Balcones Canyon Lands National Wildlife Refuge
24518 FM 1431, Marble Falls TX 78654
(512) 339-9432 X 70, cindy_fronk@fws.gov

SOCIAL AND BENEFICIAL INSECTS

(or It's a Bug's Job)

VOLUNTEER DIRECTIONS

Need to Know

1. Your station, SOCIAL AND BENEFICIAL INSECTS (Station #6), will help students understand what insects do and how they are beneficial to us. The idea of "habitat" introduced at Station #6 will be reinforced to show the close relationship between insects and man. Describe how living organisms modify their physical environment to meet their needs. Identify and describe the roles of some organisms in living systems. Identify and describe roles of some organisms in living systems. Predict and draw conclusions about what happens when part of a system is removed. Make wise choices in the use and conservation of resources.
2. You **must include something about the Golden-cheeked warbler and Black-capped vireo into this program (a section in this guide book has more on both birds).** Any logical tie-in is good: insects as food, habitat the birds forage to find the food, insect threats to the birds, etc. After all, these birds are the reason there is a refuge near Austin. Furthermore, all of the resource management and public use management plans on the refuge must consider how these birds will be affected by man induced impacts.
3. The section in these directions called "Inherited versus Learned Behavior" is a specific science TEK requirement. **Get to know the Inherited and Learned TEKS and be ready to share this with the students.**
4. **A map** of the stations is in this guide book to help you direct your group to the next station. They go clock-wise in number order. Please be ready to direct your group to the next sequential station.

Sequence of Stations in Bridges to Birding

1. What is an Insect?
2. Insect Families and Life Cycles
3. Collecting and Studying Insects
4. Insect Senses
5. Insect Habitat
6. **Social & Beneficial Insects**
7. Aquatic Insects

GOLDEN-CHEEKED WARBLER (GCW)

HABITAT: Old forests with big trees; shady, dense forests in steep-sided canyons &

slopes as well as drier, flat hill tops. Requires Ashe Juniper ("cedar") bark to construct nest. **Spanish Oak, Live Oak, cedar foliage provides insects, caterpillars, spiders, beetles for food.**

TERRITORY: 5-20 acres to forage;
NEST TERRITORY: 3-6 acres/ nesting pair

Female constructs Cup nest in old cedar and Hardwood (oak, elm) trees at least 15' high. All nests require cedar bark. **Bark is woven with spider webs.** Nest is tucked in forked vertical limb & camouflaged. Warblers usually nest only once/season unless accident or predation. Male stays nearby singing & defending during incubation. 3-4 eggs are hatched in 12 days & fledge 8-9 days later. Parents care for them for 1 month.

GCWs migrate to pine/oak habitat of southern Mexico & Central America in July-mid-August & return in mid-March.

BLACK-CAPPED VIREO (BCV)

HABITAT: Dense, shrubby, broad-leafed (shin oak, hackberry, sumac, agarita, persimmon, Texas Mountain Laurel) young forest. Patchy habitat with 30-60% cover interspersed with open grassland.
Shrubby vegetation reaching from ground level to 6- 7' high.

TERRITORY: 1-16 acres NEST TERRITORY: 2-4 acres

Male & female select nest site between 3-'6' off ground (door knob height) in dense cover. Pendulous Cup Nest is made by female from grasses and **spider webs** and is suspended from its rim in the fork of a branch. Nest is completed in 2-3 days. They may nest more than once /year building a new nest each time. Incubation is 14-17 days and this work is shared by male & female (as well as fed by both). Fledge in 10-12 days.

BCVs arrive in mid-March to mid-April and stay until mid Sept. They spend their winter in western Mexico.

INSTINCTIVE v.s. LEARNED BEHAVIOR

Instinctive behaviors: behaviors that occur without experience, a pattern of activities that is not learned; are born with the ability to perform the task.

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Learned behaviors: behaviors that are changed by experience

Example of a learned behavior - Birds can learn by imitation. In a study, a Blue Jay learned not to eat Monarch Butterflies by watching other jays eating Monarchs & spitting them out because they taste bad. The other jays were in adjacent cages.

Example of an instinctive behavior - Almost all insect behavior is instinctive (think of spiders spinning a web). All female Golden-cheeked Warblers use Juniper Ashe (cedar) bark to construct her nest. The following is a situation where instinctive behavior and learned behavior are involved in behavioral activity: It is instinctive for a bird to chase after a butterfly to eat it, but if the butterfly is a Monarch butterfly, then the bird learns not to attempt to catch and eat Monarchs again because they are so distasteful.

Getting Ready

Use the laminated activity station sign to identify your table (in the guide book).

