# Garden Ecology

## A WALKING TOUR THROUGH THE GARDENS AT SIUE

## The Adventure Starts Here

As you embark on your tour through The Gardens, be sure to keep an eye out for all types of wildlife as well as interesting plants and landscape features. All of these things are important to the ecology of The Gardens.

**Ecology is the study of both the living and non-living things within the environment and how they interact together.** On this tour of The Gardens we will discover how several ecological processes impact the world around us!

## Be on the lookout for QR codes in The Gardens!

Scan this QR code with your smart phone for more information about The Gardens!

Each tour stop also has its own QR code, so you can listen to our audio tour and learn all about the environment around you!

## Welcome!

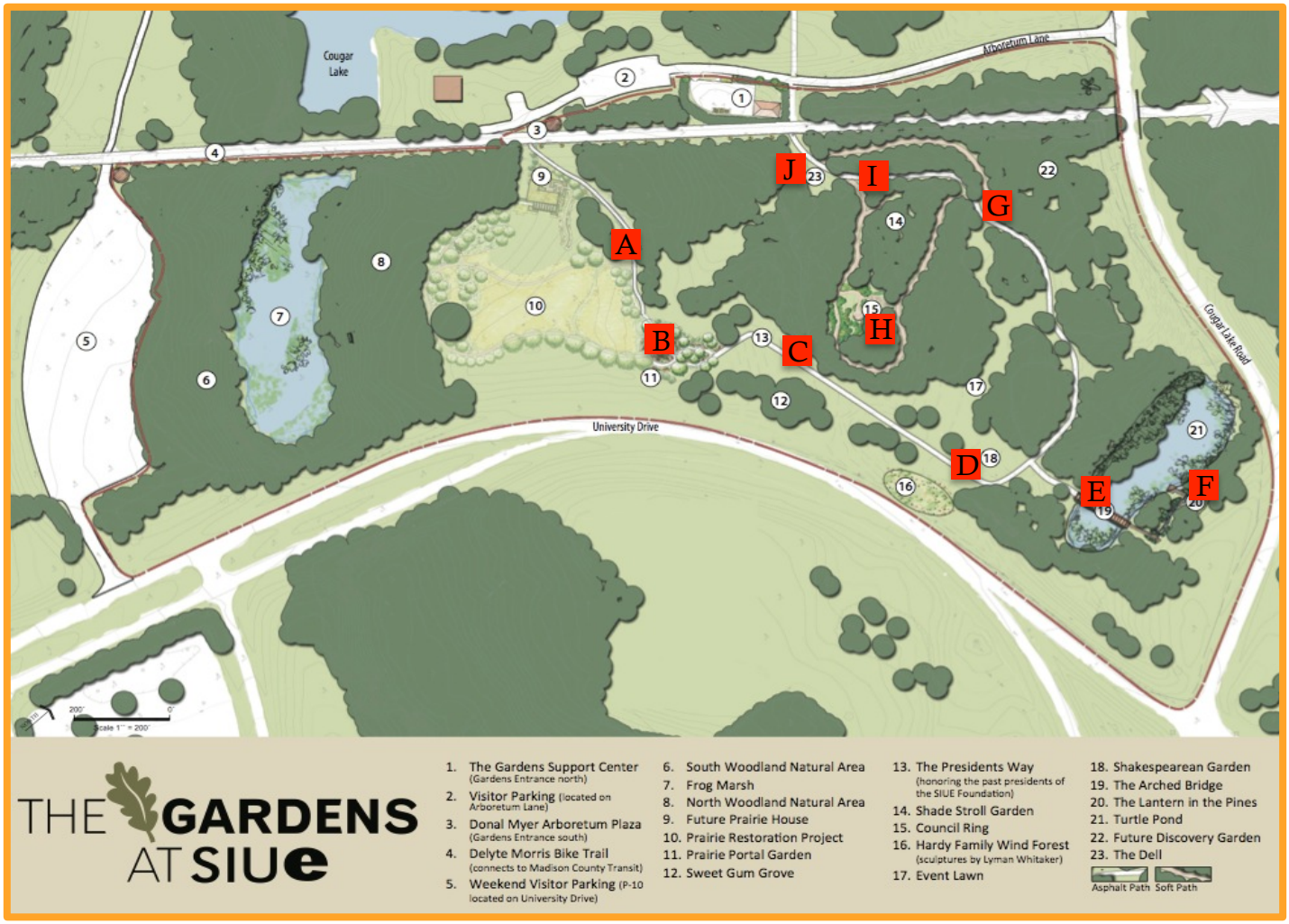
We hope to keep The Gardens beautiful and clean for all of our visitors so we ask that you please do not pick any flowers or leave any trash behind.

