

How can landscape designs help reduce habitat loss for local bird species?

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HORT 4092: Senior Project

## How can landscape designs help reduce habitat loss for local bird species?

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Bachelor of Science

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### About the Author



This is Riley Holmes, located in West Chester, Ohio. He is currently in his 4<sup>th</sup> year of college and finishing out his first year in the University of Cincinnati's Horticulture program in DAAP. He officially graduated from Cincinnati State University in December of 2024 with an associate degree in both landscape horticulture and turfgrass management as well as receiving a certificate in landscape design. He currently works for Degree Lawn & Landscape as a property manager and part-time landscape designer.

Matthew 4:19 – “Follow me, and I will make you fishers of men.”

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## Previous Experience

2022-2025

Spring 2025, Horticulture Final Project, Hort 4092  
Professor Stevie Famulari Gds  
University of Cincinnati  
Capstone Project relating to landscape designs and bird populations

Spring 2025, Urban Landscape IV: Roofs and Facades, Hort 3044  
Professors: Wendy Ellis, Rose Henry-Seeger  
University of Cincinnati  
Learning all possible uses for green roofs and how to design and install them

Spring 2025, Woody Ornamentals II, Hort 2031  
Professor Stephen Foltz  
University of Cincinnati  
Learning the different types of woody plants and their cultivars for possible better plant selection when designing

Fall 2024, Plant Morphology, Hort 4010  
Professor Brian Grubb  
University of Cincinnati  
Learned the morphology of plants and how to better identify them

Fall 2024, Urban Landscape II: Agriculture, Hort 3042  
Professor Brian Grubb  
University of Cincinnati  
Learned how to farm in urban settings

Fall 2024, Native Plants I, Hort 1030  
Professors: Brian Grubb, James Hansel  
University of Cincinnati  
Learned about plants native to Ohio

Spring 2024, Landscape Pest, LH 205  
Professor Heather Augustine  
Cincinnati State University  
Proper pest management techniques and how to identify them

Spring 2024, Landscape Design Capstone, LH290  
Professor Samuel (Mark) Deacon

Cincinnati State University  
Projects include Native, Nativars, & Cultivars Capstone Presentation

Fall 2023, Arboriculture, LH215  
Professor Joseph Shaw  
Cincinnati State University  
Proper care and maintenance of trees

Summer 2023, Herbaceous Plants, LH135  
Professor Kelly Wanstrath  
Cincinnati State University  
Proper identification of herbaceous plant species

Spring 2023, Applied Botany, LH110  
Professor Heather Augustine  
Cincinnati State University  
The science of the growth and maintenance of plants

Fall 2022, Woody Plant Materials, LH130  
Professor Samuel (Mark) Deacon  
Cincinnati State University  
Proper identification of woody plants

Fall 2022, Soil Science, LH120  
Professor Andres Van Der Bent  
Cincinnati State University  
The science behind soil and what healthy soil is

## Abstract



Figure 1: Schain, R. (2014, April 8). Mourning Dove. Mourning Dove - Macaulay Library.

<https://macaulaylibrary.org/asset/37845121>

This paper dives into the importance of landscaping for birds. Current building practices lead to loss of habitat for much of the wildlife in Ohio, including birds. Birds serve an important role in the health of a local ecosystem, such as being an alarm for prey animals, pollinators, and pest management. Most modern home development landscape designs are simplistic and made for the primary purpose of aesthetics. According to Michelle Mastro for *The Spruce* “gardens with modern landscaping designs might focus on standout garden structures, but the garden, itself, should feel uncluttered and simple, allowing the viewer’s eye to rest on a few memorable items” (Mastro, 2024). This means that most modern designs are relatively barren as it is shooting for a cleaner aesthetic where the negative space emphasizes the plants selected, this capstone talks about why that needs to change and practices that can help improve the landscapes not only for people’s enjoyment but also for birds. In Ohio there are currently 2

extinct bird species, and 5 extirpated species, meaning that due to habitat loss and loss of food sources that species have been forced to leave the region and have not been seen in that region since. There are also 5 threatened species and 10 endangered. Of the 22 birds on those lists 30%

of them are native to prairies and another 36% are native to wetlands and marshes. Prairies have been disappearing throughout Ohio since the 1700s. There were over 1,000,000 acres of documented prairie land in Ohio in the 1700s now that number is less than 10% of what it used to

be. The rest of this project touches on

why the future of birds is so important and how landscape design can help.



*Figure 2: Stone, B. (2020, June 28). Lark Sparrow photos and videos for, all about birds, Cornell Lab of Ornithology. Photos and Videos for Lark Sparrow, All About Birds, Cornell Lab of Ornithology. [https://www.allaboutbirds.org/guide/Lark\\_Sparrow/photo-gallery/](https://www.allaboutbirds.org/guide/Lark_Sparrow/photo-gallery/)*

### Keywords

**Acre** - a unit of land equating to 43,560 square feet, roughly the size of a football field (48,000 square feet).

**Ecosystem** - a biological community of interacting organisms and their physical environment.

**Endangered** - (of a species) seriously at risk of extinction.

**Extirpated** - (also known as 'local extinction') describes the situation in which a species or population no longer exists within a certain geographical location. Unlike *extinction*, whereby a species no longer exists anywhere, extirpation means that at least one other *population* of the species still persists in other areas.

**Extinct** - (of a species, family, or other group of animals or plants) having no living members; no longer in existence.

**Green roof** - a rooftop covered with plants and vegetation.

**Habitat loss** - the reduction or elimination of the natural environment where a species or community of organisms lives and reproduces.

**Naturalistic** - derived from real life or nature or imitating it very closely.

**Prairie** - a plain of grassy land without many trees.

**Sustainable** - able to be maintained at a certain rate or level.

**Threatened** - any species (animals, plants, or fungi) that is at risk of becoming endangered within the foreseeable future.

## Project Justification

### How can Landscape design help reduce habitat loss for local bird species?

This capstone discusses how the home and business lawns can escape modern landscaping and evolve the landscape into one desirable to people and wildlife. Currently modern design choices use angles, straight lines, and negative space to create that modern simplistic appeal that use far more mulch than necessary. Many home and



*Figure 3: Covill, J. (2017, January 1). American Robin. American Robin - Macaulay Library.  
<https://macaulaylibrary.org/asset/44135951>*

business owners do not realize that by getting that mulching service done every spring they end up spending more on their landscape over time than if it was filled with plants requiring less mulch. These installs with smaller plants spaced further apart can have a negative effect on plant health by causing unnecessary heat stress due to the lack of nearby plant material to help defuse the heat. A naturalistic design is almost the complete opposite of what a modern landscape design stands for. A naturalistic design can be messy with many different plants blooming all at once, very little mulch showing if any, and little to no negative space. A naturalistic garden design is just that a design meant to mimic nature. This capstone talks about why a messy, colorful, naturalistic design centered around grasslands and prairies should be the future of new home and business landscape designs

I am extremely passionate about this topic for a multitude of reasons. Not only do I believe that birds are one of the core pillars to be able to easily tell the health of a local ecosystem, but birds have played a silent but important role in my early life, and I never realized just how big a roll it was until they were already gone. Growing up I idolized someone I believe many young kids my age did, Steve Irwin. I would be up at 6:00 am every Saturday just to be able to watch *Crocodile Hunter* on discovery. He shaped my world view on how important animals are. I grew up an avid hunter, fisherman, and outdoorsman, and no matter what I was doing outside you could always hear the bird's song bringing a beautiful serenity to my surroundings.

Growing up at my childhood home I would be so

frustrated every spring as a robin like clockwork would make a nest in my windowsill never failing to wake me up at the first light of dawn with its song, or mourning doves sitting on the wire and cooing that familiar melody. Yet now that I am older and the robin no longer makes its nest and the doves are seldom seen cooing on the electrical wire. I realize how much I miss their early morning calls.



Figure 4: Wiitanen, J. (2024, July 25). Why two American Robins would sit on eggs in one nest. BirdWatching. <https://www.birdwatchingdaily.com/beginners/birding-faq/two-american-robins-in-one-nest/>

### User Description

For individuals involved in the process of landscape designs, from clients to designers, to



*Figure 5: Diblik, R. (n.d.). Roy Diblik. Northwind Perennial Farm. <https://www.northwindperennialfarm.com/roy-diblik>*

communities as well.

the installation team, this research is valuable. In the world of landscape design as well as many other service industries the clients drive the trends. This research shows how our current landscape practices are harming local ecosystems and why birds are important in said ecosystems. What this information clarifies is that the land owners of Ohio need to come together to change the current ways of modern landscaping and move to a more sustainable and naturalistic landscape design because it benefits local wildlife and the people within those

## Major Project Elements

This capstone project tackles 4 main topics. Why are differing bird populations dwindling in urban and suburban areas, why are these biomes so important to our endangered bird populations, why do birds play an important role in the health of an ecosystem, and how a landscape design can help. This paper covers the basics of why birds are struggling in urban and suburban areas and what people can do to help. In Ohio there are currently 2 extinct bird species, and 5 extirpated, 5 threatened, and 10 endangered. Of those 22 birds on those lists 30% of them are native to prairies and another 36% are native to wetlands and marshes. Not to mention the many other species on the species of concern and special interest lists. The 6 current species on those 4 lists that call the prairies of Ohio home are, Upland Sandpiper (*Bartramia longicauda*), Northern Harrier (*Circus cyaneus*), Loggerhead Shrike (*Lanius ludovicianus*), and Lark Sparrow (*Chondestes grammacus*) on the endangered list. The Greater-Prairie Chicken (*Tympanuchus cupido*) on the extirpated species list, and the Barn Owl (*Tyto alba*) on the threatened species list. Ohio is in danger of losing all of its prairie lands as they are now less than 10% of what they were in the 1700s. The survival of prairies and the wildlife that call it home is up to the stewardship of Ohioans. There currently aren't enough studies done to show exactly how much land is required to attract wildlife to a landscape, however studies do show that even a small amount of garden design in a landscape can have an effect of attracting wildlife and insects to the gardens especially pollinators.

