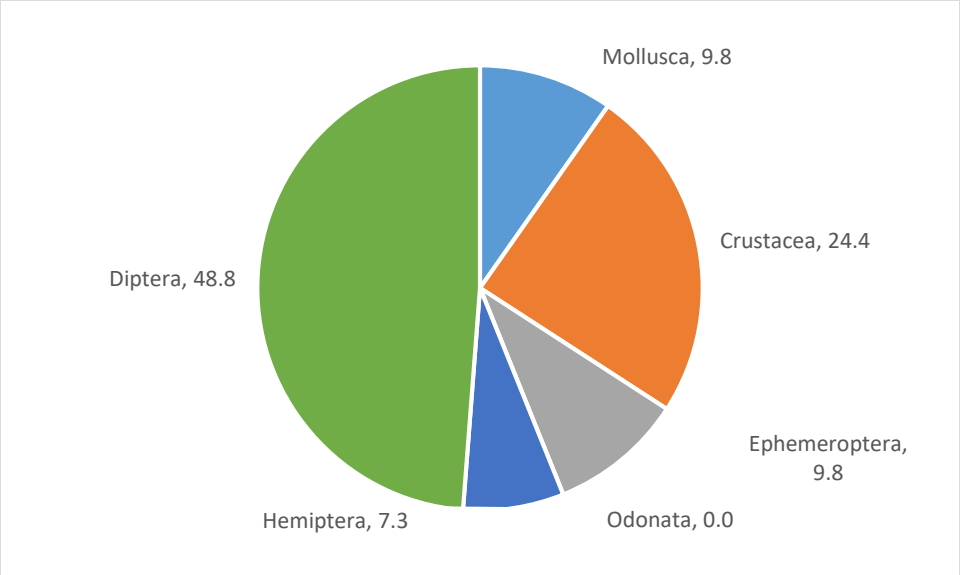


Figure 1c. Pie graph of percent composition of major aquatic macroinvertebrates of MC1.

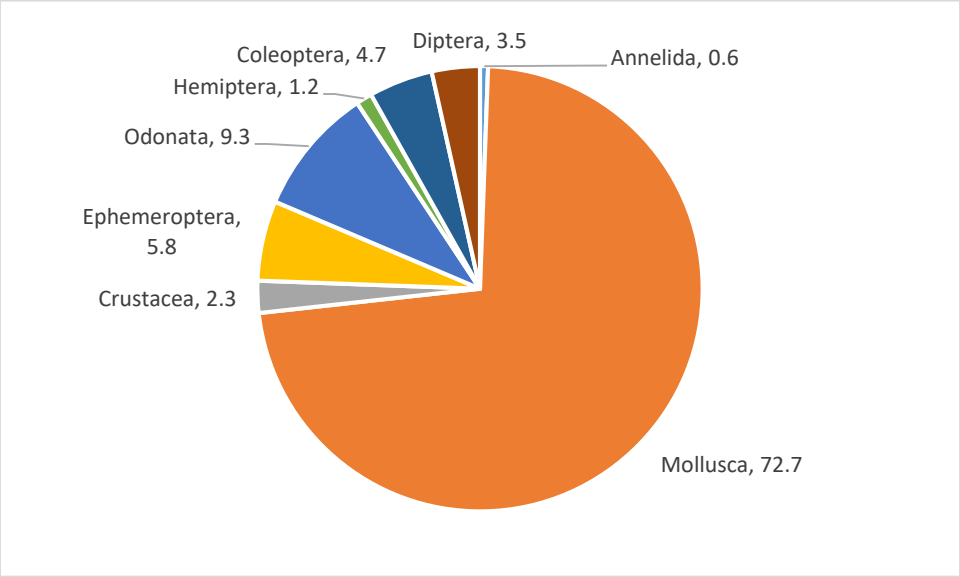


Figure 1d. Pie graph of percent composition of major aquatic macroinvertebrates of the upper Moiese Valley.