We greatly appreciate your cooperation!

**Pets:** Your dog is welcome to visit The Gardens on a leash. We do ask however, that you please pick up after your pet.

# Map of The Gardens

The red boxes on this map mark the Garden Ecology Walking Tour's interpretive stops. You are welcome to walk off the trail but beware of stepping on saplings and poison ivy.




## Garden Ecology Walking Tour Interpretive Tour Stops

A. Prairie Grassland
B. Plant Identification
C. Native and Non-Native Species
D. Flying Through the Air and Carried by the Wind
E. Symbiotic Living
F. Spotting Life in Turtle Pond
G. Ever-Changing Landscapes
H. It's All for the Birds
I. Finding Inspiration in Nature
J. Edge Effects and You

A

# Prairie Grassland

**Take a look at our prairie grassland and try to imagine how Illinois would have looked when prairies covered the state, before intensive human development.**

## Productivity

Prairies are very productive ecosystems. The soil layers beneath a prairie show just how productive they can be! Deep layers of dark, nutrient rich soil accumulate after many years. Each growing season the grasses vigorously grow and then die off in the winter, with the old growth becoming compost for the future.

### Do you know all the names of the different soil layers found in an Illinois prairie?

From top to bottom they are: humus (rich organic matter), topsoil, subsoil, weathered rock and bedrock.

## Useful Prairie Plants

Humans have used plants for thousands of years. Native Americans living in the American Midwest found that many plants could be stored and eaten throughout the year. They also collected certain plants to use as medicines. Plants are an essential part of life within any ecosystem.

### Prairie Plant Spotlight

**Big Bluestem** (*Andropogon gerardii*) is a tall and abundant prairie grass; it is now the official state grass of Illinois. American pioneers said that this grass stood as tall as a man on horseback, that's over eight feet tall! Having deep roots allow the Big Bluestem to grow to such heights and also deal with extended droughts.

Figure 1

# One Grass From Another

There are thousands of different types of grasses. The prairie grasses you can see here are native to Illinois, which means they are all naturally found here. The most predominant grasses here are Prairie Drop Seed, Indian Grass and Little Bluestem.

When scientists are studying plants and animals, it is important that they make very detailed and accurate descriptions of what they are observing. Let's pretend The Gardens is going to conduct a study to determine the health of this prairie landscape. If you were the scientist, you might want to first document the different types of grasses found here.

**Take a closer look at the grasses. How many can you find?**

List your **observations** here:

_____

_____

_____

_____

_____

_____

_____

_____

_____

**Draw a picture** of the grasses here:

B

# Plant Identification

Let's say you are on a leisurely stroll through a garden like the one you're in now! And, you find a flowering plant that you really like and want to add to your garden at home.

**What is the best way to identify this plant?**

## Flowers and Leaf Investigation

First, if the plant has flowers, take a closer look.

**What are the colors?**
**How many petals does it have?**

Now look at the stem and leaves of this mystery plant.

**What is the shape of the leaves?** Are they oval, round, pointed?

**Are the leaves simple or compound on the stem?** Use Figure 2 for help.

**How are they attached to the stem of the plant?** Are the leaves alternating, or do two leaves sprout out at the same point along the stem? Use Figure 3 to answer this question.

