INCREDIBLE INSECTS
EDUCATOR GUIDE

Thank you for registering for the Incredible Insects field trip at New England Botanic Garden at Tower Hill. This guide provides an overview and introduction to the program. The optional pre- and post-visit activities on the following pages will support your students' learning during the program and help extend their knowledge beyond your trip. Prior to your visit you are not mandated to complete any specific lessons or units of study.

WHAT'S INSIDE

OVERVIEW

During this guided program your students will learn what makes an insect an insect and uncover an insect needs to survive. Students will explore different insect habitats, including ponds, meadows, gardens, and forests and search for local species. Together we will study insects up close, classify specimens, and learn about adaptations that help insects meet their needs for survival. We recommend you complete the pre- and post-visit activities on the following pages to enhance your visit and support the classroom integration of the concepts addressed during this program.

Throughout the 90-minute field trip, Teacher Naturalists will guide small working groups of no more than 15 students to different insect habitats throughout the Garden. Students will be encouraged to make observations, explore, and ask questions. Each student will be provided with a hand lens, clipboard, and data collection field notebook to use during their visit. Teacher Naturalists will engage students using a combination of investigations, experiments, and games.

LEARNING OBJECTIVES

Students will...

- Know three or more body parts that all insects share.
- Define an example of an adaptation that helps an insect meet its' needs for survival.
- Make field observations that can be used to identify and classify insects.

BACKGROUND

Insects are part of the arthropod animal group. They coldblooded, have an exoskeleton, and no backbone. All insects share these body parts: head, thorax, abdomen, antennae, six legs, and a pair of compound eyes; if a bug does not have six legs, it is not an insect. Like all living things, insects have special adaptations to help them survive like wings for flight, a protective exoskeleton, etc. Many plants and insects depend on each other to meet their needs for survival.

VOCABULARY

Habitat: a place where plants or animals live and find the things they need to survive
Survive: to be alive and healthy.
Basic Needs: are the things all living things need to survive. All animals need food, water, shelter, and air.
Head: is the top body part of an insect which holds the antennae and eyes.
Thorax: is the middle body part of an insect which holds the wings and legs.
Abdomen: is the bottom body part of the insect.
Antennae: are a pair of sensory organs that help insects to feel and smell.
Compound Eyes: are made up of many smaller eyes that work together to detect fast movement.
Exoskeleton: is an external skeleton that supports and protects an insect's body.
Metamorphosis: is the process of changing from an egg, to a larvae, to an adult.
Entomologist: is a scientist who studies insects.
Pollination: the transfer of pollen from the stamen of a plant to the pistil of another to allow for reproduction, often with the help of a pollinator.
Adaptation: is a physical feature or behavior that helps and organism survive.

IN ALIGNMENT WITH THE 2016 MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING CURRICULUM FRAMEWORKS

STANDARDS

KINDERGARDEN

- K-LS1-1. Observe and communicate that animals (including humans) and plants need food, water, and air to survive. Animals get food from plants or other animals. Plants make their own food and need light to live and grow.
- K-LS1-2. Recognize that all plants and animals grow and change over time.

GRADE 1

- 1-LS1-1. Use evidence to explain that (a) different animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air, and (b) plants have roots, stems, leaves, flowers, and fruits that are used to take in water, air, and other nutrients, and produce food for the plant.
- 1-LS1-2. Obtain information to compare ways in which the behavior of different animal parents and their offspring help the offspring to survive.
- 1-LS3-1. Use information from observations (first-hand and from media) to identify similarities and differences among individual plants or animals of the same kind.

PRE-VISIT ACTIVITY GUIDE

The following optional pre-visit activities and resources are designed to support the understanding of concepts that will be addressed during the Incredible Insects program.

METAMOPHOSIS MAGIC

Students will learn about the life cycle of a butterfly and make their own butterfly metamorphosis models with salt dough.

MATERIALS

Bowl
Flour
Water
Salt
Paper Plates
Food Coloring

Review that butterflies are insects. They have six legs, two antennae, a head, thorax, abdomen, and sometimes wings. Explain that many insects go through metamorphosis and change from an egg, to a larvae, to an adult. Explain that they will be creating their own butterfly metamorphosis models using salt dough.

