



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

Pollinator Education Program:

Funded in part by the Legislative Commission on the Environment, and with resources from our Fish Creek Grant partners: Great River Greening, and the Xerces Society. Other resources include Bumblebee Watch, and the Great Sunflower Project.

Grade Level: 4-8th

Season: The preferred survey time for pollinators is late May through September.

Program Activities are subject to change depending on seasonal timing, grade level, site conditions and restoration, weather, and scheduling

In a Nutshell:

Students will engage in classroom activities to learn about many different kinds of pollinators, their characteristics and their importance. Students will participate in pollinator surveys, habitat restoration, and connection to natural areas at Fish Creek Natural Area. This area is located south of Carver Avenue, and borders the area west of I-494.

Program Series Outcomes/Objectives:

The students will be able to...

- ❖ Give four specific examples of pollinators.
- ❖ Describe interdependence between insects, plants and humans.
- ❖ Carry-out service-learning activity to improve pollinator habitat at Fish Creek.

Lesson 1: Program in the Classroom

Naturalist MNC staff introduces the terms, concepts, background & overview. Students learn about some of Minnesota's native prairie flowers, and about Minnesota's native bees such as bumble bees.

Lesson 2: Field Day at Fish Creek

- A) Pollinator observation & survey
- B) Habitat restoration (native wildflower planting, seeding, or seed collection)
- C) Connections to nature & place: habitat bingo.

Lessons:

Lesson 1: Naturalist-led activities in the classroom at school

Lesson 2: Field day at Fish Creek Neighborhood Preserve

Time

2 hours

2-4 hours

Main Concepts & Vocabulary:

Pollinators are animals that transport pollen from flower to flower and include honey bees, bumble bees, butterflies, moths, beetles, flies, wasps, hummingbirds, carpenter bees, sweat bees, and many other kinds of native bees. Most of these animals transport pollen from flower to flower (usually because they are drinking nectar from the flowers) and then pollen gets stuck on their bodies. This pollen rubs off on the next flower they fly to.

Pollination The spreading of pollen from the male parts to the female parts of a flower of the same species, resulting in the production of seeds and fruits.

9/21/2016



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

Pollinated – A flower in which the female parts of a flower have received pollen from the male parts of the same flower, or another flower.

Pollinator – Animal that carries pollen from the male parts of flowers to the female parts

Nectar – A sugary fluid produced by flowers to attract animal pollinators.

Petal – Colorful flower parts that surround the floral reproductive structures.

Pollen – Pollen provides protein for many animals and is taken from the male flower part to the female flower part for plant reproduction.

Pistil – The collective female floral reproductive parts that receive pollen including the stigma, style and ovary.

Seed – Part of the plant that is capable of growing (germinating) and producing a new plant.

Stamen – Name for the male floral reproductive parts, including the anthers and filaments

Pollinators are important to humans because they provide pollination for a great many of the foods we eat. Bees alone are responsible for one third of the food we eat.

When most people hear the word "bee," a single species comes to mind, the European honey bee. However, in Minnesota, there are more than 350 species of native wild bees, including many extremely important pollinators of crops, wildflowers and trees. With a little practice and guidance, volunteer citizen scientists (like the students) can learn to identify the most common bee species and "species-groups" found in Minnesota.

Our bees are in trouble! Research is showing us that human raised bees (such as honey bees), monarch butterflies, and also wild bees including several bumble bee species are in serious decline in Minnesota. Wasps and bees are not the same kind of animal.

We can help bees and other pollinators (and we will be working on these things during this programs) by participating in Citizen Science surveys that can help scientists study and work to solve these problems about bees, and also by planting native prairie plants.

Citizen science is when science researchers ask citizens to help them gather data for their studies. Citizen Science is increasingly recognized as a valuable tool for collecting meaningful scientific data and understanding of the distribution and conservation needs of pollinators.

A native (indigenous) species is one that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions (Kartesz and Morse 1997; Richards 1998). Species native to North America are generally recognized as those occurring on the continent prior to European settlement.