Site Analysis



Figure 6: Manns, M. (Ed.). (2007, June). The Cincinnati-Middletown-Wilmington CSA. The Cincinnati-middletown-wilmington CSA. Photo of the Greater Cincinnati Area (GCA)

<https://www.incontext.indiana.edu/2007/june/6.asp>

The Greater Cincinnati Area (GCA) is the main site for this research project, however all of Ohio is mentioned when talking about total bird populations and prairie loss, areas such as Chicago and Milwaukee is mentioned when talking about Roy Diblik's designs.

This research focuses on urban and suburban areas in the Greater Cincinnati Area. This paper discusses the importance of birds in the area and how landscape users can better help with habitat loss of birds in particular. This research talks about why birds are endangered or extirpated and how home landscapes can help to bring back or revitalize these species in the Greater Cincinnati Area.

## Topic Summary

This capstone research discusses the topic of bird populations in Ohio and how many of



*Figure 7: Hacker, B. (2019, June 11). ML165207611. Upland Sandpiper - Macaulay Library. <https://macaulaylibrary.org/asset/165207611>*

its endangered species call prairies or wetlands home, and what Ohio residents can do to fix it. The first case study is one discussing the use of green roofs to help endangered bird populations. This case study relevancy could prove useful in the future installation of green roofs designed for the use of bird species that have been displaced

due to habitat loss. The second case study discusses why there are so many species on Ohio DNR's endangered and threatened species list. The third case study covers how to properly design a space with birds in mind. The goal of this case study not only shows how to properly design a space but also how easy it is to do so. The fourth case study looks at the naturalist garden designer Roy Diblik. This case study covers the types of designs he has done and his philosophies when it comes to naturalist garden designs.

### Case Study 1: How can green roofs help displaced bird populations.

There are many ways in which a green roof can be built to suit a bird needs. It can be built to provide nesting grounds to a target species to help bolster their numbers in urban areas.

A research paper written by Nathalie Baumann discussed how easily green roofs could be



Figure 8: Das, A. (2023, January 21). ML530705741. Northern Lapwing - Macaulay Library.

<https://macaulaylibrary.org/asset/530705741>

specialized to help with ground nesting species such as the Northern Lapwing (*Vanellus vanellus*) which are endangered in Switzerland. According to Nathalie in 2005 “In the Shoppyländ, Steinhausen, and Zurich–Kloten sites, older breeding hollows of the northern lapwing were found on all the flat green roofs. These provide evidence that the northern lapwing has returned consistently to the flat roofs over multiple seasons (ranging from 2 to 13 years) and made

Primary broods” (Baumann, 2006).



*Figure 9: Project workers add compost substrate (about 4 cm) to the topsoil of the roof at Shoppylund, Berne. (Photo by N. Baumann)*

This evidence indicates that the northern lapwing chose to return to these sites year after year. This shows that the design intent of the green roofs was a success in creating a space for the northern lapwings to be able to reproduce, unfortunately this research did not continue for a few extenuating circumstances. Green roofs can also serve to help local bird species by providing food sources that are readily available for the birds. A great way to do this is by choosing plants that produce berries and other such fruits that are native and helpful for the local bird species. Berry Architecture + Associates and Downey Roth Hrywkiw Fidek LLP Office Building in Red Deer,



*Figure 10: The Berry Architecture + Associates and Downey Roth Hrywkiw Fidek LLP Office Building in autumn glory, September, 2015. Photo by Cynthia Pohl*

Alberta,  
Canada has  
built a green  
roof with the  
goal of  
maintaining an  
ecosystem. It  
has a stream  
with native  
fruits and  
vegetables

along it, and habitats for local birds, butterflies, and bees. The design of the green roof was specifically built so that “Food has been provided through the specific selection of plants indigenous to the prairie and parkland ecosystems” (Pohl, 2015). This specific design is important to the Greater Cincinnati Area because what is discussed in the next case study 4 of the 10 endangered bird species are prairie birds, an ecosystem in Ohio that is rapidly lost due to the ease of turning it into farm fields and new home development areas. Prairies are flat grassland areas with little woody vegetation meaning that they can be easily replicated on roof buildings giving refuge to the bird species whose habitat was lost (Ohio DNR, 2023). Be careful with the prairie plant selection however as many prairie plant species are deeply rooted and can reach depths of 10 ft which can cause problems if there is not enough soil material. Plant selection is key when designing a green roof.

The goal of this case study was to show an alternative way to help bird populations that are struggling in urban and suburban areas where bird diversity is lacking, and many species have been displaced. This research showed that it is possible to create a habitat on a roof that an endangered species felt as though it could reproduce on the roof. This case study also showed how habitats for bird species can be created fairly easily on a roof with just some fruiting and native plants. This research proves that green roofs are an effective alternative that can help a struggling population in urban areas.

### Case Study 2: Why are there so many endangered and threatened bird species in Ohio

Currently Ohio has 10 endangered, 5 threatened, 5 extirpated, and 2 extinct bird species (*Ohio's listed species, 2024*). Of those 22 species 8 of them are native to prairie and grassland biomes, 8 more are native to marsh and wetland biomes, and the rests biomes simply no longer exist in Ohio such as the pine forest or swamp biomes. According to Ohio's Division of Wildlife "Grassland bird species have experienced documented population declines over the past 50 years. Causes for decline include habitat loss, degradation, and fragmentation" (Ohio DNR, 2023).



Figure 11: Liu, A. (2020, April 13). ML223520221. Loggerhead Shrike - Macaulay Library. <https://macaulaylibrary.org/asset/223520221>

New development is not the only cause of grassland habitat loss, so are invasive woody trees and shrubs such as autumn olive and black locust trees (Ohio DNR, 2023). While Ohio places 30<sup>th</sup> with the amount of bird species at 449 bird species it places 8<sup>th</sup> with total bird population sitting at 2.28 million birds (*Subregions - United States 2025*). Due to Lake Erie and

Ohio's geographical location, it is not only an important state for bird habitat but also migratory patterns. According to Ohio's Ornithological Society (OOS) "Perhaps more important than high species lists are the large numbers of certain birds that Ohio plays an integral role in supporting, either by being on their migratory path or by providing breeding habitat" (*Bird conservation in Ohio*). It is not all bleak however, strip mining has turned out to have some beneficial effects. After the areas are done with their use as nature reclaims them, they seem to grow back as open grasslands being reclaimed by prairie birds and other animals (*Bird conservation in Ohio*). The roles that animals play in an ecosystem are called ecosystem services. This is a way that scientists can quantify the amount of work that a species does within a given ecosystem. There are four main types of ecosystem services "supporting, provisioning, regulating and cultural services" (Gaston, 2022). Birds play a role in all four of these ecosystem services. Birds' ecological impact is vast and important.

The Goal of this Case study was to underline the importance of bird species in an ecosystem and why it is important to preserve and help restore the land that humans have taken away from them. It shows that most of Ohio's endangered and threatened species are prairie and wetlands species, biomes that are being lost all throughout Ohio.

### Case Study 3: Roy Diblik's Approach to Naturalistic Landscaping for Wildlife



*Figure 12: Diblik, R. (n.d.). Roy Diblik. Northwind Perennial Farm. <https://www.northwindperennialfarm>.*

Roy Diblik is a naturalist garden designer. This means that his landscape designs take a more ecological approach. Roy Diblik was born in Charles, Illinois, before becoming a naturalist garden designer he had no formal education in horticulture. Roy's specific designs lean towards a more prairie like design, and his designs always took wildlife into consideration. Roy currently runs a YouTube channel where he discusses his experiences and also discusses his design philosophies and ideas. One of Roy's notable designs is the Shedd Aquarium & Oceanarium in Chicago Illinois. The goal of the design was to provide a source of year-round food and shelter for migratory birds (Nedbalski, 2022). Roy Diblik also

wrote a book called "*know maintenance*" where he not only teaches how to do his garden designs but also how goes more in depth on his own design philosophies. The goal of this book was to provide designs that had very little maintenance work that needed to be done. Roy's no maintenance approach is great for wildlife design as it often causes underbrush and a more dense area for animals like birds to be able to hid in. it also increases insect activity within the

designs. This source of protein is vitally important to birds especially during nesting season. “An astonishing 96 percent of all terrestrial North American bird species rely on insects for at least part of their diets at some point throughout the life cycle” (Kathryn, 2024). Roy’s designs are geared for the health of an ecosystem and by extension providing food and shelter to the bird species.

The goal of this case study was to provide an example of what a naturalist garden design entails and someone whose designs are done with the health of local wildlife in mind. Roy’s migratory bird design *Figure 13* shows how a design for birds can and should look. Roy Diblik’s

naturalist prairie designs are ideal for many struggling bird species in Ohio today, and the implementation of Roy’s techniques and philosophies can help



ensure the future of these prairie bird species.