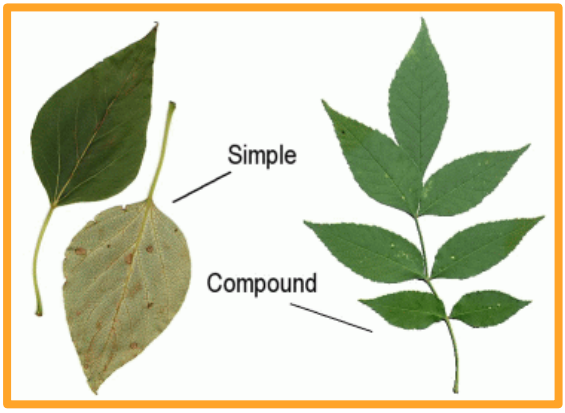



Figure 2

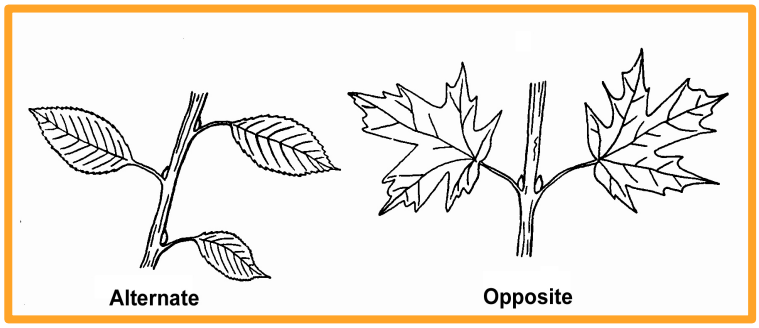



Figure 3

## A Field Guide is Your Friend

When scientists out in the field need help identifying a plant, they refer to a field guide. A field guide is a reference book filled with information about a variety of plant or animal species. In the case of this mysterious flowering plant, once you answer the basic questions above you could consult a field guide to find the name of the plant species you found! Some guides are organized by flower color, leaf shape or geographic region.

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Here are some flowering plants you might find here in the Prairie Portal Garden:

- Salvia (Look for pink and blue flowers)
- Russian Sage
- Grey Sunflower
- Purple Cone Flower

# Anatomy of a Flowering Plant

Fill in this diagram. Try to find all of these parts on a real flower here in The Gardens.

Word Bank

Roots

Leaves

Stem

Flower

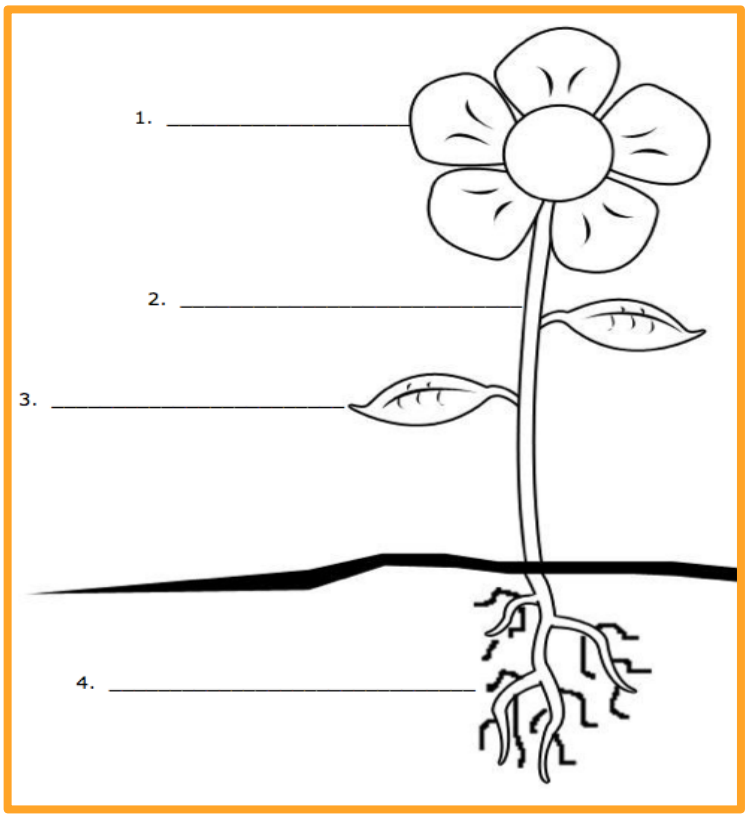



Figure 4

## What is the function of each of these plant parts?

Flower - _____

Stem - _____

Leaves - _____

Roots - _____

Answer Key: 1. Flower; 2. Stem; 3. Leaves; 4. Roots
The flower functions to attract pollinators to the plant, which fertilize it allowing for the plant to reproduce. The stem supports the plant and carries water and nutrients from the roots to the leaves and flower. Leaves take in carbon dioxide for the plant to use during photosynthesis and they expel oxygen (which we humans need to breath). Roots hold the plant to the ground and take in water and nutrients through the soil.

