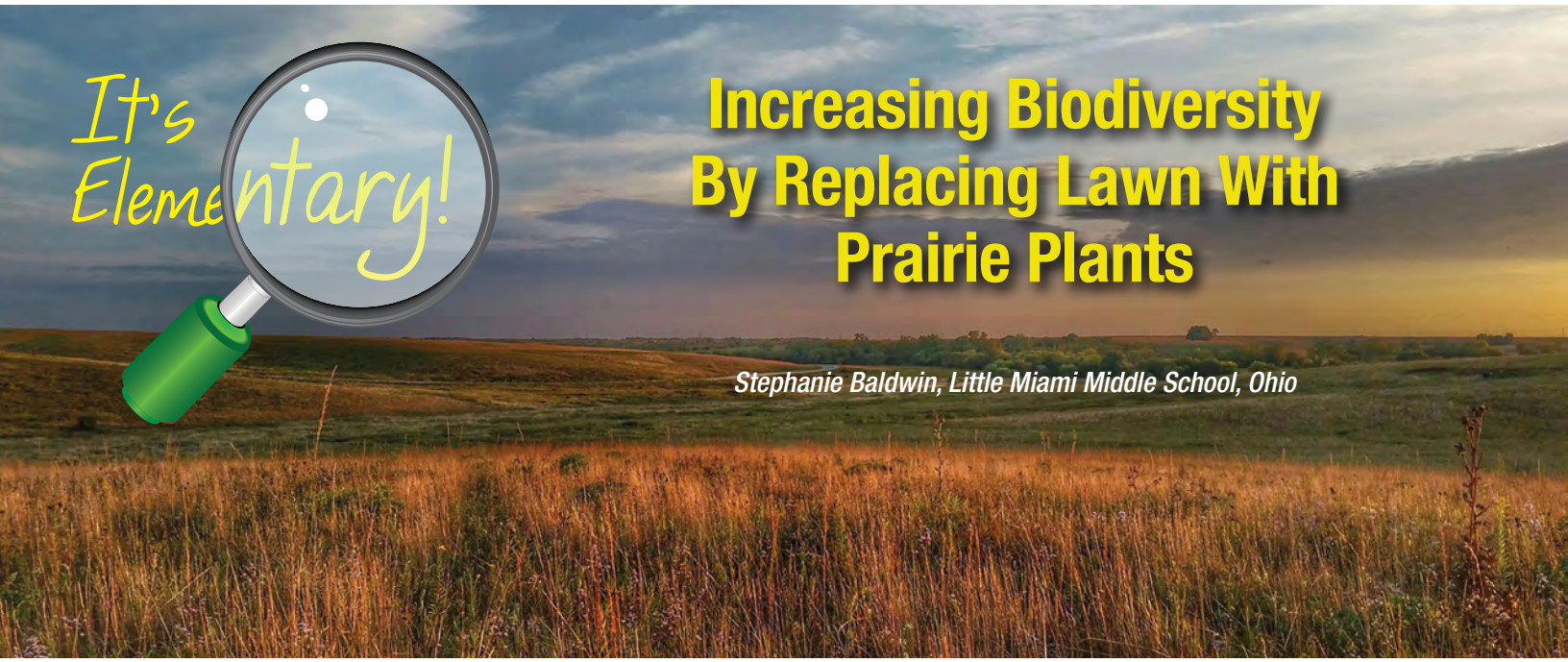

Increasing Biodiversity By Replacing Lawn With Prairie Plants

Stephanie Baldwin, Little Miami Middle School, Ohio

Prairie Sunset at Neal Smith National Wildlife Refuge in Iowa

Photo Credit: Doreen Van Ryswyk - USFWS

Abstract

Prairies are defined by unique soil characteristics, grasses, and wildflowers. They provide native habitat for birds, butterflies, insects, reptiles, and other small wildlife. This middle school project, supported by funding from NOAA Planet Stewards, created a native prairie landscape on a school-site yard where there was once only a 2.75-acre lawn. Students worked with community members to research planting and maintenance of prairie plants. After installation, students were able to track an increase in biodiversity of plants and animals over a four-year span. They also compared the biomass of lawn and prairie and calculated the savings of carbon emissions due to a reduction of mowing.

Figure 1. Baldwin Prairie area before restoration.