### Case Study 4: How to landscape for birds

Landscaping for birds does not have to be a messy landscape. The easiest way to start planting for wildlife is by planting native plants. Choose plants that are host plants to caterpillars



Figure 13: 2019sas. (2020, April 1). *Landscaping for birds*. Sacajawea Audubon Society. <https://sacajaweaaudubon.org/project/landscaping-for-birds/>

are fruit, berry, or nut bearing plants as they provide a good source of sugars and protein for birds that are not as hard to scavenge for. Choosing plants such as trumpet honeysuckle is a good way to attract nectar feasting birds like hummingbirds. (Society, *How to make your yard bird-friendly*, 2023). In America lawns are important to most home and business owners, however just removing as little as 250 square feet of lawn space to install a beautiful plant garden for the ecosystem is enough to see a vast improvement in the amount of wildlife located within the garden design and can also provide protection and shelter for nesting birds.

Be sure not to cut back or dead head any flowers as they produce seeds that the birds rely on for food and also provide good cover for many bird species. If the chosen design choice is a naturalistic prairie design then kill a strip or large area of grass wait for it to die out, prepare the soil, throw down a myriad of the chosen prairie plant species, like coneflower, black eye-

such as goldenrod, milkweed, sunflowers, and trees like oaks and maples. Caterpillars are a great source of protein for most bird species. Other types

Susan, and coreopsis. It is also advised that some native grass species such as Indian grass and big bluestem grass are also selected to provide a more full ecological site. Give it time and water and eventually there will be large prairie filled with wildlife. Designs for birds and wildlife can range from a DIY prairie to half a million dollar green roof installations.

### Best Plants for a natural Prairie Design

According to 5 rivers metroparks horticulturalist team based in dayton ohio these are the flowering plants that can be found in our native prairies.

## WILDFLOWERS FOUND IN METROPARKS' PRAIRIE AREAS

















 <p><b>Stiff Goldenrod</b> <i>Oligoneuron rigidum</i> BLOOM TIME: September to early October VALUE TO POLLINATORS: native bees, Monarch butterflies</p>	 <p><b>Fringeleaf Wild Petunia</b> <i>Ruellia humilis</i> BLOOM TIME: June - July VALUE TO POLLINATORS: butterflies</p>	 <p><b>Prairie Cordgrass</b> <i>Spartina pectinata</i> BLOOM TIME: August - September VALUE TO POLLINATORS: cover for birds</p>	 <p><b>Deertongue Panicgrass</b> <i>Dichanthium clandestinum</i> BLOOM TIME: August - October VALUE TO POLLINATORS: bees and butterflies</p>
 <p><b>Royal Catchfly</b> <i>Silene regia</i> BLOOM TIME: July - August VALUE TO POLLINATORS: hummingbirds</p>	 <p><b>Big Bluestem</b> <i>Andropogon gerardii</i> BLOOM TIME: June - September VALUE TO POLLINATORS: skippers</p>	 <p><b>Butterfly Milkweed</b> <i>Asclepias tuberosa</i> BLOOM TIME: June VALUE TO POLLINATORS: Monarchs and other butterflies</p>	 <p><b>Sweet Everlasting</b> <i>Pseudognaphalium obtusifolium</i> BLOOM TIME: July - September VALUE TO POLLINATORS: butterflies</p>
 <p><b>Prairie Dock</b> <i>Silphium laciniatum</i> BLOOM TIME: July - August VALUE TO POLLINATORS: bumble bees and native bees</p>	 <p><b>Pinnate Coneflower</b> <i>Ratibida pinnata</i> BLOOM TIME: July - September VALUE TO POLLINATORS: butterflies and native bees</p>	 <p><b>Virginia Mountain Mint</b> <i>Acyroanthemum virginianum</i> BLOOM TIME: August - September VALUE TO POLLINATORS: butterflies and bees</p>	 <p><b>New England Aster</b> <i>Symphotrichum novae-angliae</i> BLOOM TIME: August - September VALUE TO POLLINATORS: bees and butterflies</p>
 <p><b>Dense Blazing Star</b> <i>Liabris spicata</i> BLOOM TIME: July - August VALUE TO POLLINATORS: butterflies and bumble bees</p>	 <p><b>Little Bluestem</b> <i>Schizachyrium scoparium</i> BLOOM TIME: August to early October VALUE TO POLLINATORS: native bees, Monarch butterflies</p>	 <p><b>Wild Senna</b> <i>Senna hebecarpa</i> BLOOM TIME: July - August VALUE TO POLLINATORS: hummingbirds</p>	 <p><b>Indian Hemp</b> <i>Apocynum cannabinum</i> BLOOM TIME: July - September</p>
 <p><b>Purple Coneflower</b> <i>Echinacea purpurea</i> BLOOM TIME: June - August VALUE TO POLLINATORS: butterflies and hummingbirds</p>	 <p><b>Whorled Rosinweed</b> <i>Silphium trifoliatum</i> BLOOM TIME: July - September VALUE TO POLLINATORS: native bees</p>	 <p><b>Jerusalem Artichoke</b> <i>Helianthus tuberosus</i> BLOOM TIME: September VALUE TO POLLINATORS: butterflies, bees and hummingbirds</p>	 <p><b>Biennial Gaura</b> <i>Gaura biennis</i> BLOOM TIME: July - October</p>
 <p><b>Northern Blazing Star</b> <i>Liabris scariosa</i> BLOOM TIME: September - October VALUE TO POLLINATORS: native bees</p>	 <p><b>Indian Grass</b> <i>Sorghastrum nutans</i> BLOOM TIME: June - September VALUE TO POLLINATORS: bees, Monarch butterflies</p>	 <p><b>Wild Bergamot</b> <i>Monarda fistulosa</i> BLOOM TIME: June - August VALUE TO POLLINATORS: butterflies, bees and hummingbirds</p>	 <p><b>Black Eyed Susan</b> <i>Rudbeckia hirta</i> BLOOM TIME: July - August VALUE TO POLLINATORS: butterflies and bees</p>

Figure 14: 5 Rivers Metroparks. (2016). *The prairies of Ohio. Meet our Prairie Plants.*

<https://www.metroparks.org/wp-content/uploads/2016/01/MetroParks-Prairie-Plants-Brochure.pdf>

The goal of this case study provides information on prairie species and prairie plant designs. There are many plant varieties to choose from when designing a home landscape but what is important is that the design incorporates these plants and is not only focused on the aesthetics of the design but also its function.

### Case Study Summary

These case studies discussed why birds are becoming extinct, why birds are so important to a local ecosystem, and how landscape designs and installations can help. Over 70% of birds on the endangered, threatened, extirpated, and extinct list are due to the loss of native prairie and wetland areas. Local communities can help bring these declining ecosystems back



Figure 15: Hitchcox, D. (2017, April 11). ML54268201. Piping Plover - Macaulay Library. <https://macaulaylibrary.org/asset/54268201>

or similar design of their neighbor. As society sees their neighbors and friends switch to a more native/wildlife-minded landscape design many will soon follow. For urban areas unused roof space can be a great way to utilize what unused space to create these green spaces needed for birds, for suburban and rural areas, a simple landscape design can be all it takes to attract many types of birds to the landscape. Case study 1 discusses an alternative solution to habitat loss for birds in urban and suburban areas, case study 2 researches how many bird species are going onto the Ohio species list and why they are, case study 3 shows a naturalistic garden designer who helps wildlife with his prairie plant designs, and case study 4 shows how a home owner can

simply by having a nature-minded landscape design which can be enough to bring back the local ecosystem in the landscape and neighborhood. As someone in the landscape industry for over 6 years

most people want the same

start to create their own prairie plant designs. In all the cumulative goal of these case studies was to bring attention to the current struggles of prairie bird species in Ohio and what can be done to help fix the habitat loss caused by the growth of human society.

### Historical Context



*Figure 16: Figure 17: A picture of Ohio’s pre-settlement prairies. Gibson, A. L. (2011, September 10). Ode to Ohio’s prairies: Bluegrass region (part I). The Buckeye Botanist. <https://floraofohio.blogspot.com/2011/09/ode-to-ohios-prairies-bluegrass-region.html>*

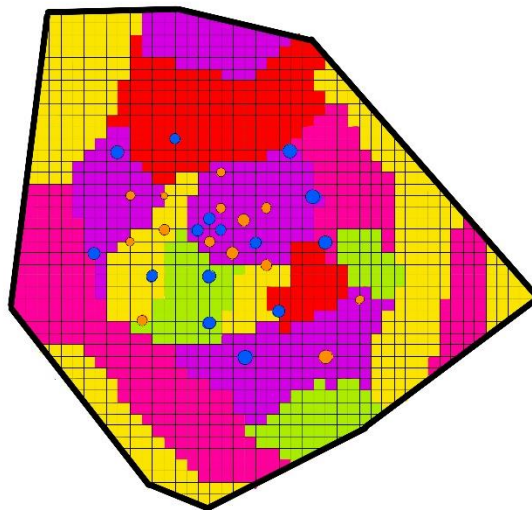
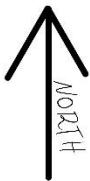
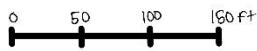
The first bird to become extinct in Ohio was the passenger pigeon going extinct in 1914 (Britannica, 2025) and the second was the Carolina parakeet going extinct in 1939 (Begum, 2021). These are the only two documented species to go extinct in Ohio. Both of the last living specimens of these species were both held at the Cincinnati Zoo.