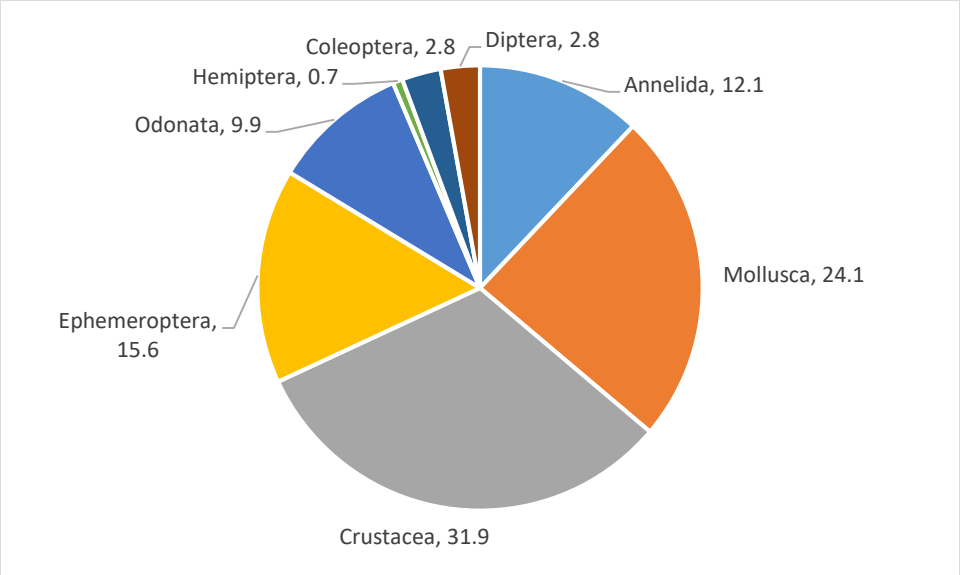


Figure 1e. Pie chart of percent composition of the major aquatic macroinvertebrate groups of Coleman sampling sites.