# C Native and Non-Native Species

Throughout history, people have transported plants and animals with them as they travel around the world. This dispersal of both **flora** (plants) and **fauna** (animals) has been both intentional and unintentional.

Certain species brought to this area by human activities have adapted well to the Illinois landscape and have taken over the ecological niche of a native species.

**Ecological Niche** – the specific role held by a species within an ecosystem.

When non-native species outcompete native species in their natural community and starts causing ecological problems, the non-native species is referred to as an **invasive species**.

In their new location, invasive species do not have the natural controls that serve to limit their population as they would in their native range. Invasive species are a problem worldwide as they degrade and alter habitats, crowd out native species, choke waterways, ruin native fisheries, keep forests from regenerating, and compete with agricultural crops.

Non-native species that have become invasive need to be kept in check to ensure the survival of our native species for future generations to enjoy.

## I Spy…

**Can you find all of the native plants listed below?**

Oak Tree
Sweet Gum Tree
Dogwood Tree
Red Maple Tree
Tulip Poplar Tree
White Pine Tree

# Tree Identification

Look around The Gardens to identify plants and find out which are native species and which are non-native or invasive species.

**Take a look at the pictures below. Can you find these two trees just off the path? Guess which one is native to Illinois and which one is non-native.**

## Sweet Gum Tree

*Liquidambar styraciflua*

Figure 5

Circle your choice, and then check your answer below!

Native Non-native

Answer Key:
Sweet Gum is native; songbirds like the Mourning Dove like to eat its seeds in the fall.

## Ginkgo Tree

*Ginkgo biloba*

Figure 6

Circle your choice, and then check your answer below!

Native Non-native

Answer Key:
The Ginkgo is a non-native tree. It is popular as an ornamental plant along city streets and in parks.

D

# Flying Through the Air and Carried by the Wind

## Pollinators: Who They Are and What They Do

For many plants to reproduce they need to be pollinated with the help of other organisms. Pollen is the powder produced by a plant that contains half of the genetic material needed for a plant to produce seeds. For a plant to be fertilized, this pollen must be transferred from one part of a plant to another.

## Birds and Bats; Bees and Butterflies

All of these flying creatures can be attracted to certain plants or their flowers because of scents or colors. When a bird, bat, bee or butterfly decides to land on a flower, it picks up that plant's pollen on its body. When it flies to another plant some of the pollen is brushed off, therefore pollinating the plant!

## The Perfect Pollinator

One example of a great pollinator is the hummingbird. Hummingbirds love to drink the sweet nectar found within flowers. These fast, little birds need a tremendous amount of energy to survive. In the process of getting a full meal, hummingbirds can pollinate many flowers.

Some plants need hummingbirds more than others. If a plant's nectar is deep within the flower, then the hummingbird's long beak might be the best tool to reach it.

Figure 7

## The Wind

A light breeze or a strong wind can both be great pollinators! The wind will bring a plant's pollen far and wide, and hopefully to another plant that needs to be fertilized!

Take a look at the wind sculptures between the path and the road. Is the wind blowing today?

# Welcome to Pollination Station

Can you spot any potential pollinators? List their names or draw them here!