Clark County Park district, a county just northeast of Dayton, ecologists talk about the extreme loss of prairie and wetland space over the years. They state that in the early 1700s when settlers arrived in Ohio had roughly 1,000,000 acres of prairie land that is over 200,000 acres more than the state of Rhode Island. Today there are less than 100,000 acres of original untouched prairie and wetland areas in Ohio that is less than half the size of Hamilton County Ohio (Boyer, 2021). *Figure 17* shows what the prairie lands looked like in Ohio before the settlers arrived those vast expanses of prairie land are now less than 10 % of what they used to be (Boyer, 2021).

It is more important now than ever that our society begins to value and protect these prairies and wetlands because 16 out of 20 endangered, threatened, or extirpated bird species call or called those habitats home (Ohio DNR, 2024). The little remaining prairie and wetland areas need to be preserved in order to be able to continue appreciating the many bird species that call those habitats home. Prairies must not only be maintained but also established in landscapes in urban, suburban, and rural areas. Habitat loss is not exclusive to just urban areas. Large farm practices strip established forests or prairies down in order to produce the food that the world needs to survive.

**Solution**

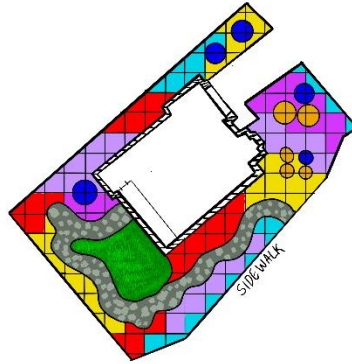
How can Ohioans solve this issue of a declining prairie habitat; through garden designs. As naturalistic garden designs tend to mimic a natural prairie very efficiently as they both tend to have lots of flowering plants and grass and few woody ones. The future of saving these endangered species is going to be through the work of land owners and garden designers. Often times there are spaces that go unused and are just large fields of turf grass that do not serve a purpose other than aesthetics. These three designs of a green roof, unused green space, and residential home are to show how a prairie garden design might look for different areas that these naturalistic garden designs can be applied.



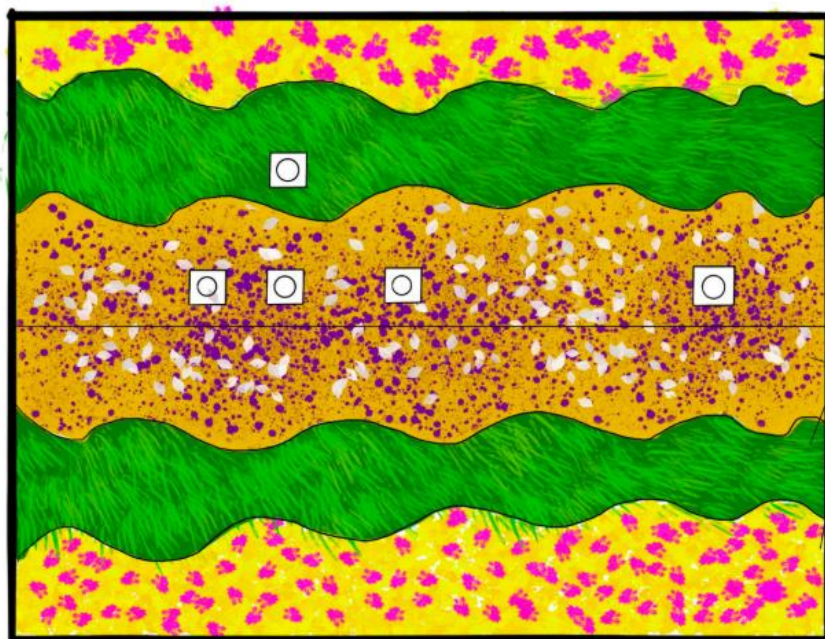
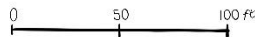
Plant List

- - *Spartina pectinata*
- - *Andropogon gerardii*
- - *Rudbeckia hirta*
- - *Echinacea purpurea*
- - *Symphoricarpon novae-angliae*
- - *Ratibida pinnata*
- - *Asclepias tuberosa*

# PLANT LIST



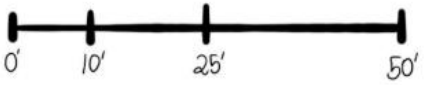
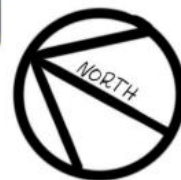
- Sorghastrum nutans*
- Sorobolus heterolepis*
- Andropogon gerardii*
- Liatris scariosa*
- Ruellia humilis*
- Silene regia*
- Asclepius tuberosa*

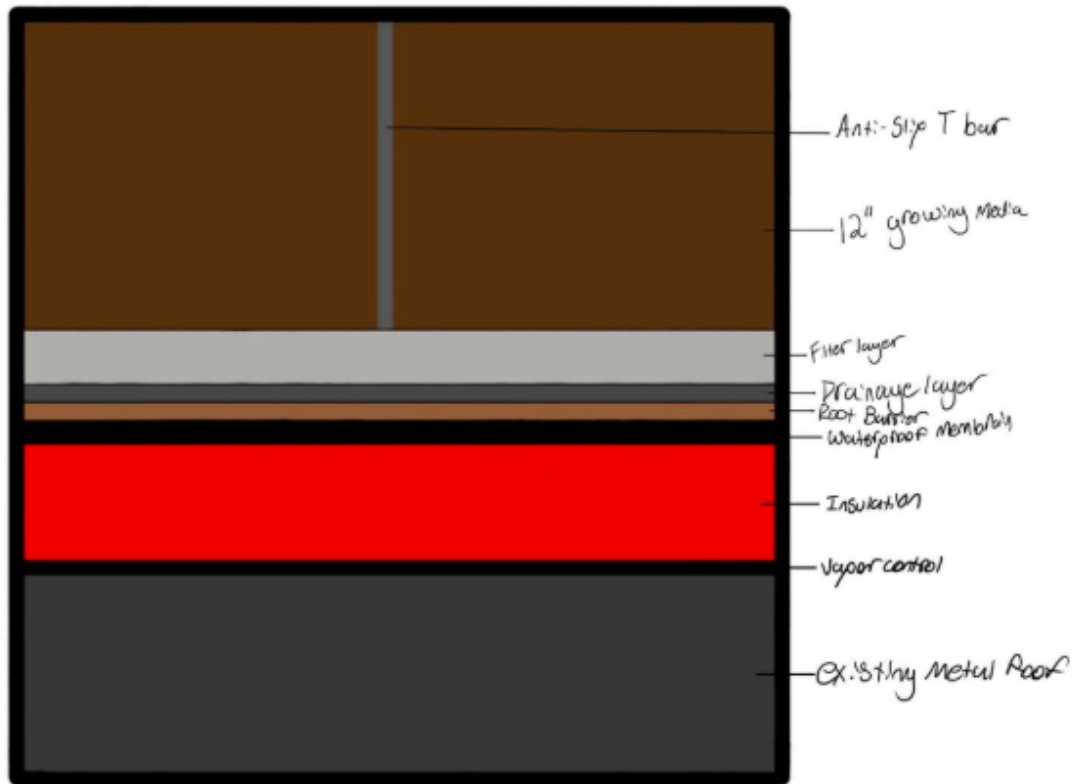


Rudbeckia & Noddy onion

Porcupine grass & Prairie sun grass

Purple core flower & Smooth Periwinkle





These large swaths of garden designs not only serve an aesthetic function but an ecological one as well. These gardens will not only attract pollinators and other wildlife, serving as way stops for migrating birds, they also help to manage stormwater runoff helping in cases of heavy rain. Storm water management is just vital to the health and safety of an area but there are many government programs that offer credits to businesses with sustainable practices.

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# Abstract



Current building practices lead to loss of habitat for much of the wildlife in Ohio, including birds. Birds serve an important role in the health of a local ecosystem, such as being an alarm for prey animals, pollinators, and pest management. Most modern home development landscape designs are simplistic and made for the primary purpose of aesthetics. According to Michelle Mastro for *The Spruce* “gardens with modern landscaping designs might focus on standout garden structures, but the garden, itself, should feel uncluttered and simple, allowing the viewer’s eye to rest on a few memorable items” (Mastro, 2024). This means that most modern designs are relatively barren as it is shooting for a cleaner aesthetic where the negative space emphasizes the plants selected, this capstone talks about why that needs to change and practices that can help improve the landscapes not only for people’s enjoyment but also for birds. In Ohio there are currently 2 extinct bird species, and 5 extirpated species, meaning that due to habitat loss and loss of food sources that species have been forced to leave the region and have not been seen in that region since. There are also 5 threatened species and 10 endangered. Of the 22 bird species on those list 30% of them are native to prairies and another 36% are native to wetlands and marshes. Prairies have been disappearing throughout Ohio since the 1700s. There were over 1,000,000 acres of documented prairie land in Ohio in the 1700s now that number is less than 10% of what it used to be. The rest of this project touches on why the future of birds is so important and how landscape design can help.

# Upland Sandpiper

**Scientific Name:** *Bartramia longicauda*

**Ecosystem:** its preferred habitat is grasslands. Seventy percent of the breeding population of Upland Sandpipers occurs in grassland areas of the central and northern Great Plains (Houston et al. 2011).

