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Paved paradise and put up a parking lot? Impacts on Isolated Wetlands in the Cuyahoga Watershed

Casey Smith

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Impacts on Isolated Wetlands in the Cuyahoga Watershed

By Casey Smith with Dr. Siobhan Fennessy

Abstract

Isolated wetlands dot the landscape of Ohio and are increasingly in danger of being filled in and paved over, or just generally overlooked. This study looks briefly at the influences on isolated wetlands and their possible impacts on the health of those wetlands, as well as comparing and contrasting influences on isolated versus non-isolated wetlands. Using the Ohio Rapid Assessment Method (ORAM) and soil cores at each site this study gives a quick look at isolated wetlands in the Cuyahoga River Watershed. It was found that isolated wetlands are generally more degraded (as indicated by a lower ORAM score) and have a lower conductivity. A trend between distance from wetland boundary to the nearest road was also discovered, suggesting that nearby roads have a negative influence on wetlands.

Introduction

In January 2001, the U.S. Supreme Court issued a ruling, popularly called the SWANCC decision, in favor of the Solid Waste Agency of Northern Cook County, limiting the jurisdiction of the U.S. Army Corps of Engineers, and imposing a strict interpretation of the Clean Water Act. The court ruled that the waters protected under the Clean Water Act, 'navigable waterways,' could not be extended to isolated waters, placing isolated wetlands in immediate danger.

Isolated wetlands play an important role in the landscape by retaining large amounts of both nutrients and sediment preventing their eventual discharge into rivers and lakes in the watershed. Isolated wetlands are believed to react differently to stressors such as development and agriculture due to the obviously different hydrologic dynamics.

This study provides a very preliminary look at the differences between isolated and non-isolated wetlands with regards to health, and the influence of road adjacence on conductivity. In general due to their position in the landscape, isolated wetlands are thought to be more degraded than non-isolated wetlands. Because non-isolated wetlands tend to be located on floodplains there is a limited amount of development that can occur in neighboring areas. Conductivity is thought to increase with nearby roads due to the input of deicing salt from runoff.

Materials and Methods

A watershed-wide survey of 200 wetlands was performed in the Cuyahoga watershed in and around Cleveland, Ohio. Each wetland was randomly chosen and located using GPS coordinates, and evaluated using the Ohio Rapid Assessment Method (ORAM), which looks at wetland health based on vegetation assessment as well as surrounding buffers and land use. Six soil samples were collected at each site for analysis (only conductivity data used here).

Of the 200 wetlands sampled 68 are represented here. Out of the pool of 68 wetlands each was assessed using field notes, aerial photographs, and topographic maps to determine whether or not it was hydrologically isolated. Isolated wetlands were defined as wetlands that demonstrated no potential for any surface water connection to any other body of water. The distance from the wetland boundary to the closest road adjacent to the wetland was measured on the aerial photographs and converted to meters.

Comparisons between isolated and non-isolated wetlands, for conductivity, ORAM score, and nearest road, were made using two-sample T tests. A regression analysis was performed to assess the relationship between the distance to the nearest road and conductivity.

