

Start Up:
(5-10 min)

Name tags: Have students write their name on a craft foam shape, then thread a clip or string through the slit at the top for easy wearing.

Insect Friend Bingo: Students find others with bug experiences that match squares on the bingo sheet. Ask them to write the names of the other student matches in the squares. See how fast rows can be filled, then go for blackout.

**Welcome/
Introduction:**
5 min.

Staff/Volunteer Names
Give a brief overview of your nature center or park.

Today's Topic-Insects

Question: What makes an insect?

Opener:
10 min.

Name Game (Sanborn)-Each student says his/her name plus one detail about themselves (e.g. favorite insect). The other students take turns repeating each introduction and adding their own name and detail.

**Background/
Exploration:**
60 min.

Ask the students to name some features of insects.

Insects are invertebrates, they have no backbones.

Insects are arthropods, which means they have jointed or segmented bodies.

- Arthropods have a hard shell covering their body, the exoskeleton.
- The exoskeleton holds them together and helps them move (vs. skeleton).
- Most have many legs-8 or more. Examples: sowbugs, crayfish, spiders, millipedes

Basic Insect Parts: Head, thorax, abdomen, 6 legs, 2 antennae, hard shell, wings
Most insects have compound eyes, and many also have simple eyes. Show photos.
Spiders and ticks are not insects, they have eight legs and two body parts.
Show the students some plastic insect models to illustrate.

Activity:
5 min.

Give the students "bug eyes" (handheld prisms) to look through.
What is it like to see through an insect's eyes? How does this vision help them?

Activity:
10 min.

Build a Grasshopper (*Ranger Rick*)-Students cut out puzzle pieces and put together a grasshopper diagram. Ask them to find the body parts on the picture.

Insects have been around for a long time, and are found almost everywhere.
They can live in many extreme conditions from boiling hot springs to frigid Antarctica.
There are several hundred thousand species of insects.

Importance of insects-A big part of nature providing useful services.

- Pollination of flowers so plants set seed
 - Food for other insects, animals, and people
 - Eat other pests (E.g. ladybugs eating aphids)
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Use pictures to give a brief overview of some familiar insect orders:
Odonata-dragonflies, **Orthoptera**-grasshoppers, **Hemiptera**-true bugs,
Homoptera-cicadas, **Coleoptera**-beetles, **Lepidoptera**-butterflies,
Diptera-flies, **Hymenoptera**-bees/wasps

Insect life cycle-Insects go through complete or incomplete metamorphosis as they mature. Butterflies, bees = complete; Cicadas, dragonflies = incomplete

Complete=**egg—larva (grub)—pupa—adult**. The change from pupa to adult is called **metamorphosis**. This is how a caterpillar changing into a butterfly.
Incomplete=nymph hatches, grows, molts, gets wings, and grows to adult size.

Insect Adaptations-An adaptation is something about a creature that helps it live and survive in its environment. Examples:

- Exoskeleton protecting the insect from moisture loss and damage.
- Compound eyes help to detect motion and avoid danger.
- Wings help many insects travel to find food and shelter.
- Some insects live together in large groups and have specialized members that do different jobs, e.g. ants, bees, and termites.
- Camouflage = ways of hiding from predators.
Viceroy butterfly larvae-look like bird droppings
- Specialized bodies, mouthparts, or legs for catching or eating their prey.
- Prey insect adaptations reduce their chance of being caught and eaten.
Monarchs become toxic by eating milkweed.
- Monarch's large wings help it fly long distances when it migrates.

Show pictures of different insects and their adaptations.

Activity:
10-15 min.

Live Colony: Look at (or show pictures of) an ant farm or a live bee hive and see what the insects are up to.

Find: eggs, larvae or pupae/grubs, workers, queen (queen cells).

Butterflies/Moths-Look at a Monarch life cycle diagram or poster.

- Wings are covered with tiny scales, which gives them color.
- Mouthparts are a sucking tube they use to feed on nectar/sap-proboscis.
- Butterflies have the widest visual range of any animal. (show photos)
- Go through complete metamorphosis

Butterflies

Active during day
Rest with folded wings
Antennae are thin with a knob at end
Slender bodies

Moths

Active at night
Rest with open wings
Antennae often feathery, no knobs
Fatter bodies

Skippers are a group of winged insects with both moth and butterfly characteristics.

Observation: **Monarchs**-Look at caterpillar, chrysalis, and emerging butterflies. Explain how the caterpillars only eat milkweed, and become toxic to predators. Monarchs migrate south to Mexico or CA in fall. Some may fly over 1800 miles. We can help them by protecting their winter homes, planting milkweed, and planting flowers for nectar.

Prepare to go Outside: Restroom break.
5 min. Apply: Sunscreen, Bug Repellant (if necessary)
Bring: Water bottles, hats, jackets (if necessary), clipboard/clip
Trail Rules (see The First Program).
What we will do/What to look for-Insects and other arthropods.
Predictions-What insects will we find?