Materials List

Laminated Activity Signs (2)
Table (1)
Station Guide Book
Flip board
A map of a path at Doeskin Ranch
A collection of insect habitat cards

Taking Flight!

Station 7 – SOCIAL AND BENEFICIAL INSECTS

Goals

Understand the cooperative nature and roles of social insects. Understand the benefits of both social and solitary insects to nature and humans. Emphasize native bees (mason bees' life history and benefits). Construct native bee nest.

Background

This station begins by quickly exploring the answers to such questions as: What benefits do humans see from insects in the ecosystem? Are we dependent on insects? What would happen if there were no insects? The leader shows the children a number of different items, or points to something relevant in nature nearby, and asks the children what each item has to do with insects. Over the course of this activity,

the children acquire an understanding of how insects have a positive impact on their world:

Insects pollinate the flowers of plants.

Insects recycle dead trees, plants, and animals by eating them.

Insects limit mold and bacteria by eating other animal's leftovers.

Many animals eat insects, and some only eat insects.

Insects feed on other insects that eat our crops. (ETC.)

Having established why/how insects are beneficial to mankind, the bulk of the station's time should be spent on bees (social and solitary). Insect pollination of plants is the obvious segue.

SOCIAL INSECTS--BEES, WASPS, ANTS, TERMITES

MEMBERS OF THE COLONY

• WORKERS: egg hatches in 3 days -> LARVA

• 20th day PUPA emerges as FEMALE WORKER; 24th day MALE WORKER--DRONE

• FEMALE -- Does repairs, collects food or guards the hive, cares for and feeds larvae, buitds the honeycomb; does NOT mate or lay eggs.

• MALE (DRONES) – have stingers and the only job is to mate with the QUEEN; may die or be driven from hive in the Fall

• QUEEN

• as LARVA--stuffed with Royal Jelly--more sugar makes QUEEN larger

• 12 days as PUPA; 16th day emerges as QUEEN

• destroys rival queens: only one to a colony and the winner is always the newest

• 10th day after hatching the QUEEN takes her maiden flight and is pursued by drones from nearby hives

• mates with up to 10 drones and stores their sperm for her 2 year-long life.

• JOBS--

- LAYS EGGS--1200 a day; 200,000 a season
- 2 kinds of eggs: female workers, male drones

• PRODUCES PHEROMONES (chemical scents)

• CALMS THE HIVE when queen is gone, workers become agitated and more active and make cells larger- called QUEEN CUPS

• KEEPS IT FUNCTIONING

• LEAVES CROWDED HIVE w/swarm of young workers led by scouts to start new hive

SOLITARY (NATIVE) BEES

The European honeybee has been in a well-documented decline in the U.S. since the 1950s as a result of agricultural intensification, diseases, parasites, and pesticides. Unabated loss of this bee will have significant repercussions for large-scale, intensive agriculture to be sure. However, it will not be an ecological calamity. The conservation challenges facing native bees are where the real concerns for natural ecosystems lay.

There are 4 types of solitary bees:

1. Miners
2. Mason
3. Leafcutter
4. Carpenters

The nesting habits of native bees can be classified into two categories: deadwood-nesters and ground-nesters. The majority of native bees in Texas are members of the latter group and either nest in burrows dug of their own labor in bare ground, in preexisting underground cavities (rodent burrows), or within clumps of vegetation. Species that nest in dead wood generally live in tunnels left by wood-boring beetle larvae in standing dead trees, under the loose bark of downed wood, or in hollow stems.

The main contrast between the honeybee (imported) and the Mason bee (native) can be made in how the bees gather the honey and then carry it back to the hive/nest.

Honeybees are very efficient pollen carriers, using leg pockets, but this means not a lot of pollen gets spread around; also, honeybees tend to go to the same flower or tree until the nectar is depleted. Mason bees instead spread pollen that has gathered on the hairs of their stomach, spreading like flour from a sifter, and they will "flit" from blossom to blossom and tree to tree, increasing "cross pollination" and strengthening the fruit.

Activities

1. Pictures to discuss (2-4 minutes)

Fruits, Vegetables, Chocolate Bar, Coffee

Insects pollinate the flowers of these plants and plant by-products. Without insects visiting the flowers of these plants, few plants would pollinate and few flowers would produce seeds. If they couldn't produce seeds, they would eventually die off and disappear from the planet. Flies do more pollinating than any other type of insect. Bees are next, and then butterflies. Chocolate is made from the seeds of a cocoa tree's fruit. Coffee is made from coffee beans.

