The unbeLEAFable effects of deciduous trees near streams in southeast Wisconsin, USA

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Introduction

- Leaf litter can have benefits, but with too many leaves, there can be disadvantages such as stream blockages
- Autumnal leaf fall can make microhabitats for macroinvertebrates, bacteria, and fungi
- Depending on the different tree species, it takes different amounts of time for the leaves to decompose and leach their nutrients into the water

Research Question

- **How does the presence of different deciduous tree species near streams affect nutrients added to the water?**

Methods

Three sites with different tree densities were visited three times over February and March 2023:

- Turtle Creek = Low
- Spring Brook = Medium
- Goose Creek = High

Field methods

- We tested the nitrates and dissolved oxygen three times at each site using the GLOBE integrated hydrology protocols
  - We tested dissolved oxygen using Lamotte Testabs
  - We used AquaChek and WaterWorks test strips for nitrates

Lab methods

- For the watershed tea, we used 450mL of water to 1g of biomass and tested every 24 hours during the school week for 11 days

Figure 1- While testing watershed tea for nitrates, we observed A) air bubbles, and B) leaf tannins

Results

- The higher amount of deciduous trees near a stream decreased the amount of dissolved oxygen
- The amount of trees had a lesser effect on the nitrate level of the water than the dissolved oxygen level

Table 1- Tree species found at each site and the average nitrate level found using watershed tea

Tree species	Goose Creek	Spring Brook	Turtle Creek	Average nitrate level (ppm)
American elm	X			2.0
Black ash	X			1.0
Black cherry	X			1.6
Bur oak	X	X		0.9
Chinkapin oak	X			2.4
Cottonwood			X	2.5
Red oak	X	X		2.2
Shagbark hickory		X		0.8
Silver maple		X		1.4
Sugar maple		X		0.2
Swamp white oak	X			2.4
White oak	X	X		0.3

Figure 2- Tree density variations for A) Goose Creek, B) Spring Brook, C) Turtle Creek in Rock County, WI

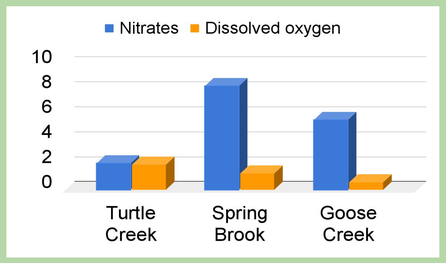

Figure 3- Average nitrate and dissolved oxygen levels for each site

Discussion

- Deciduous trees near a stream seem to have an effect on the nitrate levels, but other factors could be at play, including fertilized soil and animal feedlots
- When more leaves are added to the stream, bacterial activity increases, which would cause dissolved oxygen to decrease
- We can accept the hypothesis that as leaf litter increases, the dissolved oxygen decreases and nitrate level increases
- A previous intern found that there were more classifications of macroinvertebrates at Spring Brook likely due to food availability.
- Future studies could investigate other factors that are contributing to nitrate levels and what additional nutrients are being added due to those factors
- Our biggest limitation was time when doing the watershed tea
- The biggest areas of human error were using a less accurate dissolved oxygen test kit, and regarding watershed tea, we should have used different containers so the water would not have evaporated
- It was a great experience being able to learn as much as I could and being more hands-on rather than inside at a desk all day
- With the information I learned here, I plan on going to college to be a environmental science or a natural history teacher

References

I would like to thank:

- The National Science Foundation (GEOPAths Award #2118482) for funding
- Michael Notaro at the UW-Madison Nelson Institute Center for Climatic Research
- Welty Environmental Center for logistical support and field assistance
- Heidi Andre for introducing me to environmental science