Native Plant Communities A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by

9/21/2016



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

introduced organisms. There are many kinds of vegetated areas that are not native plant communities. These include places where native species have largely been replaced by exotic or invasive species such as smooth brome grass, buckthorn, and purple loosestrife, and planted areas such as orchards, pine plantations, golf courses, and lawns. Other areas not considered to be native plant communities include areas where modern human activities such as farming, overgrazing, non-sustainable logging, and development have destroyed or greatly altered the vegetation

Prairies are “Minnesota Native Plant Communities” consisting of wild plants, mostly grasses and tall flowers native to this area, as well as a diversity of wildlife including prairie dwelling reptiles, birds, insects, and mammals. Prairies are an important part of Minnesota’s natural and cultural history, and though less than 1% of our historic prairies are left, many people are working to restore prairies by planting prairie plants. **Planting and maintaining prairie plants is called “prairie restoration.”**

Woodlands are “Minnesota Natural Plant Communities” consisting of trees, shrubs, ferns, and flowering plants, native to this area, as well as a diversity of wildlife including woodland dwelling reptiles, birds, insects, and mammals. Woodlands such as oak forests, are an important part of Minnesota’s natural and cultural history.

Pollinators are keystone species in prairies and woodlands, sustaining wild plant communities that in turn provide food and shelter for a myriad of other wildlife.

Keystone species- a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without **keystone species**, the ecosystem would be dramatically different or cease to exist altogether. All **species** in an ecosystem, or habitat, rely on each other.

Diversity- (or biodiversity) a variety of different living organisms

Restoration -As the public becomes more concerned about the environment, the interest in the preservation and restoration of native plant communities increases as well. Native plants are valued for their economic, ecological, genetic, and aesthetic benefits in addition to the growing societal belief in their intrinsic value as living species.

Fish creek Open Space Site is a wild natural area in South Maplewood owned by the City of Maplewood where our partners are doing prairie restoration. At that site, students will be working to learn about pollinators, observe pollinators interacting with the prairie plants, and help with the pollinator surveys and restoration process by planting prairie plants.



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

Alignment with Minnesota State Standards:

SCIENCE & ENGINEERING

Standard 4.2.1.1.1 Measure temperature, volume, weight, and length using appropriate tools and units. (Measure air temperature, soil temperature of pollinator habitat. Measure insect length to help with identification.)

Standard 4.1.2.1.1 Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products are created and used (Positive impacts: scientists can study the natural world even better by using technology. Negative impacts: Pesticides have agriculture benefits/creates problems for pollinators. Roads & development have human benefits, but reduces animal habitat.)

STANDARD 5.4.1.1 Diversity Living things are diverse with many different characteristics that enable them to grow, reproduce and survive.

Benchmarks: 5.4.1.1.1 Structures & Survival

STANDARD 5.4.2.1 Interdependence Among Living Systems Natural systems have many parts that interact to maintain the living system.

Benchmarks: 5.4.2.1.1 Relations in Living Systems, 5.4.2.1.2 Changes in Natural Systems

STANDARD 5.4.4.1 Humans Change Environments Humans change environments in ways that can be either beneficial or harmful to themselves and other organisms.

Benchmarks: 5.4.4.1.1 Humans & Natural Systems

CONTENT FRAMEWORK FOR MINNESOTA'S "PEOPLE & CULTURES" STANDARDS

Minnesota Primary Content Standard: H. Family, School, and Community. A student shall demonstrate knowledge of the interaction of location, family, school, and community including an understanding of how to work to improve the school, community or environment.

Minnesota Intermediate Content Standards—Geography and Citizenship.

A student shall demonstrate an understanding of people, places and locations...and characteristics of the student's local community by participating in an activity that contributes to the improvement of the student's community.



POLLINATOR PROGRAM ACTIVITY DESCRIPTION
MAPLEWOOD NATURE CENTER

Classroom Program: What's the BUZZ on Pollinators?