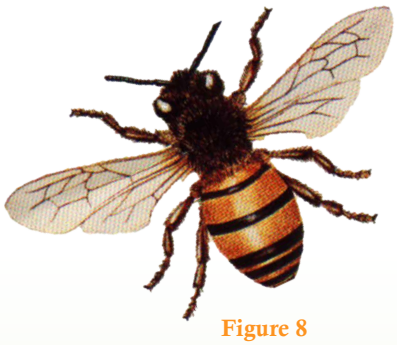


Figure 8

## What can you do to help protect pollinators?

- Plant native plants in your home garden
- Build and install bat and bird houses
- Supply water for wildlife, for example you could add a bird bath to your backyard
- Reduce your use of pesticides on your lawn and garden
- Instead of having a large and unnatural grass lawn plant flowers instead

E

# Symbiotic Living

**Over time, many plant and animal species have evolved to have symbiotic relationships with each other.**

Figure 9

Figure 10

## Three Types of Symbiosis

1. **Mutualistic** – In this case both species benefit from the relationship.
2. **Commensal** – In this relationship only one of the species benefits from the interaction, but the other is not harmed.
3. **Parasitic** – In this situation one species benefits at the expense of the other.

Can you think of an example of each of these three types of symbiotic relationships?

## Dynamic Duos

Take a look at the trees growing next to the bridge.

Can you spot a gray/green patch on any of them?
Look at this picture for an example →

Do you know what it is?

It is called **Lichen** and it is actually not just one living thing but two! Lichens contain both an algae and fungus organism, which work together to survive.

The fungus anchors this dynamic duo to the tree and the algae produce chlorophyll for photosynthesis. Through the process of photosynthesis food is made for both organisms in this partnership.

# Symbiotic Match Making

Draw a line between the boxes to match each of the situations to the correct type of symbiotic relationship they represent!

**Parasitic**

Many termites species eat only wood yet termites cannot digest the main substance in wood, called cellulose. How do they get the nourishment they need? It turns out that termites have tiny protozoa living in their digestive tract that can digest wood. So, when a termite eats wood, the protozoa digest the cellulose and supply nutrients to the termite.

**Commensal**

Fleas and ticks suck blood from their hosts to survive, but the hosts suffer from itching and may also contract diseases from the fleas and ticks.

**Mutualistic**

Some frogs in the rainforest carry their young to water-filled plants called bromeliads. Bromeliads grow up off the forest floor on trees branches. The tadpoles get a safe place to develop and the bromeliad doesn't seem to be harmed by this use.

**Answer Key:** Parasitic – Fleas and ticks; Commensal – Frogs and bromeliads; Mutualistic – Termites and protozoa

# Spotting Life in Turtle Pond

## Take a look out over Turtle Pond, what do you see at first glance?

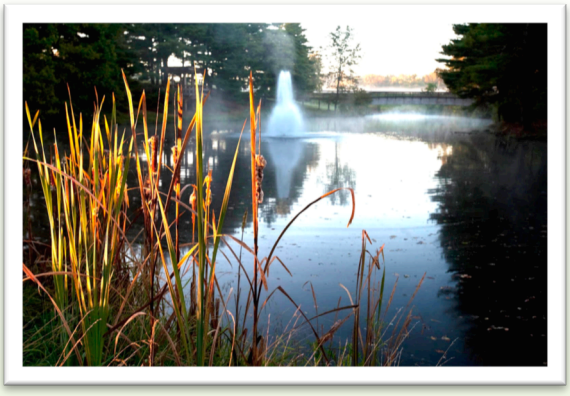
This pond is its own ecosystem, with plants and animals living together. Some of the most popular residents of Turtle Pond are of course the turtles!

**Red Eared Sliders** are the most common type of turtle within the pond.

## Turtle Facts:

- Turtles hibernate during the cold, winter months; most will snuggle down at the bottom of a pond beneath a thick blanket of leaves and mud. During this time the turtle will take in oxygen from the water around it.
- A turtle's shell acts as its defense mechanism. When threatened, a turtle pulls inside its shell for safety.
- In a pond like this one, turtles might eat crickets, worms, and lots of leafy plants.
- Turtles are reptiles, and therefore cold-blooded. This means that they need to absorb heat from the sun to stay warm, unlike mammals that can produce their own heat.

Figure 11



## I Spy…

**Can you find all of the organisms listed below?**

- Red Eared Slider Turtle
- Leopard Frog
- Mallard Duck
- Canada Geese
- Bullfrog
- Dragonfly

# The Cycle of Life

Turtles are not the only organisms in Turtle Pond. Frogs are also an integral part of this pond ecosystem along with the plants, birds, insects, fish and non-living organic matter within this space.