OUTDOOR EXPLORATION: Hike to a nearby prairie or meadow.
80-90 min. Let the students use nets to carefully capture insects for observation. A white sheet can be spread on the ground for easier viewing critters shaken from nets. Magnifying boxes and critter keepers are useful for closer observation.

Butterflies/moths: Move slowly, don't cast your shadow on them or they'll fly.

- How many kinds can we find?
- What sizes, wing patterns, and wing colors are there?
- What flight patterns do we see?
- Do certain butterflies visit certain flowers or colors?
- How close can you get?
- Can you see a butterfly proboscis touching the flowers?
- Can we find any Monarch eggs, caterpillars, or butterflies?

Look for ants along sidewalks and in prairie and woods. Can you find their nests?
Look for bees, wasp nests (in trees), and carpenter ants (in rotting logs).

Check the bug bait to see what it attracted (flies, bees, gnats, ants...).

Game: **Monarch Migration Headache** (see below)-Students play migrating monarchs and learn about hazards faced on the journey south.
15 min. (cold temps., habitat loss, disturbance, storms, drought)

Closing: **Pesticides**-Chemicals made to kill pests, like insects. Farmers and homeowners use them. Problems: Chemical pesticides work very well at first, but some insects are naturally resistant to the chemicals. Eventually, as the resistant insects reproduce, there are many the pesticide doesn't work on anymore. Pesticides also kill other living things, not just the insects they are used for. Sometimes killing other insects besides the pest causes problems (e.g. honeybees) Chemicals can work up the food chain and sicken and kill predators like eagles, hawks, and possibly humans. Scientists study how to use pathogens instead of chemicals to get rid of pests-other insect predators (ladybugs-aphids), bacteria, or viruses that kill the pest and not other creatures.

Send Off: Goodbye!
Next Month-Seeds & Fruits
Collect nametags for use at next program.

Take Home: Parent Outline
Insect activities
Grasshopper puzzle

Vocabulary

Invertebrate, arthropod, insect, thorax, abdomen, antenna, proboscis, exoskeleton, pupa, larva, adaptation, colony, migration, carnivore, herbivore, drone, pesticide, pollination, metamorphosis

Background and Activity References for Naturalists and Parents

www.nwf.org National Wildlife Federation
www.naba.org North American Butterfly Association
www.nationalgeographic.com/kids/ neat site for all kinds of animal and nature information and photos
www.pbs.org/wgbh/nova/bees
www.honey.com/kids/index.html
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www.honey.com National Honey Board-facts, kids info., recipes, links

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Lang, Susan S. 1995. *Nature in Your Backyard: Simple Activities for Children*. The Millbrook Press, Brookfield, CN.
P. 6 Ant attracting activities; p. 10 Bottle of Bugs (Berlese funnel)-Take Home
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Pp. 123-127 Ants
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P. 13 Build a Grasshopper; p. 21 Caterpillar Capers-Take Home; p. 25 Wordsearch; p. 42 Ant maze; p. 54 Insect Trivia; p. 58-59 Insect traps, nets, & cages (Berlese funnel);
pp. 38-39, 44 Ant Detective; p. 45 Like/don't like insects survey
Sanborn, Jane. 1984. *Bag of Tricks: 180 Great Games*. Search Publications, Florissant, CO.
P. 16 Name Game; p. 29 The Pretzel
Sisson, Edith A. 1987. *Nature with Children of All Ages*. The Massachusetts Audubon Society-Prentice Hall Press, New York. Pp. 53-65 Invertebrates-animal kingdom chart, information, activities

Extensions/Alternate Activities/Rainy Day

The Pretzel (Sanborn)-Students stand in a circle and hold hands across the circle with two different people, then attempt to untangle the human knot into a regular hand-holding circle. This works best with 5-10 students. Make two or more “knots” with a larger group.

Honeybees (see *K-2 Honeybees*)-Discuss specialization of jobs/bodies in colonial insects.

Ants-A thin waist between the thorax and abdomen. Compound eyes and complex mouthparts for carrying, digging, building, grasping, eating, and fighting. Colonies have one queen, the mother of all the workers, who are all female. Workers tend the new eggs, feed and clean the grubs, and search for food outside their nest. Sometimes, the queen lays eggs which develop into winged males and new queens. They fly around, mate, and the new queens find places to make new colonies under ground.

You can keep an ant farm to study them. **Maze worksheet, Be an Ant Detective** (*Ranger Rick*).

Do the **Metamorphosis Cheer** (*HS-1: K-2 Creepy Crawlies*) to illustrate the insect life cycle.

Hold a brief discussion with students on “Why people Like/Don’t Like Insects” (*Ranger Rick*).

Find some interesting insect facts to share with the students (*Boys Life*).

Let the students play **Insect Bingo** (*Ranger Rick*) on the hike back. See also *K-2 Honeybees*.

Cicadas-An interesting interview if time allows.