IN A NUTSHELL: Students learn about different kinds of pollinators, and the special role that bees play in prairies and other natural areas. Students will then learn that many of the foods they eat are pollinated by bees. They'll see a slideshow, then visit several interactive stations about pollinators and pollination, and sample some fruits that are pollinated by bees. Students will learn about the different activities that happen at Fish Creek Natural Area.

TIME: 2 hours

OBJECTIVES: Students will be able to...

- Define pollination
- Name three pollinators in addition to honey bees and monarchs
- Describe three adaptations of a bumble bee
- Taste foods that are only possible because of pollinators
- Name one thing that students can do to help pollinators

Best student response examples of “what I learned from this program”

- I learned that pollinators include many different kinds of butterflies, bees, beetles, other insects, and even some bats and birds.
- I understand that much of the food we eat depends on pollinators.
- I understand that creating habitat by planting native wildflowers, flowering shrubs and trees will help these animals.

TEACHER PREPARATION:

1. Familiarize students with program's main concepts and vocabulary
2. Administer Pre-assessment. Students do not have to put their names on this assessment.

INTRODUCTION:

- 1) Naturalist gives introduction-who we are, why we are here, what students will learn about.
- 2) Naturalist shows dresses-up student as a bumble bee to discuss adaptations, presents PowerPoint on pollinators, sets up activities to help students learn about native bees.
- 3) Naturalist explains activities students will do during Field Day and how students should prepare.



POLLINATOR QUESTIONS FOR STUDENTS

Assessment to be given before the classroom program activities and after the field trip activities.

1. Name four different kinds of pollinators

1. _____

2. _____

3. _____

4. _____

2. Why are bees important to people?

3. How can people help protect bees and other pollinators?



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

INTRODUCTION: Bumble Bee Adaptations/Dress-Up

Activity duration: 15 minutes

- 1) Elicit what we know about bees.... Stings. Intro to bees and stings: this is not a time to share your stories about any wasp stings that you have experienced. We know that can happen. There are other things that are dangerous that we interact with that are very useful: sidewalks, kitchen knives, scissors. We're going to focus on the wonderful job that bees do in nature.
 - a) Also note, usually when people are stung it is not by a bee, but rather by a wasp!
- 2) When most people hear the word "bee," a single species comes to mind, the European honey bee. However, in Minnesota, there are more than 350 species of native wild bees, including many extremely important pollinators of crops, wildflowers and trees.
- 3) Use Bumble Bee Dress-up materials to illustrate bee adaptations:
 - head, thorax, abdomen, six legs; hairy body
 - compound eyes & Ocelli
 - two pair of wings
 - stinger
 - short or long tongue
 - pollen "baskets"
 - antennae

Powerpoint Presentation on Pollinators

Presentation addresses these questions: What is pollination and why is it important? Who are the pollinators? How can we help pollinators? What will we do on the field trip to Fish Creek?

Time: 20 minutes

Bee Stretches

1. Stretch like a flower up to the sun.
2. Pack pollen on your legs.
3. Rest your "wings" on your back like a butterfly.

INVESTIGATION STATIONS

Time: 30-40 minutes depend on number of stations set up

1. LEARN THE NAMES OF FIVE POLLINATORS

Sign: Look at the picture. What kind of animal is this? Turn card over to read the name of the pollinator.

Materials: Photo cards of various pollinators with name on the back of the picture.



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

NOTE: This is a good review activity to do with the class at the end of the program. Tell them they will be expected to be able to identify FIVE pollinators and will be quizzed at the end. At the end of the program, hold up all the pictures one by one and let the kids shout out what type of pollinator it is.

1. TAKE A CLOSER LOOK

Sign: Use a magnifying lens to examine the body parts of a bumble bee, wasp, beetle and butterfly. Find the head, thorax, abdomen

Materials: i-Pad and charger (have i-Pad fully charged), microscope for i-Pad. Several hand lenses. Take Insect Mounts boards.

2. CAVITY-NESTING BEES

Sign: Touch natural and man-made tunnels that are nesting sites for bees.
Crawl through a tunnel as if you were a bee. (Only TWO times!)
Examine shapes in a leaf made by a leaf-cutter bee.