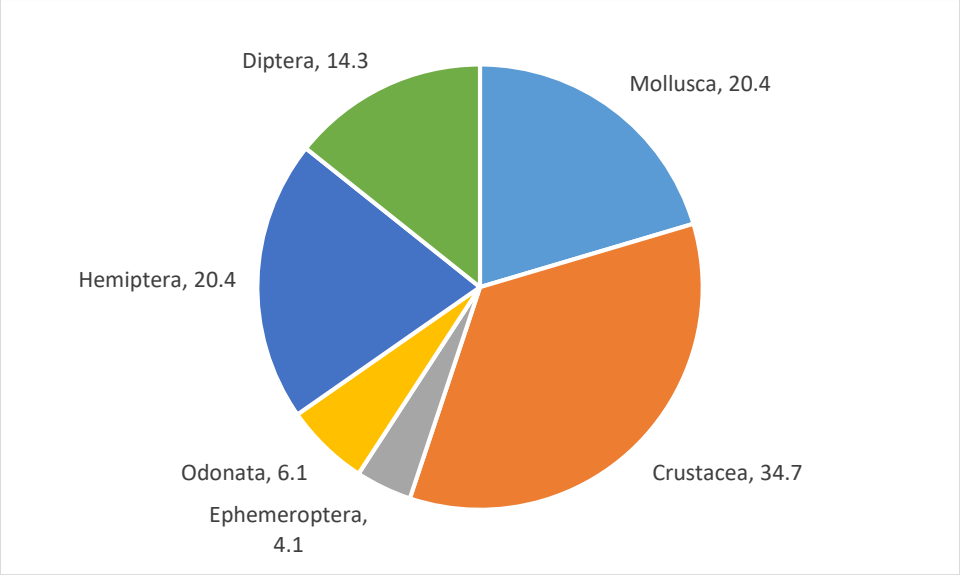
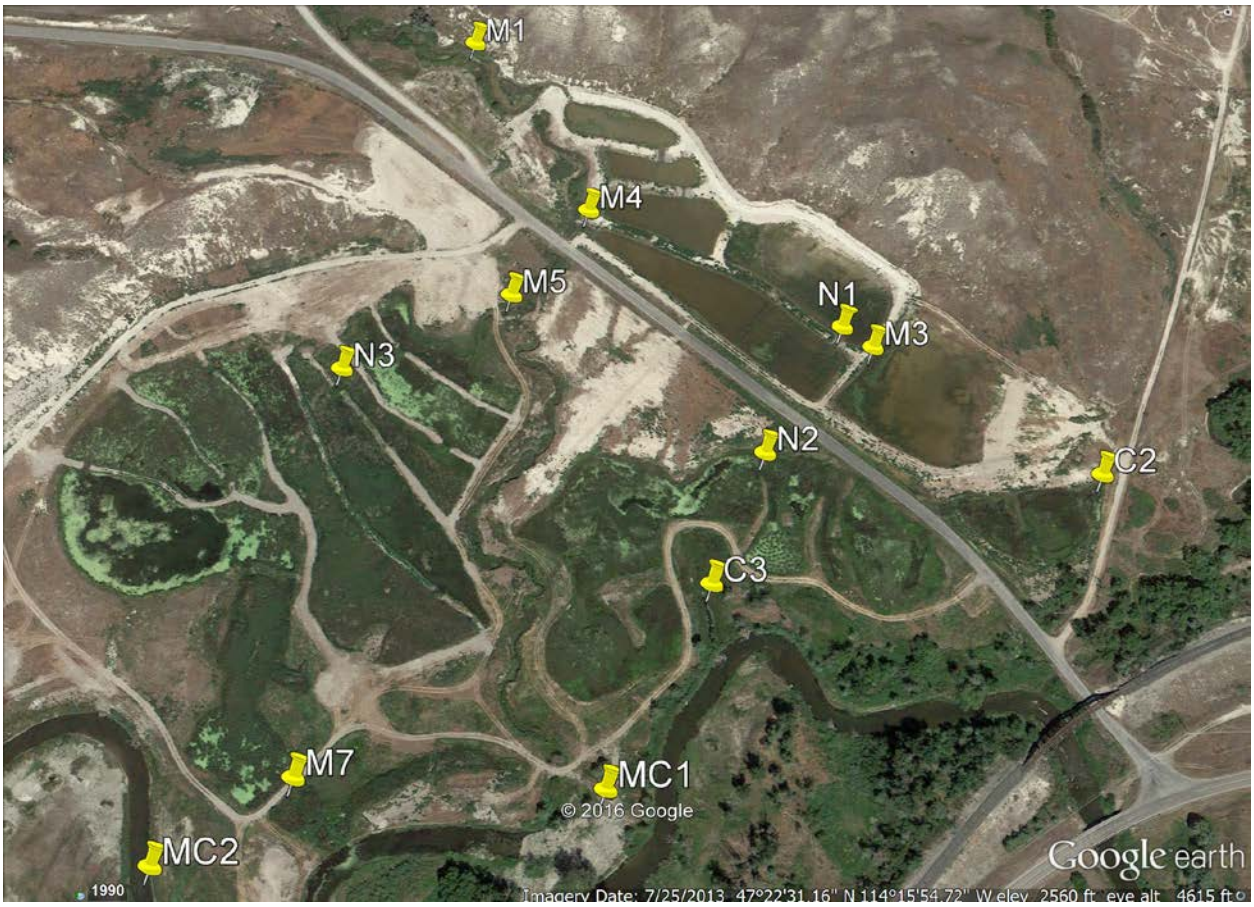
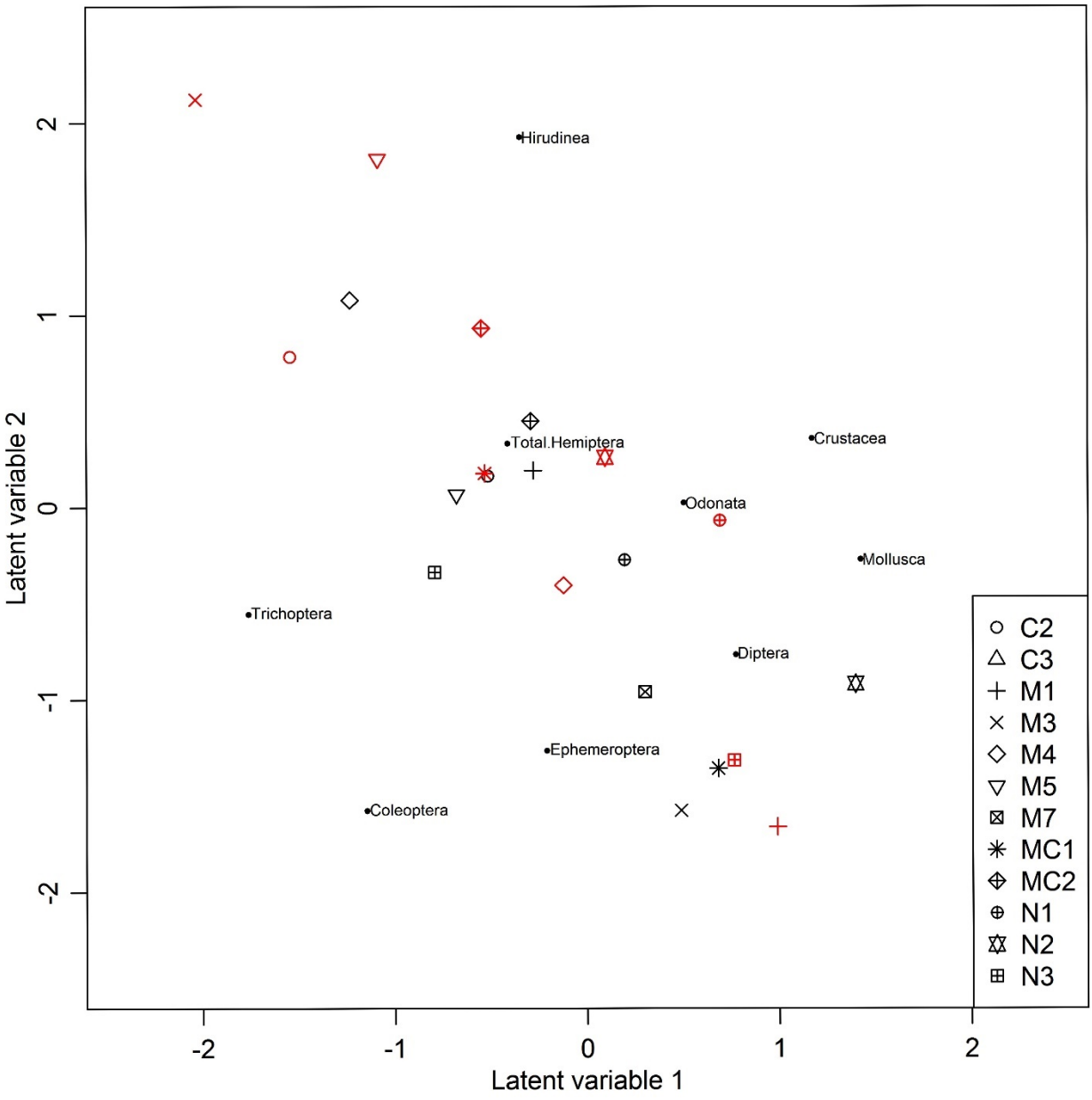


Figure 1f. Pie chart of percent composition of the major aquatic macroinvertebrate groups of the Moiese Wasteway.



The Moiese Valley Wetland. Location of each sample site.



Red=June. Black=July