Photo credit: Stephanie Baldwin

Introduction

Native prairies require little maintenance, are long lasting, and do not need fertilizers or pesticides and they are perfectly adapted to the midwestern climate. Prairie root systems are drought resistant, hold soils in place, absorb water, *slow runoff, reduce soil loss, and lessen the severity of flooding.* (https://tallgrassprairiecenter.org/) The benefits of restoring prairie in previous lawns can be substantial, maintenance that uses less water and no fertilizer, and an ecosystem that supports wildflowers and wildlife. (Kessler, 2021)

In the spring of 2017, my students watched with wonder each day as a mother killdeer tended to her chicks that had been born on the grassy lawn beside the playground. We used safety cones and communicated with our groundskeeper to keep them safe, but what if there were other nests we had missed? My students worked together to find a way we could encourage wildlife be on our school grounds.

The Project

This project had 2 anticipated outcomes:

- Eliminate carbon dioxide gas produced by lawn mowing.
- Increase biodiversity by planting more species of plant instead of turf grass.

Finding community helpers was key to our success. Students worked closely with our district groundskeeper to develop a plan. We had local master gardeners look over our plans and they helped us pick plants and connected us with the Ohio Prairie Nursery where we sourced our seeds.

A representative from the Greenfield Plant Farm taught students how to select native plants that would grow well in our local soil and attract the largest number of pollinators to our site. Warren County Master Gardeners explained to students how to clear our site and maintain the young plants for the most successful plant growth in the Spring. Local gardeners and high school student volunteers helped students learn the proper way to dig, transfer and water new plants.

The groundskeeper was happy to stop mowing the new prairie during the school year and also had a brush cutter available to cut down the tall prairie plants once each fall to prevent our grass species from being taken over by newly growing trees. Funds for our plants, new benches and signs came from NOAA Planet Stewards and the Ohio Department of Natural Resources WILD school sites grant (https://ohiodnr.gov/discover-and-learn/education-training/environmental-education/wild-school-sites). A local greenhouse manager came to our school on planting day and brought mature plants to plant along with our seeds.

Species Planted

Grasses

- *Schizachyrium scoparium* - Little Bluestem
- *Bouteloua curtipendula* - Side-oats Grama

Wildflowers

- *Chamaecrista fasciculata* - Partridge Pea
- *Heliopsis helianthoides* - Ox Eye Sunflower
- *Gaillardia pulchella* - Indian Blanket
- *Echinacea purpurea* - Purple Coneflower
- *Monarda citriodora* - Lemon Mint
- *Coreopsis lanceolata* - Lanceleaf Coreopsis
- *Senna hebecarpa* - Wild Senna
- *Rudbeckia hirta* - Black-eyed Susan
- *Ratibida pinnata* - Yellow/Grey-headed Coneflower
- *Liatris spicata* - Dense Blazingstar
- *Asclepias syriaca* - Common Milkweed
- *Asclepias tuberosa* - Butterfly Milkweed
- *Asclepias incarnata* - Swamp Milkweed
- *Monarda fistulosa* - Wild Bergamot
- *Tradescantia ohiensis* - Ohio Spiderwort
- *Penstemon digitalis* - Foxglove Beardtongue

Figure 2. Students planting native species.

Photo credit: Stephanie Baldwin

School year timeline

August

- A local businessman tilled the soil that would become the prairie
- Prairie seeds were ordered
- Students installed 2 benches at the prairie site

September

- Students planted the prairie seed
- Students collected data on how much carbon our school mower emits per hour and calculated a carbon footprint for our current school yard maintenance practices
- Students planted 100 native plants

October-March

- Students in the school's nature club weeded the new prairie area weekly

Figure 3. Butterflies on newly restored prairie.
Photo credit: Stephanie Baldwin

April

- Students continued weeding
- Students completed a quadrant frame measurement of biomass.

May

- Students calculate new carbon footprint data for our schoolyard maintenance practices

We installed signs designating the area as a National Wildlife Federation Certified Wildlife Habitat. In subsequent years we have added bluebird boxes, bat houses and walking trails to the area. It is well used by both students and the neighboring community.

Data Collection and Results

The students gathered four types of data over the course of the project. For biomass calculations, students collected all the plants from a 1x1 foot grid and let the plants dry. Students then weighed the dried grass from each grid to show change.

Table 1. Project data collection types and results

Type of Data	Data Collection Method	Amount
Carbon sequestered	Biomass comparison of lawn vs. prairie	Students measure 400% more biomass in our prairie plants as compared to the maintained lawn areas of our school.
Carbon released by typical lawn mowing	Students calculated the amount of gas used to mow the school lawn where the prairie would be planted.	Students calculated a savings of 1,062 lbs of carbon per year from our prairie.
Types of plants observed	Plant survey comparison of lawn vs. prairie	Students recorded 20 types of plants in our prairie area compared to 3 types of plants in our lawn areas.
Animal diversity observed	Animal survey comparison of lawn vs. prairie	Students took an original survey of 30 animals found on our school grounds. After prairie planting the list has grown to 45 species of animals observed.