Fallen Trees, Rotting Wood

Insects recycle dead trees and plants by eating them. Plants, especially trees, consume a lot of the nutrients available in the soil and so lock up a lot of an ecosystem's nutrition. Subsequent generations of plants need these nutrients returned to the soil so that more plants can grow. Insects provide this service, particularly termites and beetles. Without insects, fungi and bacteria would decompose plant matter only very slowly. Dead plants and trees would pile up and it would be a very long time before they turned to dirt and provided room and nutrients for more plants to grow.

Dead Bird, Raccoon Scat

Insects recycle dead animals by eating them. Insects, especially flies, beetles and ants, very quickly consume dead animals. Although some birds and other animals are also scavengers, insects are the primary reason dead animals and dung don't pile up everywhere and make the world stink. Consider that the larvae that emerge from the eggs of a single fly can consume half a cow in just a few days. Here in Texas we have dung beetles that pat dung into little balls and then roll those balls off, where they bury the dung balls with their eggs. When the beetle eggs hatch, the beetle larvae eat the dung in the safety of an underground burrow.

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Rotten Food in the House

Insects limit mold and bacteria by eating other animal's leftovers. Ever wonder why old food left in the fridge only gets moldier and stinkier over time, while old food left outside usually disappears in a day or two? Although some animals will eat old food that's sitting outside, much of the food is eaten by insects like ants, flies, and beetles. The food hardly has time to get moldy and stinky. While mold can stink, bacteria are responsible for most of the stench. Mold and bacteria decompose organic matter much more slowly than insects recycle it.

Golden Cheeked Warbler, Frog, Lizard

Many animals eat insects, and some only eat insects. Without insects, most of these animals would die and never be seen by people again. The golden-cheeked warbler, an endangered bird (depicted), is one of these animals. One of Doeskin Ranch's primary purposes is to preserve golden-cheeked warbler habitat. The golden-cheeked warbler is an insectivore, meaning that it primarily eats insects. They prefer to feed their young soft-bodied prey, such as caterpillars and spiders, rather than hard-bodied prey such as beetles.

Honey, Honey Jars

Honeybees make honey by collecting nectar from flowers. Without honeybees, there would be no honey. The orchard Mason bee, a "solitary" bee, is very important for the pollinating of Texas' fruit.

2. Role-Playing the Life of the Hive

***Set out the hive (bee box), and flowers along the trail. Have the coffee can of honeycomb ready to show the children.

***Use chart on honeybees to expand on the information that the children read from their cards.

***Choose students to role-play and have them read and act out their roles:

1 SCOUT (male) -- EATEN BY A BIRD and dies

2 SCOUT -- (male) FINDS THE NEW HIVE (BEE BOX)

3 DRONE --(male) MATES WITH THE QUEEN AND DIES

4 DRONE -- (male) MATES WITH THE QUEEN AND DIES

5 QUEEN -- (female) LAYS THE EGGS

The queen is kept in the bottom box (the brooder) of the super (stack of bee boxes) by clipping her wings. Otherwise, she would lay her eggs where the honey is being made.

6 WORKERS-- (female) I FEED THE LARVAE (YOUNG). I feed the queen royal jelly all of her life (a secretion from the workers' glands) and feed the royal jelly to the larvae for the first two and a half days.

WORKER – (female): I'm a field worker bee and I gather nectar and transfer it to the house worker bee by my tongue.

WORKER – (female): I'm a house worker bee -- I form the cells of wax and I fill the nectar into the cells with my tongue.

WORKER – (female): I gather nectar and transfer it to the house bee.

WORKER – (female): I gather nectar and when the cell is filled. I seal the cell with beeswax.

WORKER – (female): I gather the nectar and transfer it to the house bee.

WORKER – (female): I seal the cell with a thin layer of wax.

WORKER – (female): I defend the hive (ask who the predators of the hive might be)

WORKER – (female): I cool the hive when it is hot (Ask why. To keep the wax from melting. The bees will also keep the hive warm in winter to keep themselves from freezing)

3. Build a Solitary Bees' House

Using paper cups and straws, tie some straws into a bundle with string and place inside the cup. Remind the students that the house must be closed on one end (the bottom) so the bee doesn't get confused. Piece of paper towel can be place around the straws to hold them securely in the cup. Cup may then be placed on the ground between rocks or logs so they don't blow around, facing south or southeast (if paper is used, rather than plastic or a was milk carton, the house should be covered to protect it from wet weather).

Tips & Options: Have the students role play hive activity as you explain hive structure and behavior to them.

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Quiz Your Guests

1. Name two ways insects are beneficial to us.
2. What would happen if all the yucca plants at the Refuge died?
3. How much honey does a bee make in its lifetime (1/12 of a teaspoon).
4. What is “cross pollination”?

Take Away: Students may take their native bee house with them or leave it at the Refuge.