- Are not really “locusts” (A type of grasshopper which travels in huge swarms and eats crops).
- Cicadas are harmless to crops. The best known are the 17 year periodical cicadas.
- The immature cicada nymphs attach to the roots of large trees, and live 1 or 2 feet underground, sucking sap out of the roots. They grow slowly.
- The nymphs dig up to the surface after a rain on a warm spring day or night of their 17th year.
- They leave 1/4 inch holes after emerging.
- Up to 1-1/2 million cicadas can live in an acre of woods.
- The still immature insects crawl up onto a plant, tree, or wall, and shed their hard shell.
- The adult cicada gets out of its old shell, and dries in a couple of hours. They live 5 or 6 weeks.
- They sing a loud, buzzing song from the treetops, making more noise in warmer weather.
- The males song attracts the females, they mate, then lay their eggs in twigs.
- The eggs hatch after 7 weeks, and the ½ inch nymphs fall to the ground and bury themselves.
- Being in large crowds helps cicadas avoid getting eaten by predators like birds, squirrels, chipmunks, and other animals. They are easy to catch since they fly slowly.
- Edible to humans!

Bees and wasps-Related, some are yellow w/black stripes. Ants are also related to bees.

Wasps eat other insects (meat-eaters, carnivores).

Many bees live alone (solitary), like bumblebees living in holes in the ground.

Many flies can be mistaken for bees.

Bees and wasps have four clear wings and a slender waist, flies have just two wings.

Dragonflies rest with open wings, **damsel**flies rest with wings closed over their backs. They are both predators of mosquitoes, gnats, and midges.

Supplies:	Craft foam nametag shapes	Magnifier boxes or glasses
	Nametag clips or string	Collection nets
	Permanent markers	White bedsheet for observation
	Animal Kingdom poster or chart	Bug keepers
	Insect posters	Pictures of various insects
	Plastic insect models	Insect Bingo sheets
	“Bug eyes” handheld prisms	Overhead/dry erase markers
	Pictures of insect adaptations, orders	Monarch Migration Game cards
	Build a Grasshopper sheets	Bowl of candy

Advance Preparation: **Name tags:** Cut out nature-related shapes from various colors of a durable material like craft foam. Cut a slit in the shapes near the top. Have students leave their nametags at the end of the program for future use.
(You may be able to use a press at your AEA to mass-produce animal and plant shapes for the program season.)

Copy the **Build a Grasshopper** sheets onto heavy paper or cardstock.

Order an ant farm and set it up before your program.

Collect some Monarch butterfly eggs or chrysalis. Keep for students to observe.

Make station labels and cards for the **Monarch Migration Game** stations.
Set up the stations (see below).

Make butterfly bait, put out where you will look for butterflies (prairie).

Butterfly Bait-	Ripe fruit	OR: ripe fruit	
	Sugar or honey		honey
	½ c sports drink		vinegar
		water	

Insect Friend Bingo

Find a new friend who fits one of these experiences or incidents. Write their name in that square.
Try to use a different friend for each square!

Found a gall on goldenrod _____	Likes butterflies _____	Has been stung By a bee/wasp _____	Is afraid of Spiders _____
Knows what a pupa is _____	Is afraid of bees/wasps _____	Has noticed Webs on trees _____	Has ladybugs in their house _____
Planted flowers _____	Watched ants carry food _____	Knows what a thorax is _____	Has seen a bird eat an insect _____
Has had a chigger bite _____	Has given a pet a flea bath _____	Had a tick in their skin _____	Has had a mosquito bite _____

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Monarch Migration Game-

Explain the monarch life cycle to students-hatch, caterpillar, chrysalis, butterfly, migration to Mexico. Ask the students what hardships the butterflies might face on their journey South.

Have them act out butterfly eggs hatching, crawling as caterpillars, making a chrysalis, then emerging as butterflies (you can have them go through a tent made from a sheet or tablecloth to represent the chrysalis).

Students can be "tagged" with a butterfly stamp on a hand as they emerge. Show them an actual butterfly tag if one is available.

Send the student butterflies through stations representing challenges faced during migration. Make 4 cards for each station, half labeled for survival, half for perishing (go back to station #1). As students go through stations, they can only die 3 times, then must keep going onward.

	Label	Activity/cards	Prop
Station #1	Start/tagging	Stamp hand	Show wing tag
Station #2	Hungry bird	Escape, eaten, bite out of wing, spit out	
Station #3	Car on highway	Survive (2), die, splat!	
Station #4	Thunderstorm	Wet wings (2), found shelter, o.k.	Spray bottle
Station #5	High winds	Flutter on, survive, too tired, broken wing	Fan
Station #6	Insect collector	Caught, trapped, escaped, hole in net	
Station #7	High Mountain	Killed, wings wore out, made it, yay!	
Station #8	Refuel	Get to eat a piece of sweet candy or drink a small cup of juice (nectar)	Bowl of candy
Station #9	Winter home-Mexico!	- -	Mexican flag