- Make a batch of salt dough as a group. Add 2 cups flower, 1 cup salt, and 1 cup water, and stir to combine. Add food coloring if desired and double or triple measurements for larger groups.
- Review each of the metamorphosis stages and discuss what happens during each stage: egg, caterpillar, chrysalis, and adult butterfly.
- Give each student a paper plate with their name on the bottom and a ball of dough to build their life cycle models.
- Instruct students to use their dough to create a model of each lifecycle stage. Practice molding techniques like rolling, flattening, and carving.
- Set out each model to dry and challenge students to add arrows and labels in the appropriate spaces on their plates.

INSECT HUNT

Students will learn the difference between an insect and other invertebrates and will explore their schoolyard to find and observe insects and other bugs.

MATERIALS

Animal Photos
Hand Lenses
Paper & Pencil
Spoons

Share insect pictures and ask students to share what they notice. Explain that all insects have 6 legs and if an animal has more or less than 6 legs then it can't be an insect. Spread out animal pictures or toys around the room and ask students to collect and sort into the correct categories; INSECT or NOT AN INSECT. Remind students to count the legs. Review the two piles as a class and discuss.

Ask students if they think their schoolyard is a place where animals might live. Explain that wildlife includes even the smallest organisms and many animals find the things they need to survive in places we may not expect. Brainstorm a list of animals that they think might live outside their school. Explain that there are lots of animals that live here including insects (ants, bees, butterflies, etc.), and other invertebrates (spiders, pill bugs, millipedes, etc.). Tell the group that we are going to go explore the schoolyard in search of animals and decide if they are an insect or not.

- Review rules for outside, gather supplies, and go search for insects and other animals.
- Flip rocks or logs and use hand lenses to observe areas and living things up close.
- Use spoons to dig in the dirt in search of life.
- Search for signs of insects, including holes in leaves, ant hills, and spittle bug bubbles.
- Draw pictures in notebooks and discuss if it is an insect or not by counting its legs.
- Create a class list of the insects you found.

POST-VISIT ACTIVITY GUIDE

The following optional post-visit activities and resources are designed to reinforce concepts that were addressed during the Incredible Insects program. We would love to see your students' work! Please share with us by mail or email us at youtheducation@nebg.org

BEE HOTEL

Students will learn about insect shelters and then build their own insect hotel using their recyclables and natural materials.

MATERIALS

Cans
Sticks
Scrap Paper
Paper Straws or Tubes

Review the basic needs that all animals, including insects, need to survive: water, air, shelter, and food. Ask students what they think would make a good insect shelter. Explain that today we will be building Bee Hotels to help create shelter for solitary bees who are under threat due to pesticides, climate change, fewer wildflowers, and habitat loss. Review different types of solitary bees (mason bees, leafcutter bees, etc.) and learn about what shelter they like. Invite the class to collect recyclable and natural materials for this project.

- Give each student a tin can with the top and label removed.
- Have students roll sheets of scrap paper around a pencil to create paper rolls.
- Fill the can with sticks, paper tubes, paper rolls, and straws. Make sure nothing is sticking out beyond the edge of each can.
- Stack all the cans on top of each other inside an upright wooden crate or hang the cans individually from a tree branch using twine.
- Check on your insect hotel every so often to see what new visitors are finding shelter.

BUILD A BUG

Students will review the common body parts that all insects have and then build their own insect inspired by one that they found at the Garden during their field trip.

MATERIALS

Egg Cartons
Pipe Cleaners
Scissors
Paper
Glue
Markers

Return student field notebooks from the Garden field trip and review the parts of an insect using the diagram. Ask students to share what insects they saw during their field trip and write the list on the board. Be sure to only list insects, not other invertebrates.

Explain that will be creating our own insects inspired by one of the insects we found at the Garden. Show students what materials they can use and challenge students to draw their design and plan what materials they will use for each body part. Check student designs and then give them the materials they need to start building.

Invite students to present their insects to the class, explaining each body part, and sharing their favorite adaptation (or superpower) that their insect has.

EDUCATOR RESOURCES

- Project Wild by the Council for Environmental Education
- A Pocket Naturalist Guide: Bugs and Slugs by James Kavanagh

STORY BOOKS

- The Big Book of Bugs by Yuval Zommer
- The Backyard Bug Book by Lauren Davidson
- A Butterfly is Patient by Dianna Hutts Aston
- Bug Hotel by Libby Walden
- 100 Bugs!: A Counting Book by Kate Narita