**Food:** Upland Sandpipers eat mostly insects, which they pick from the ground or low vegetation as they walk. Among their known prey are grasshoppers, crickets, weevils, billbugs, cutworms, leaf beetles, click beetles, May beetles, larvae of many sorts of flies (horsefly, cranefly, sawfly), moths, ants, and bugs. In addition to insects, they eat centipedes, millipedes, snails, spiders, ticks, and earthworms. Upland Sandpipers also consume seeds of grasses, weeds, and forbs, as well as wheat, rye, and berries.

**Description:** The Upland Sandpiper is a medium-sized shorebird of about 28-32 cm in length. Some distinguishing features of the Upland Sandpiper include its dove-like head, thin neck, long thin legs, camouflage olive-brown coloring, and yellow bill with a black tip. The under parts of the Upland Sandpiper are whitish or yellowish in color. The sides and breast of the Upland Sandpiper are strongly patterned with dark and pale brown buff. The call of the Upland Sandpiper is a distinctive, long “wolf whistle.”

**Citations:** <https://ecos.fws.gov/ecp/species/9294>,  
<http://bna.birds.cornell.edu/bna/species/580>,  
[https://www.allaboutbirds.org/guide/Upland\\_Sandpiper/lifehistory#:~:text=Back%20to%20top-,Food,moths%2C%20ants%2C%20and%20bugs](https://www.allaboutbirds.org/guide/Upland_Sandpiper/lifehistory#:~:text=Back%20to%20top-,Food,moths%2C%20ants%2C%20and%20bugs).



# Northern Harrier

**Scientific Name:** *Circus cyaneus*

**Ecosystem:** Across its range, the Northern Harrier prefers open habitats, including marshes and grasslands. Harriers typically nest on the ground, either alone or in loose colonies. Outside of the breeding season, harriers roost communally on the ground, sometimes with Short-eared Owls.

**Food:** Northern Harriers search for prey in open habitats, typically while flying close to the ground in buoyant gliding and flapping flight. The species prefers to hunt in open areas with mixed vegetative cover and tends to avoid areas with only short vegetation. Harriers rarely hunt while perched. In winter, individuals sometimes rob prey from each other. The harrier's owl-like facial ruff and tendency to fly close to the ground allows the species to hear, as well as see, potential prey, and the species often locates its prey by sound. Adult males tend to be the most successful hunters, followed by adult females.

**Description:** Northern Harriers have long wings, long and narrow tails, and owl-like faces. The species is lightly wing-loaded and often rocks in the wind like a Turkey Vulture while flying with its wings held in a dihedral or "V" above its back. Harriers have three distinct plumages: the largely light gray adult male, the largely light brown adult female, and the largely dark brown juvenal. In all three plumages the species has a conspicuous white rump patch. Adult males, which are sometimes referred to as the "gray ghosts," are mostly gray above and whitish below with black trailing edges on their underwings and black wingtips. Adult females are mostly brown above with buffy underparts that are heavily streaked with dark brown. Juveniles are mostly dark brown above with cinnamon breasts and bellies. Females are 10-20% larger and weigh approximately 50% more than males.

**Citations:** <https://www.hawkmountain.org/raptors/northern-harrier#:~:text=Across%20its%20range%2C%20the%20Northern,sometimes%20with%20Short-eared%20Owls>



# Lark Sparrow

**Scientific Name:** *Chondestes grammacus*

**Ecosystem:** Lark Sparrows breed in open grassy habitats with scattered trees and shrubs including orchards, fallow fields, open woodlands, mesquite grasslands, savanna, sagebrush steppe, and grasslands.

**Food:** Lark Sparrows eat insects and seeds, consuming more insects in the summer months and more seeds in the winter months.

**Description:** Adults have a bold, blocky facial pattern that sets them apart from other sparrows. Chestnut and white stripes streak across the head, a black mustache runs down the sides of the throat, and the cheeks have chestnut spots. The outer tail feathers are tipped in white and a black spot marks the center of the chest.

## **Citations:**

[https://www.allaboutbirds.org/guide/Lark\\_Sparrow/id#:~:text=Adults%20have%20a%20bold%2C%20blocky,the%20center%20of%20the%20chest](https://www.allaboutbirds.org/guide/Lark_Sparrow/id#:~:text=Adults%20have%20a%20bold%2C%20blocky,the%20center%20of%20the%20chest),

[https://www.allaboutbirds.org/guide/Lark\\_Sparrow/lifehistory#:~:text=ConservationLow%20Concern-,Habitat,%2C%20sagebrush%20steppe%2C%20and%20grasslands](https://www.allaboutbirds.org/guide/Lark_Sparrow/lifehistory#:~:text=ConservationLow%20Concern-,Habitat,%2C%20sagebrush%20steppe%2C%20and%20grasslands).



# Loggerhead shrike



**Scientific Name:** *Lanius ludovicianus*

**Ecosystem:** Open country with short vegetation and well-spaced shrubs or low trees, particularly those with spines or thorns.

**Food:** Loggerhead Shrikes eat insects and other arthropods, amphibians, reptiles, small mammals, and birds; they also occasionally feed on roadkill. Their staple foods include agricultural pests such as grasshoppers, beetles and rodents. Insects generally dominate the Loggerhead Shrike's diet during breeding season, while winter brings a greater reliance on vertebrate prey. They are sit-and-wait predators, diving at prey upon seeing it. When diving towards vertebrate prey, Loggerhead Shrikes aim for the nape of the neck, paralyzing its prey. Whole prey items are often impaled on thorns or barbed wire fences for later consumption.

**Description:** Loggerhead Shrikes are thick-bodied songbirds. Their gray head contrasts with the wide, black mask, black bill, and white throat. Their tail is black with white corners; the wings are black with white at the base of the primaries, forming a small handkerchief spot when the wing is closed and larger white patches in flight. Juveniles have darker barring above and below.

**Citations:** [http://www.allaboutbirds.org/guide/Loggerhead\\_Shrike/id](http://www.allaboutbirds.org/guide/Loggerhead_Shrike/id),  
<http://www.blm.gov/pgdata/etc/medialib/blm/wy/wildlife/animal-assessmnts.Par.94347.File.dat/LoggerheadShrike.pdf>,  
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<http://bna.birds.cornell.edu/bna/species/231>

# Barn Owl

**Scientific Name:** *Tyto alba*

**Ecosystem:** The barn owl lives in open areas, forest edges, and clearings, farmland, and cities.

**Food:** The barn owl is a nocturnal hunter. It eats small mammals like mice, shrews, voles, and rats. It also eats birds. It has a keen sense of smell, which along with the ability to see in low light, helps it catch its prey. Its soft feathers also muffle sound so it can silently sneak up on its prey.

**Description:** The barn owl is 14-20 inches in length and has a wingspan of close to four feet. It is golden-brown on its upper sides and grayish-white on its chest and belly. It has dark specks on both its underside and upper side. It has a heart-shaped white face with a ring of brown feathers around it. Its wings are rounded, and it has a short tail and long legs. It doesn't hoot like other owls, instead it makes a raspy hissing or shrieking sound.

**Citations:**

<https://nhpbs.org/natureworks/barnowl.htm#:~:text=Australia%2C%20and%20Asia.-,Habitat,in%20cliffs%2C%20or%20in%20riverbanks.>



# Greater-Prairie Chicken



**Scientific Name:** *Tympanuchus cupido*

**Ecosystem:** The Greater Prairie-chicken (*Tympanuchus cupido*) historically occupied much of the Great Plains, possibly reaching north into Canada and as far south as Texas (Johnson et al. 2020, Svedarsky et al. 2022). However, the range has contracted substantially because of habitat loss. Today, the primary range of the Greater Prairie-chicken occurs in portions of the prairie states of Kansas, Nebraska, and South Dakota. Isolated populations remain in Wisconsin, Illinois, Iowa, Missouri, Oklahoma, Colorado, Minnesota, and North Dakota.

**Food:** Greater Prairie-Chickens eat leaves, seeds, buds, fruits, acorns, cultivated grains such as corn, sunflower, soy, and sorghum, and insects such as grasshoppers, crickets, and beetles.

**Description:** The Greater Prairie-chicken is a medium-sized grouse. The plumage has buff and dark brown barring on the chest, and the tail is short and rounded, which is distinctly different from the Sharp-tailed Grouse (*Tympanuchus phasianellus*), which has a V-shaped pattern on the chest feathers and a white pointed tail. The males have a conspicuous courtship display in which they make a low booming sound as they inflate yellow-orange air sacs on the side of their necks, erect dark elongated feathers behind the head and engorge a bare orange patch above the eyes while jumping, strutting, and stomping.