Materials: Examples of places where a cavity nester could live; hollow stems, twigs, log with holes in the sides, human-made cavity-nesting house. Include laminated leaf-cutter bee leaves, photos of cavity-nesters, photos of cavity nests in the ground, long tunnel

Note: Tell the kids they can each only crawl through the tunnel twice; a lot of focus on that station easily becomes distracted from learning to crawling through the tunnel over and over.

3. FOOD FROM THE BEES

Sign: Examine a flower with the hand lens. Look for the stamens.
Find the blossom end of the apple. Do you see the old stamens?
Sort the fruit pictures. What are your favorites?

Materials: Poster with many different kinds of food that are pollinated by animals. Bouquet of native flowers with photos of bee tongues'

4. DRESS LIKE A BUMBLE BEE

Sign: Try on parts of a bee costume to learn about bee anatomy.
Look through the glasses to see with compound eyes.

Materials: Bumble Bee dress-up, life cycle stages of a bee and ant sets. Laminated photo of Bumble bee wings.

5. WIND VERSUS ANIMAL POLLINATION

Procedure: Wind: Stand at one flower and blow pollen to another flower. Remember- the wind doesn't aim!

Animal Pollinator: Carry pollen from one flower to another flower using a bee or butterfly puppet.

Materials:

Ice-cream buckets, with large paper-cut-out flowers sitting atop, yellow pompoms (pollen),



POLLINATOR PROGRAM ACTIVITY DESCRIPTION MAPLEWOOD NATURE CENTER

Bumble bee and monarch puppets

Demonstrate wind pollination: one student stands at one flower and tries to blow the pollen into the air to land inside the bucket. 10% of the whole world's plants are wind-pollinated. Tell them just to blow and keep their hand *still*- some kids will try to semi-toss and aim their pollen into the buckets. Remember- wind does not aim for a target!

Demonstrate animal pollinators: one student takes a puppet, picks up the pollen at one flower, then visits the next flower and drops the pollen in the bucket. 90% of the whole world's plants are animal-pollinated.

1. Each pollination set (wind and animal) has 10 pollen puff balls.
2. Typically, when carrying pollen from one bucket to the other we see close to a 90% success rate. When putting all pollen balls in the hand and blowing at once from one bucket to the other, we typically see close to a 10% success rate. – these numbers reflect what really happens in nature!
3. Do each trial a couple times, taking data.
 - a. Ex. If 3/10 pollen puffs made it to the other bucket “flower,” that’s a 30% success rate

Emphasize the importance of animal pollinators- We can't rely on wind alone! And with many pollinator species disappearing we run the risk of many plants (food included) dying out as well.

LEARN-A-PLANT & POLLINATOR

IN A NUTSHELL: Students learn the native prairie plants that they will be planting, and teach other students about native plants specific interactions with pollinators. Students create a poster teaching others about a native prairie pollinator-friendly plant.

TIME: 15min

MATERIALS:

Print-out with labelled plant and 3-4 photos (with labels) of pollinators that visit the plant

Glue sticks

Colorful cardstock

Scissors

Short strips of paper; accordion fold to create “boings” that the pollinators are glued on to look like they are flying around the plant

ACTIVITY:

PREP: Each student receives a print-out with a plant and pollinators

CRAFT: Working together in pairs, cut out the plant and glue it to the colorful cardstock- make sure to keep the labels on so we can see the names of the plants and pollinators! Accordion fold the thin strips of paper, glue one end near the flower. Cut out the pollinators, glue to the other end of the “boing.”

PRESENTATION: Students present their flower to the class in groups, describing it with their own words, and naming the different pollinators that visit it.



POLLINATOR PROGRAM ACTIVITY DESCRIPTION
MAPLEWOOD NATURE CENTER

AT FISH CREEK: Students participate in some of these activities.