## Bellwether Organisms

Amphibians like frogs and toads are very special organisms. Scientists call them **bellwether organisms** because they are the first to show signs of distress if there is a problem within the ecosystem.

Amphibians take in oxygen through their skin, which makes them very susceptible to pollution in both the air and water.

Figure 12

Can you find any frogs in Turtle Pond?

How about turtles like the Red Eared Slider shown on the previous page?

Once you spot them **draw** them here and **describe** what you observe.

G

# Ever-Changing Landscapes

This section of The Gardens has obvious examples of how humans can change the natural environmental around them. We construct large buildings and shape the land for whatever best suits our needs.

One of the most common ways in which humans change the environment is for agriculture. Large tracts of land are used exclusively for food crops. This practice where only one type of plant is grown is called **monoculture**.

Plant diversity is an important part of an ecosystem and by planting only one crop we harm the organisms living around us. Planting many types of different plants together is called **polyculture** and it enables humans to grow food while maintaining the health of the surrounding habitat.

In our vegetable garden here, we plant many different types of plants.

Each different type grows at a different rate and produces flowers at different times of the growing season. This means that there is always a steady supply of flowers for pollinators to visit!

## Do you know where your food comes from?

Check our website for upcoming classes hosted here at The Gardens.

# Human Impacts

## We All Need To Eat

The human population has risen to over 7 billion people in 2013! That is a lot of people for the planet to support. With limited resources, we need to be ever more watchful of how we change and impact our environment and the delicate ecosystems within it.

## The 7th Generation Principle

The Iroquois, a Native American Tribe of the northeast coast has traditionally practiced the 7th generation principle.

This principle states that present humans should live such that they do not harm the earth in order to allow their descendants, seven generations from now, to enjoy the same opportunities on this earth.

## What You Can Do To Help

There are a lot of things you can do to reduce the negative impacts of humans on the environment. No matter how small, every little bit helps!

- Build a birdhouse
- Recycle
- Don't waste our precious resources
- Ride your bike or carpool with friends
- Compost your food waste
- Be an informed consumer

# H It's All for the Birds

## Get Out Your Binoculars!

Many bird species migrate through this area during the spring and fall, and other birds only live in this area during the winter or summer. So, depending on what time of year it is you always have the opportunity to spot a new and interesting species. See how many birds you can spot today!

## Step 1 – Put Your Ears on and Listen

Our ears are constantly being bombarded with sounds, so much so that we "tune out" a lot of what we hear. The first step in becoming a great bird watcher is to learn to really listen to the chorus of sounds in nature. Chances are you will hear a lot more than you would expect!

**For the first few minutes just close your eyes.**

**Do you hear a bird singing?**

**What other noises do you hear?**

## Step 2 – Look

Now that you have listened to the birds it is time to try and spot them. Use your eyes first; can you see anything moving up in the tree canopy? Or in the forest understory? Once you locate a bird, try and focus on it with a pair of binoculars if you have them (we have binoculars for you to borrow in the Garden Support Center).

### Binocular Basics

Look through the two smaller eyepieces; make sure to remove the lens caps! You can make the eyepieces closer together so that they fit the width of your face. Now, turn the focus knob until something far away becomes clear.

Follow this QR code to see more information on native birds and season specific bird checklists!

## Step 3 - Identify

To find out what species of bird you found, it is best to consult a **field guide**. A good field guide will list hundreds of species and provide information on habitat, range, migration patterns, plumage and much more!