**Citations:**

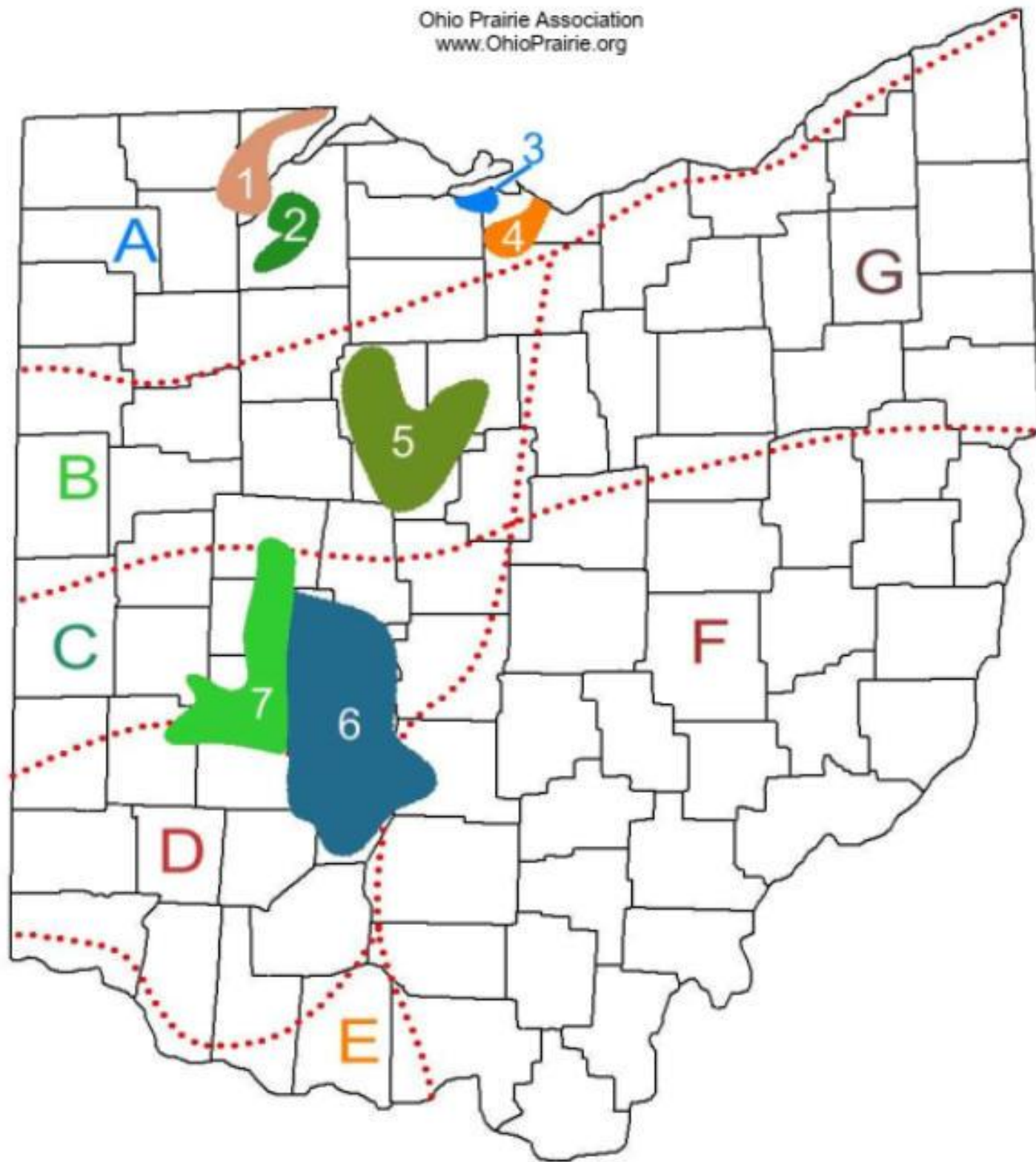
<https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNLC13010>, [https://www.allaboutbirds.org/guide/Greater\\_Prairie-Chicken/lifehistory#:~:text=Greater%20Prairie-Chickens%20eat%20leaves,grasshoppers%2C%20crickets%2C%20and%20beetles.](https://www.allaboutbirds.org/guide/Greater_Prairie-Chicken/lifehistory#:~:text=Greater%20Prairie-Chickens%20eat%20leaves,grasshoppers%2C%20crickets%2C%20and%20beetles.)

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- <https://u.osu.edu/marionprairie/prairies-around-ohio/>
- <https://abcbirds.org/bird/northern-harrier/>
- <http://www.ohioprairie.org/faq%20p2.htm>

# Pre-settlement Ohio Prairies

Ohio Prairie Association  
www.OhioPrairie.org



## Prairie Region Name

- A Lake Plains Prairie Region
- B Central Till Plain Prairie Region
- C Southern Till Plain Prairie Region
- D Southwest Ohio Prairie Region
- E Lexington Plain Prairie Region
- F Unglaciated Appalachian Plateau Prairie Region
- G Glaciated Appalachian Plateau Prairie Region

## Large Original Landscape Prairies of Presettlement Ohio

- 1 Oak Openings Prairies
- 2 Wood County Prairies
- 3 Castalia-Sandusky Bay Prairies
- 4 Firelands Prairie
- 5 Sandusky Plains Prairie
- 6 Darby Plains Prairie
- 7 Mad River Prairie Fens

<http://www.ohioprairie.org/faq%20p2.htm>



# Riley Holmes

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Stevie Famulari Gds

Spring 2025

Bachelors of science in Horticulture



# Roy Diblik's Approach to Naturalistic Landscaping for Ecosystems

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- Roy Diblik is a naturalist garden designer. This means that his landscape designs take a more ecological approach. Roy's designs lean towards a more prairie-like design, and his designs always took wildlife into consideration. Roy currently runs a YouTube channel where he discusses his experiences and discusses his design philosophies and ideas. One of Roy's notable designs is the Shedd Aquarium & Oceanarium in Chicago Illinois. The goal of the design was to provide a source of year-round food and shelter for migratory birds (Nedbalski, 2022). Roy Diblik also wrote a book called "*know maintenance*" where he not only teaches how to do his garden designs but also how goes more in depth on his own design philosophies. The goal of this book was to provide designs that had very little maintenance work that needed to be done. Roy's no maintenance approach is great for wildlife design as it often causes underbrush and a denser area for animals like birds to be able to hide in. It also increases insect activity within the designs. This source of protein is vitally important to birds especially during nesting season, 96% of all terrestrial birds rely on insects at some point in life. Roy's designs are geared for the health of an ecosystem and by extension providing food and shelter to the bird population.



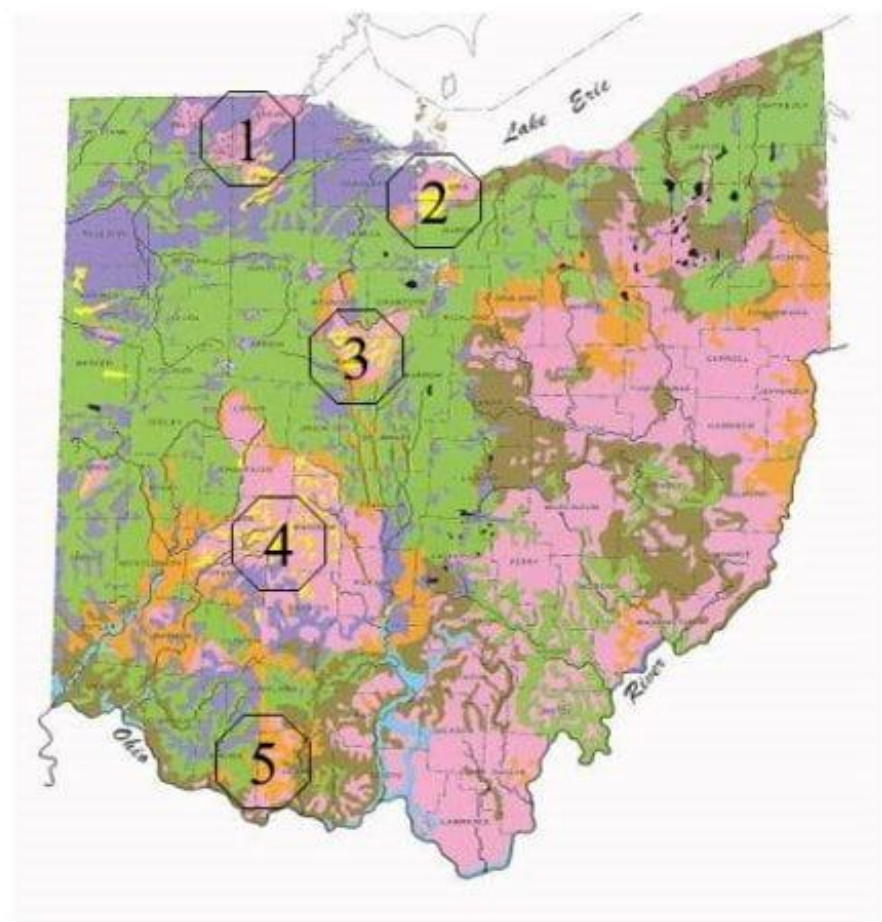
# Solution

How can Ohioans solve this issue of a declining prairie habitat; through garden designs. As naturalistic garden designs tend to mimic a natural prairie very efficiently as they both tend to have lots of flowering plants and grass and few woody ones. The future of saving these endangered species is going to be through the work of landowners and garden designers. Often there are spaces that go unused and are just large fields of turf grass that do not serve a purpose other than aesthetics. These three designs of a green roof, unused green space, and residential home are to show how a prairie garden design might look for different areas that these naturalistic garden designs can be applied.

These large swaths of garden designs not only serve an aesthetic function but an ecological one as well. These gardens will not only attract pollinators and other wildlife, serving as way stops for migrating birds, they also help to manage stormwater runoff helping in cases of heavy rain. Storm water management is just vital to the health and safety of an area but there are many government programs that offer credits to businesses with sustainable practices.