1. PLANTING POLLINATOR PLANTS

IN A NUTSHELL: Students will plant native plants as a part of a restoration project for Fish Creek to improve habitat for pollinators and other wildlife

TIME: 1.5 hours

MATERIALS:

- ❖ Plants
- ❖ Trowels
- ❖ Gloves
- ❖ Marking stakes/tape
- ❖ Rulers
- ❖ Watering Cans/buckets
- ❖ Plant ID sheets

OUTCOMES/OBJECTIVES: Students will ...

1. Plant Native Wildflowers
2. Mark plant with wooden marker, check planting depth and water plants.
3. Name at least one challenge to restoring natural areas (observe deer exclosures and discuss plans for future watering, weeds, and trampling issues)
4. Observe and learn about other restoration activities of oaks and prairie plants on the site

INTRODUCTION:

1. Define the terms “Native Prairie Plants” and “Native Plant Communities”
2. Review why we are planting these plants
 - a. pollinator food sources and habitat
 - b. other animals use as habitat too
 - c. deep rooted plants
3. Explain Deer Exclosures
4. Teach how to plant Native Wildflowers –tools, trowel, gloves, etc
5. Show how to mark plant with wooden marker, check planting depth and water plants.

STUDENT PLANTING : about 10 plants each, work in groups

SUMMARY:

1. Name at least one challenge to restoring natural areas (observe deer exclosures and discuss plans for future watering, weeds, and trampling issues).
2. Observe other restoration activities of oaks and prairie plants on the site.
3. Review the different native plants that were planted using photos of the plants.



POLLINATOR PROGRAM ACTIVITY DESCRIPTION
MAPLEWOOD NATURE CENTER

2. DATA COLLECTION & OBSERVATION

IN A NUTSHELL: Students will observe plants and pollinators.

TIME: 45 minutes

MATERIALS:

- ❖ Data Sheets & Clipboards & pencils
- ❖ Digital camera (2 kinds) or Tablets
- ❖ First Aid
- ❖ Wind meters
- ❖ Site location markers (flagging)

OBJECTIVES: Students will be able to...

- Identify different pollinator species

LOCATION: FISH CREEK, near prairie remnant and/or restoration sites

INTRODUCTION

Assign roles, show proper use of equipment, practice making tally marks, pass out data sheets.

STUDENT INVENTORY: kids all work together in one large group to collect different parts of data

SUMMARY:

- We finish this lesson by talking with the students about the time of day of the observations to get them to start thinking about whether it matters if you observe bees in the morning or in the afternoon.
- Ask questions about other things we could study, scientific questions we could ask about this data we have gathered and comparing it to future data gathered.
- Discuss technology used and compare modern technology to tools of the past
- Discuss the next steps for this information (entry for Great Sunflower Project)



POLLINATOR PROGRAM ACTIVITY DESCRIPTION
MAPLEWOOD NATURE CENTER

3. FISH CREEK HABITAT BINGO

IN A NUTSHELL: Students search through Fish Creek Natural Area together in a group with a naturalist or volunteer trail guide leading them. Groups will be looking for pollinator habitat, migratory bird habitat, catch a view of the Mississippi River, and adopt (take a picture of) a personal favorite natural area there.

TIME: 45 minutes

MATERIALS:

- ❖ Bingo Sheets
- ❖ Clipboards
- ❖ Pencils
- ❖ Windmeters
- ❖ Mag lenses (field microscope)
- ❖ Digital camera (2 kinds) Tablets or hand-held electronic devices for pictures
- ❖ Map of Fish Creek
- ❖ Capturing tools
- ❖ Backpacks/other portable materials-carrying implement for each trail group

OUTCOMES/OBJECTIVES: Students will be able to

- Describe at least two examples of pollinator habitat
 - Examples: hollow stems and small holes in trees
- Describe as two examples of migratory bird habitat
 - Examples include tall trees, tree holes, and insects for food
- Describe a specific place at fish creek where they felt a connection to nature

LOCATION: This is a walking tour of Fish Creek, so location varies.

ACTIVITY INTRODUCTION-

Trail guide introduces self and the activity. Describes where we will be walking and how to use the bingo sheets.

SUMMARY: Share findings and thoughts with each other. Summarize pollinator habitat and migratory bird habitat observed