# What Birds Were You Able to See or Hear?

**Check off** the names of the birds you identified and/or **draw** them here:

- Eastern Bluebird, *Sialia sialis*
- Northern Cardinal, *Cardinalis cardinalis*
- American Robin, *Turdus migratorius*
- Downy Woodpecker, *Picoides pubescens*
- Black Capped Chickadee, *Poecile atricapillus*
- Cedar Waxwing, *Bombycilla cedrorum*
- Canada Goose, *Branta canadensis*
- Northern Bobwhite, *Colinus virginianus*
- Red-Tailed Hawk, *Buteo jamaicensis*
- Mourning Dove, *Zenaida macroura*
- Ruby-Throated Hummingbird, *Archilochus colubris*
- Tree Swallow, *Tachycineta bicolor*
- Tufted Titmouse, *Baeolophus bicolor*

Many native plants found here at The Gardens produce berries or seeds that birds love to munch on, other birds eat insects, fish or small mammals. **A bird's size and beak type provide a lot of clues as to what they eat.**

| | | |
|---|---|---|
|  | Shredder | Birds of prey like hawks and owls have sharp, curved bills for tearing meat. |
|  | Probe | Hummingbird bills are long and slender for probing flowers for nectar. |
|  | Cracker | Seed eaters like sparrows and cardinals have short, thick conical bills for cracking seed. |
|  | Tweezer | Insect eaters like warblers have thin, pointed bills. |

**Look at this chart and think about the birds you saw today. What do you think they eat?**

Figure 13

# I Finding Inspiration in Nature

**"In this world, there is nothing softer or thinner than water. But to compel the hard and unyielding, it has no equal."**

**-Lao Tse**

## Art and Nature

Throughout history, humans have been inspired to create great works of art, and one source of inspiration has always been the natural world around us.

Nature is amazing, and many artists have tried to capture everything from the majesty of a mountain range to the serenity of a quiet turtle filled pond.

## From Ponds to Oceans: Water and Artistic Inspiration

Water is one of the greatest influences on our lives and the lives of all organisms. We all need water to live. It makes perfect sense that it is the focus of so many pieces of artwork.

### Fun Facts About Water:

- 97.5% of the earth's water is salt water.
- Only 2.5% is of the water on Earth is fresh water that we can drink.
- The average American uses 100 gallons of water a day.
- Our bodies are more than 60% water.

### How does nature inspire you? Use this space to express yourself.

# The Power of Water: Erosion

## Use Your Imagination

Take a seat inside this sculpture and imagine a small creek flowing through this wooded area and the openings of this stone sculpture.

Over time, that creek would pick up soil from its banks and bring it downstream. The creek bed would become deeper and deeper and it might even become a raging river if the water sources upstream shifted.

The transport of soil sediments from one place to another is one of several types of **erosion**.

Erosion caused by water has done amazing things to our planet. Have you ever heard of the Grand Canyon?

The effects of erosion can also be detrimental to ecosystems. Human activities often increase the rate of erosion, making it happen too fast. Nutrients are washed downstream before they can be used, and habitats are lost.

## Go With the Flow

Even a small amount of water can cause erosion. Next time it rains take a look outside and see if you can find which way the water went.

Here are some tips:

- Water always flows downhill and takes the easiest path
- Grooves left in mud or sand are good indicators of waters movements

J

# Edge Effects and You

## Gradual Transitions are Best

The area within the forest interior is a great habitat for a lot of organisms, but the edges can also serve as the home for many plants and animals too. Humans frequently cut down forest and do not take care to make the transitory space between forest interior and edge gradual enough for it to serve this purpose.

**The amount of light that filters down within a gradual edge space is greater than that within the interior, making it perfect for smaller trees and shrubs.**

