Anthropogenic Effects on Macroinvertebrates in Wetlands

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Introduction

Wetlands are areas that are important both for the organisms that inhabit them and for humans. Wetlands provide habitat for plants and animals, serve as protection against flooding, control stormwater runoﬀ, and are a source of research for educational purposes (Ehrenfeld, 2000). As compared to rural wetlands, urban environments are highly aﬀected by human activity as a result of higher concentrations of humans around the wetlands themselves. Anthropogenic effects on urban wetlands include air and water pollution through poor waste disposal methods, as well as the release of harmful toxins into the air and into groundwater systems (Mensing, 1998). I hypothesized that the aquatic macroinvertebrates inhabiting restored urban wetlands are directly aﬀected by the anthropogenic effects from upslope. My study included two recently restored wetlands at the Passionist Earth & Spirit Center in Louisville, KY. The wetlands are pictured here, in Figure 1.

Abstract

Wetlands are areas that are important both for the organisms that inhabit them and for humans. Wetlands provide habitat for plants and animals, serve as protection against ﬂooding, control stormwater runoﬀ, and are a source of research for educational purposes. As compared to rural wetlands, urban environments are highly aﬀected by human activity. Anthropogenic effects on urban wetlands include air and water pollution through poor waste disposal methods and the release of harmful toxins into the air and water. I hypothesized that the aquatic macroinvertebrates restoring urban wetlands are aﬀected by the anthropogenic effects from upslope. My study included two recently restored wetlands at the Passionist Earth & Spirit Center in Louisville, KY. To test for pollutants that might be present in the wetlands, I measured pH, turbidity (NTU), temperature (ºC), nitrate (mg/L), and speciﬁc conductance (µS/cm) using a YSI Pro-DSS. I used a Hach kit to test orthophosphate and alkalinity (mg/L CaCO3) and a Vernier instrument to test dissolved oxygen levels in each wetland. Macroinvertebrate sampling was performed in spring and fall by collecting organisms using a D-frame net and identifying them to family level in the ﬁeld.

Methods

To test for pollutants that might be present in the wetlands, I measured pH, turbidity (NTU), temperature (ºC), nitrate (mg/L), and speciﬁc conductance (µS/cm) using a YSI Pro-DSS. To test orthophosphate and alkalinity (mg/L CaCO3) I used a Hach kit. I also used a Vernier instrument to test dissolved oxygen levels in each wetland. Macroinvertebrate sampling was performed in spring and fall by collecting organisms using a D-frame net and identifying them to family level in the ﬁeld.

Results

The results of this study showed that macroinvertebrate abundance is higher in Wetland 2 in the spring than in the fall. Conversely, macroinvertebrate abundance was higher in the fall in Wetland 1 than it was in the spring. Nitrogen levels were found to be higher in the spring in Wetland 2 than they were in the fall. Nitrogen levels were higher in the fall in Wetland 1 than they were in the spring. There was also more of a ﬂuctuation in oxygen when nitrate was abundant in each wetland, with higher oxygen during the day. For example, mean dissolved oxygen in September and October was 14.72 mg/L in Wetland 1 and 8.65 mg/L in Wetland 2.

Discussion

Wetland 2 diﬀered from Wetland 1 in the sense that the wetland is fed year-round by a groundwater spring, which is located at the base of a hill. On the top of the hill are a lawn, trees and gardens that are regularly fertilized, which contained high levels of nitrogen. The high nitrogen levels found in Wetland 2 in the spring are likely a result of nitrogen permeating through the soil in groundwater and ﬂowing into the wetland over time. Conversely, nitrogen levels were lower in Wetland 2 in the fall because the nitrate has not yet traveled through the groundwater system. Lower nitrogen levels in Wetland 1 in the spring were likely due to water supplied by rainfall. Higher nitrate levels in the fall in Wetland 1 were likely a result of nitrogen delivered by runoff. High nitrate levels lead to greater diurnal ﬂuctuations in oxygen due to photosynthesis and respiration (USGS, 2020). As a result, these wetland environments are less hospitable to macroinvertebrates when nitrate levels are high.

References