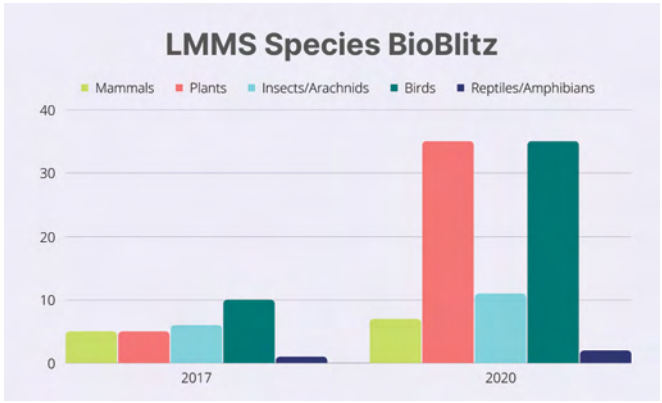

Figure 4. Comparison of numbers of animal species before and after restoration at Little Miami Middle School (LMMS).

iNaturalist (https://www.inaturalist.org/pages/teacher's+guide) is an app that provides a way for citizen scientists to share their observations of organisms with their community. It works well as a way to collect data for a biodiversity discovery project, such as a BioBlitz, a short (often 24 hours or less) inventory of living organisms found within a specified geographic area. (https://www.nationalgeographic.org/projects/bioblitz/) A BioBlitz may be conducted on all organisms or confined to a single taxonomic group or habitat. I took students out weekly for a month each Spring and Fall to get a tally of species found in our prairie. Students recorded any species they could find by snapping a picture using a smartphone and using the iNaturalist app to help identify the species. Using the iNaturalist community we were able to delete duplicate species and have community members check the accuracy of our species identification. Once

our observations were verified by the iNaturalist community we added the species to our bioblitz list.

To calculate the carbon dioxide emissions of the original plot of land my students began by interviewing our school grounds keeper. He reported that his riding mower used 1.5 gallons of gas per hour. The 2.75-acre site took him 2 hours to mow and he mowed the site twice a week from April to October. First, students used this data to determine the amount of gas used on mowing the site. They calculated:

> Gas used in a year of mowing the school grounds (168 gallons) = [hours of mowing per week (4 hours) * number of weeks mowed per year (28 weeks)] @ 1.5 gallons per hour

According to the U.S. Energy Information Administration, the motor gas used in the school lawn mower produces 19.37 pounds of carbon dioxide for each gallon burned. Using this information my student calculated that:

> Carbon footprint of maintaining our school lawn (3,254.16 lb.) = 19.37 pounds carbon dioxide per gallon x 168 gallons

Conclusion

Our goal of increasing biodiversity and giving wildlife a safe space to live in our school yard were met. We found an increasing number of species each year the prairie continued to grow. We had the most increase in plant species and bird species. Where we once only had fescue grass, there are now wildflowers and tall grass species. Birds attracted to prairies like red winged blackbird and meadowlark are now plentiful in our space where we had not seen them previously. By turning a portion of lawn to prairie we gave schoolyard wildlife a place to be safe and thrive. Over the years my students have tracked the increasing biodiversity of the area and enjoyed the new species our space has attracted. Educators who are interested in developing native species areas can find additional information in the *National Wildlife Federation Schoolyard Habitats Planning Guide.* (https://www.nwf.org/Eco-Schools-USA/Pathways/Schoolyard-Habitats/schoolyard-habitat-planning-guide)

Link for the BioBlitz activity

https://docs.google.com/document/d/1QkygYtnR4N7oTiFGyPjbXatfN4-l0N3DgccIJQm39b0/edit?usp=sharing

Reference

Kessler, Rebecca, 2021. Yale Environment 360. https://e360.yale.edu/features/in_us_midwest_restoring_native_prairie_ecosystems_kessler

About the Author

Stephanie Baldwin is a sixth grade language arts and science teacher at Little Miami Middle School in Ohio. She holds a BA degree from DePauw University in Biology and an MS degree in Curriculum and Instruction from the University of Cincinnati. She has taught for 18 years in the middle school sciences and received the Warren County Soil and Water Conservation Teacher of the Year award in 2018. Stephanie can be reached at sbaldwin@lmsdoh.org.