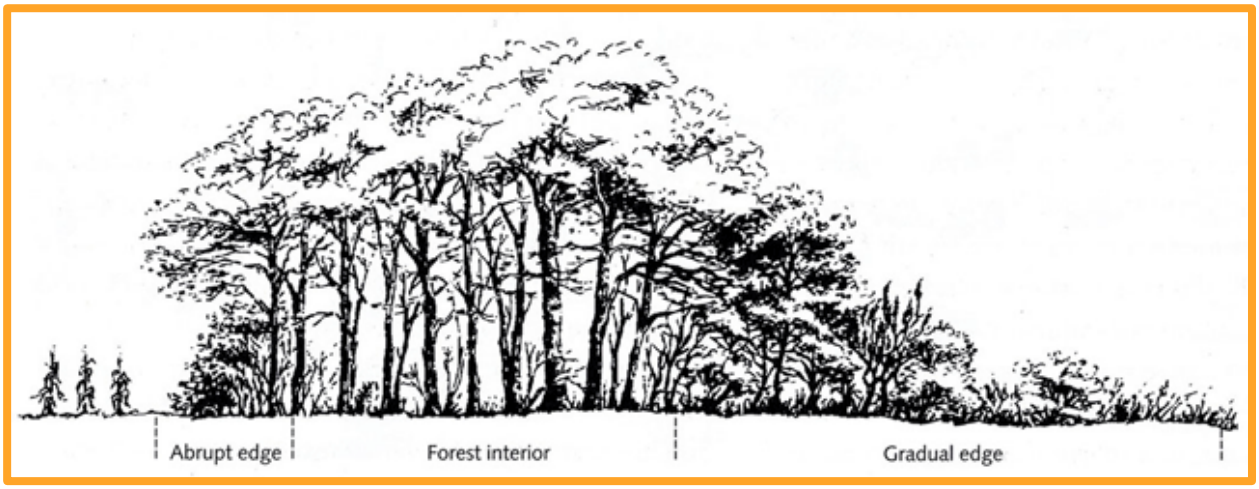


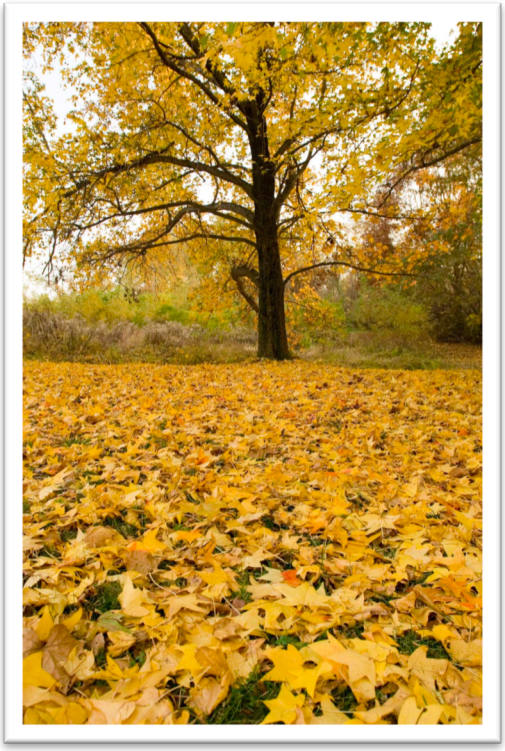

Figure 14

## What Can We Do To Help?

If you have a large forested area in your backyard, let it be! Forests provide great habitat and the more there is the better it is for our native species.

If you see evidence of edge effects try and help establish a more gradual transition. Plant some small shrubs or bushes around the forest edge.

# On the Edge



Take another look at the diagram on the previous page, Figure 14.

Now, decide for yourself whether our forest edge next to the bike path is **gradual** or **abrupt**.

- Can you see many animals in this area?
- Do you see a difference in the amount of light between forest interior and at the forest edge?

## Draw our forest edge here and list any changes you would make

# Figures

1. http://mrbdc.mnsu.edu/sites/mrbdc.mnsu.edu/files/public/images/slideshows/prairie_ss/index.html
2. http://trails.rutgers.edu/identify.html
3. http://www.butler.edu/herbarium/treeid/treeparts.html
4. http://secondgradeplantsunit.wikispaces.com/Label+the+Parts +of+the+Plant
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13. http://www.normanbirdsanctuary.org/beak_adaptations.shtml
14. http://www.pbsregen.com.au/edge_effect.html

This walking tour was created by **Deanna Lally**, an SIUE graduate with special thanks to **Jane Drake**, Director of The Gardens.

# Thank You For Visiting!

We hope you enjoyed your walking tour of The Gardens. As an ever-changing landscape we hope you will come again soon!

To learn more about programs and events hosted by The Gardens please visit our website at:

http://www.siue.edu/gardens

## The Gardens Support Center

Open Monday through Friday 8:30am to 4:00pm and special event weekends, the Support Center is the main hub of activity for staff and volunteers working at The Gardens.

Feel free to stop in and fill your water bottle, use our restrooms, or just say hello anytime the building is open.

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