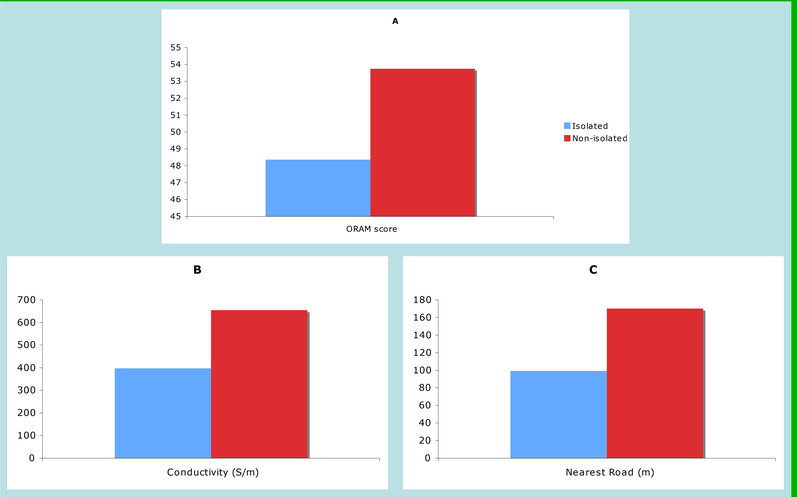

Figure 1. Graphs A, B, and C show the difference in mean Ohio Rapid Assessment Method (ORAM) score (an indicator of wetland health), conductivity, and distance between the wetland and the nearest road, respectively, between isolated and non-isolated wetlands. ORAM score (two-sample t test, t=2.40, df=66, p=0.019), Conductivity (two-sample t test, t=2.99, df=68, p=0.004), Nearest Road, not significant, but shows definite trend, (two-sample t test, t=1.45, df=67, p=0.153).

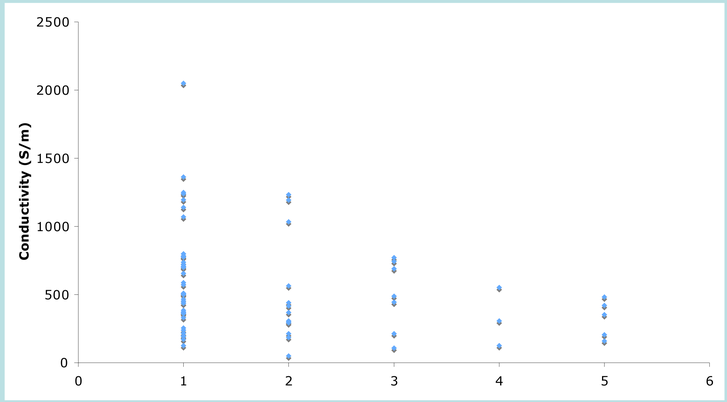

Figure 2. The relationship between distance from the wetland boundary to the nearest road and conductivity. The x-axis represents 100m increments, so 1 is wetlands with a road closer than 100 m, 2 is a wetland with a road that falls 100-200 m away, and so on up to 5 which is wetlands with a road greater than 400 m away.

Figure 3. A 'wetland' that was visited during our study which has been filled. This is a commonplace occurrence, and is enabled to a greater extent by the SWANCC decision.

Results

- **Isolated wetlands had a lower mean ORAM score at 54.5 (±1.6) than non-isolated wetlands at 47.5 (±2.6) (fig. 1a)**
- **Conductivity and distance to the nearest road were both greater in non-isolated wetlands than in isolated wetlands (fig. 1b and 1c).**
- **There was a clear negative trend in the relationship between distance to the nearest road and conductivity (fig. 2).**

Conclusion

In general, significant differences were seen between isolated wetlands in overall health (as indicated by ORAM score), and conductivity. Isolated wetlands had a mean ORAM score lower than non-isolated wetlands, suggesting that either isolated wetlands are more sensitive to stress, or they are generally more stressed.

Although there was a difference in means between distance from the wetland boundary to the nearest road, the difference was not significant, or conclusive.

Anthropogenic inputs clearly influence conductivity in wetlands. Road proximity shows a negative relationship with conductivity, meaning that wetlands with roads immediately adjacent to tem tend to have higher conductivity, although we were unable to demonstrate a causal relationship. Other studies have shown negative impacts of roads on nearby wetlands through the influence of deicing salt.

Future Directions

This project is very much a work in progress. Data is slowly filtering, but considering the scale of the project it will take time. Eventually the goal is to evaluate differences in nutrient retention between isolated and non-isolated wetlands, and compare this with respect to wetland health and position in the landscape (in relation to road density and surrounding land-use). Using the nutrient data for all isolated wetlands sampled in the Cuyahoga watershed we hope to calculate a cumulative nutrient retention capacity, to illustrate the collective importance of isolated wetlands in the watershed.

This is the first study of this scale conducted…ever, as well as the first to use rapid assessment methods to evaluate wetlands at a watershed level. The data set is inconceivably large and will yield unpredictable results I'm sure. It's very exciting.

Acknowledgments

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