## Major Prairie Regions in Ohio

1. **Oak Openings** of Lucas County
2. **Firelands** of Erie and Huron Counties
3. **Sandusky Plains** of Marion, Crawford and Wyandot Counties
4. **Darby Plains** of Madison, Clark, Union, Fayette and Greene Counties
5. **Dry Hill Prairies** of Adams and Scioto Counties.



NATURAL VEGETATION OF OHIO AT THE TIME OF THE EARLIEST LAND SURVEYS

# WILDFLOWERS FOUND IN METROPARKS' PRAIRIE AREAS



## Stiff Goldenrod

*Oligoneuron rigida*

**BLOOM TIME:**  
September to early October

**VALUE TO POLLINATORS:**  
native bees, Monarch butterflies



## Fringeleaf Wild

*Petunia Ruellia humilis*

**BLOOM TIME:**  
June - July  
**VALUE TO POLLINATORS:**  
butterflies



## Prairie Cordgrass

*Spartina pectinata*

**BLOOM TIME:**  
August - September

**VALUE TO POLLINATORS:**  
cover for birds



## Deertongue Panicgrass

*Dichanthelium clandestinum*

**BLOOM TIME:**  
August - October

**VALUE TO POLLINATORS:**  
bees and butterflies



## Royal Catchfly

*Silene regia*

**BLOOM TIME:**  
July - August

**VALUE TO POLLINATORS:**  
hummingbirds



## Big Bluestem

*Andropogon gerardii*

**BLOOM TIME:**  
June - September

**VALUE TO POLLINATORS:**  
skippers



## Butterfly Milkweed

*Asclepias tuberosa*

**BLOOM TIME:**  
June

**VALUE TO POLLINATORS:**  
Monarchs and other butterflies



## Sweet Everlasting

*Pseudognaphalium obtusifolium*

**BLOOM TIME:**  
July - September

**VALUE TO POLLINATORS:**  
butterflies



## Prairie Dock

*Silphium terebinthinaceum*

**BLOOM TIME:**  
July - August

**VALUE TO POLLINATORS:**  
bumble bees and native bees



## Pinnate Coneflower

*Ratibida pinnata*

**BLOOM TIME:**  
July - September

**VALUE TO POLLINATORS:**  
butterflies and native bees



## Virginia Mountain

*Mint Pycnanthemum virginianum*

**BLOOM TIME:**  
August - September

**VALUE TO POLLINATORS:**  
butterflies and bees



## New England Aster

*Symphyotrichum novae-angliae*

**BLOOM TIME:**  
August - September

**VALUE TO POLLINATORS:**  
bees and butterflies



## Dense Blazing Star

*Liatris spicata*

**BLOOM TIME:**  
July - August

**VALUE TO POLLINATORS:**  
butterflies and bumble bees



## Little Bluestem

*Schizachyrium scoparium*

**BLOOM TIME:**  
August to early October

**VALUE TO POLLINATORS:**  
native bees, Monarch butterflies



## Wild Senna

*Senna hebecarpa*

**BLOOM TIME:**  
July - August

**VALUE TO POLLINATORS:**  
hummingbirds



## Indian Hemp

*Apocynum cannabinum*

**BLOOM TIME:**  
July - September



## Purple Coneflower

*Echinacea purpurea*

**BLOOM TIME:**  
June - August

**VALUE TO POLLINATORS:**  
butterflies and hummingbirds



## Whorled Rosinweed

*Silphium trifoliatum*

**BLOOM TIME:**  
July - September

**VALUE TO POLLINATORS:**  
native bees



## Jerusalem Artichoke

*Helianthus tuberosus*

**BLOOM TIME:**  
September

**VALUE TO POLLINATORS:**  
butterflies, bees and hummingbirds



## Biennial Gaura

*Gaura biennis*

**BLOOM TIME:**  
July - October



## Northern Blazing Star

*Liatris scariosa*

**BLOOM TIME:**  
September - October

**VALUE TO POLLINATORS:**  
native bees



## Indian Grass

*Sorghastrum nutans*

**BLOOM TIME:**  
June - September

**VALUE TO POLLINATORS:**  
bees, Monarch butterflies



## Wild Bergamot

*Monarda fistulosa*

**BLOOM TIME:**  
June - August

**VALUE TO POLLINATORS:**  
butterflies, bees and hummingbirds



## Black Eyed Susan

*Rudbeckia hirta*

**BLOOM TIME:**  
July - August

**VALUE TO POLLINATORS:**  
butterflies and bees

# Site Analysis



Distance  Area

868.6627 m<sup>2</sup>  
0.0009 km<sup>2</sup>  
9350.1984 ft<sup>2</sup>  
1038.9119 yd<sup>2</sup>  
0.0003 mi<sup>2</sup>  
0.2147 ac

Last Coordinate:  
39.397005,-84.450868

Searched Address:  
Winners Circle Dr, Liberty Twp, OH  
45011, United States

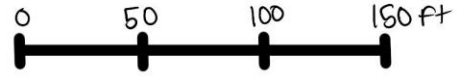


Distance  Area

8619.5186 m<sup>2</sup>  
0.0086 km<sup>2</sup>  
92779.6359 ft<sup>2</sup>  
10308.8580 yd<sup>2</sup>  
0.0033 mi<sup>2</sup>  
2.1299 ac

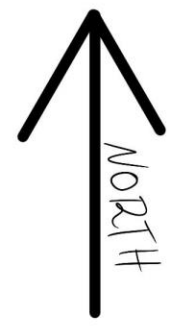
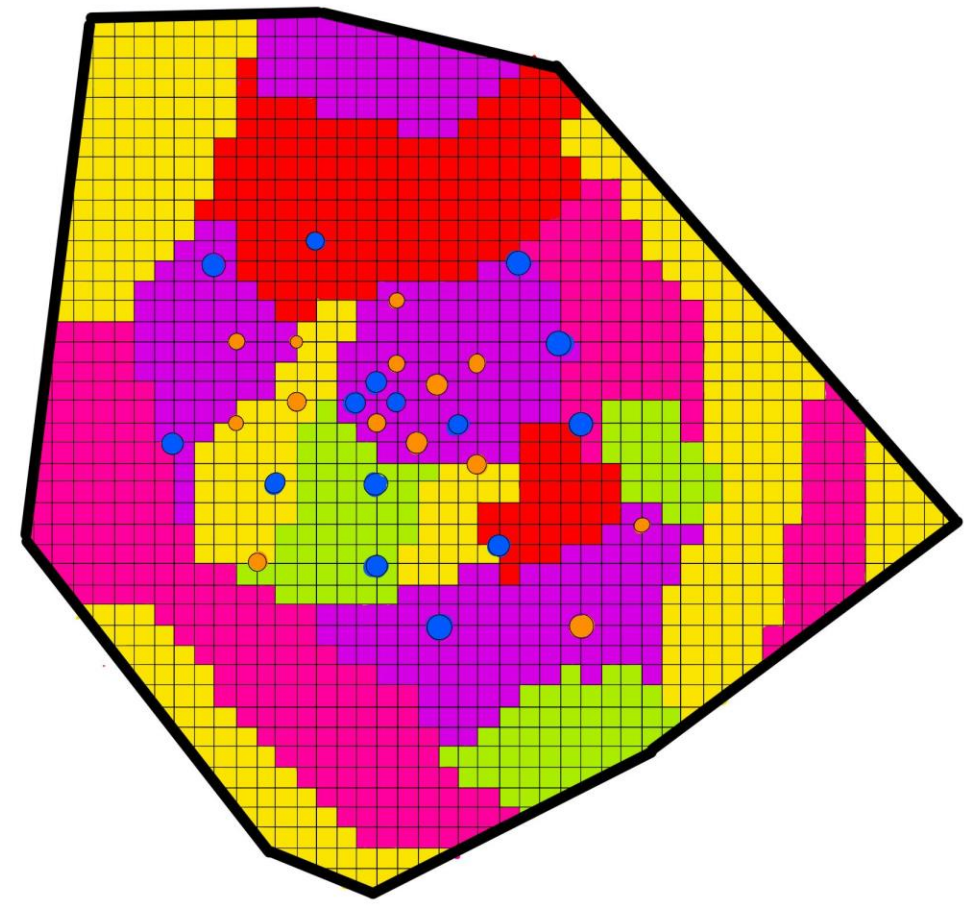
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Searched Address:  
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45011, United States



# Plant List

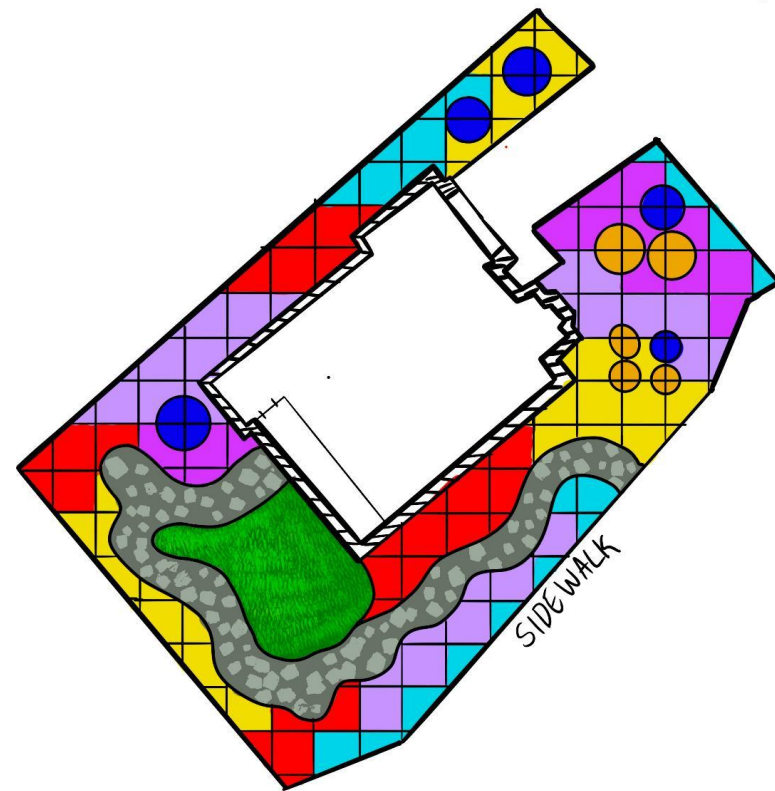
- *Spartina pectinata*
- *Andropogon gerardii*
- *Rudbeckia hirta*
- *Echinacea purpurea*
- *Symphoricarum novae-angliae*
- *Ratibida pinnata*
- *Asclepias tuberosa*



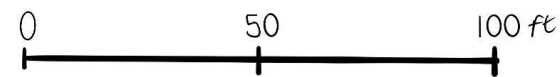
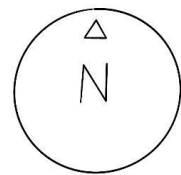
# HOA Design

# Residential Design

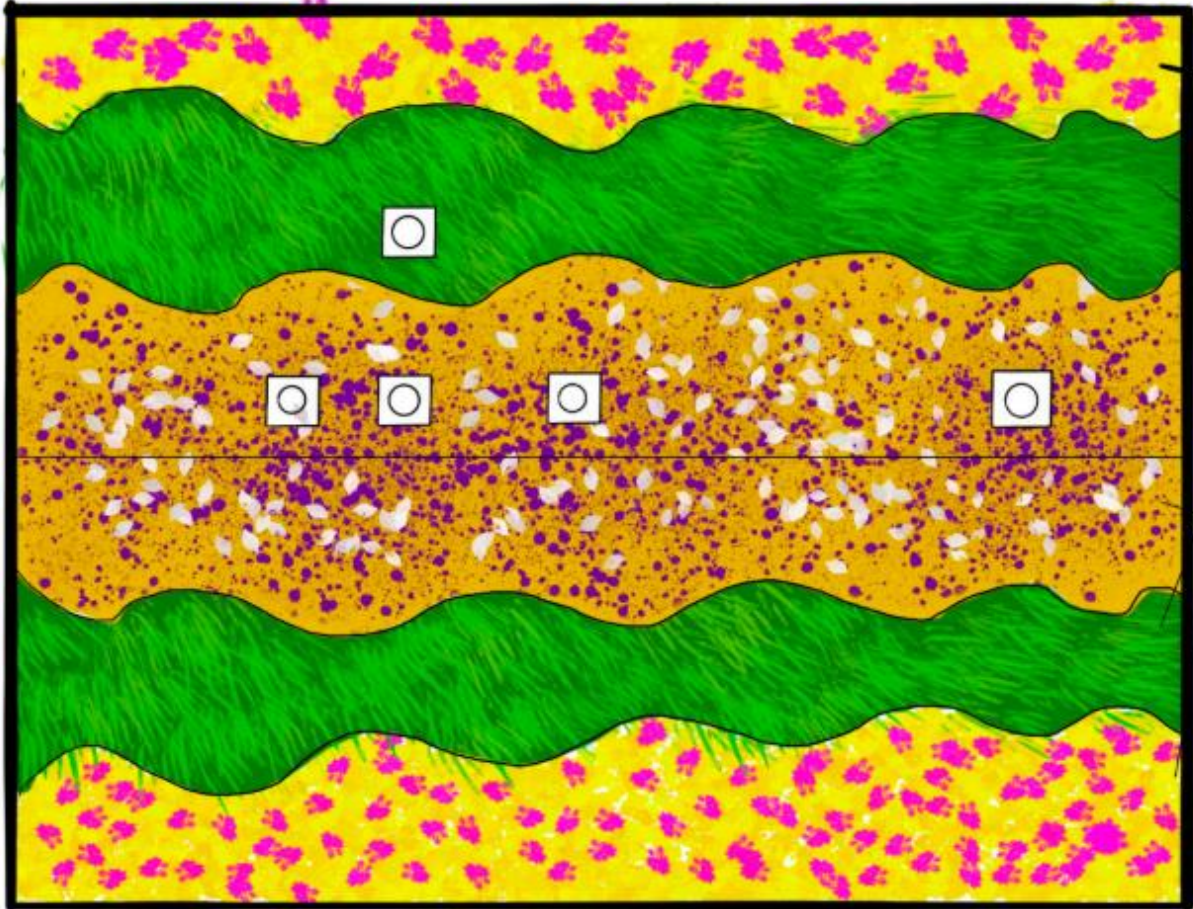
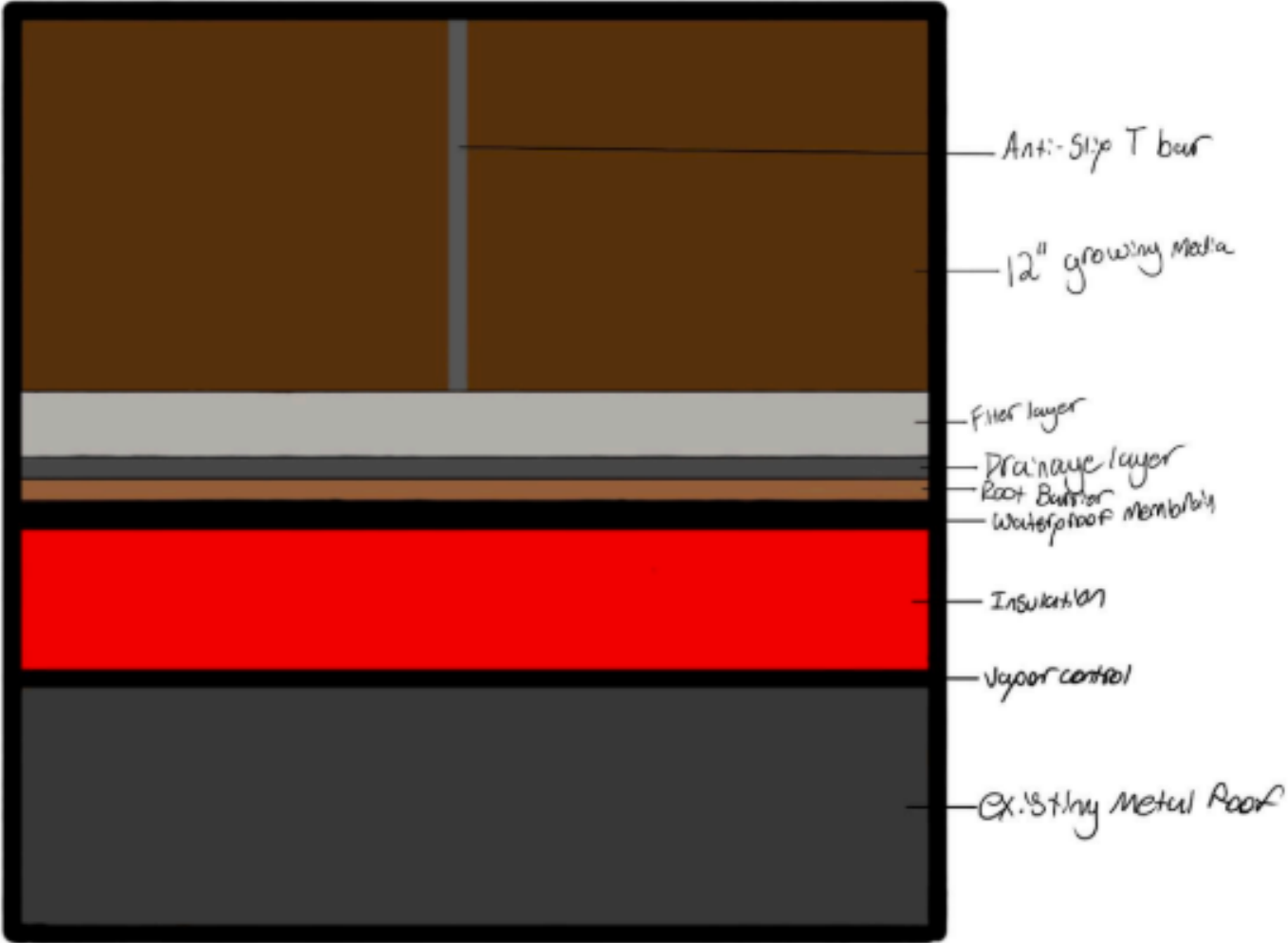
## PLANT LIST



-  *Sorghastrum nutans*
-  *Sorobolus heterolepis*
-  *Andropogon gerardii*
-  *Liatris scariosa*
-  *Ruellia humilis*
-  *Silene regia*
-  *Asclepias tuberosa*



# Green Roof Design



Rudbeckia & Noddy onion  
Prairie grass & Prairie Sun grass  
Purple Coreflower & Smooth Periwinkle

