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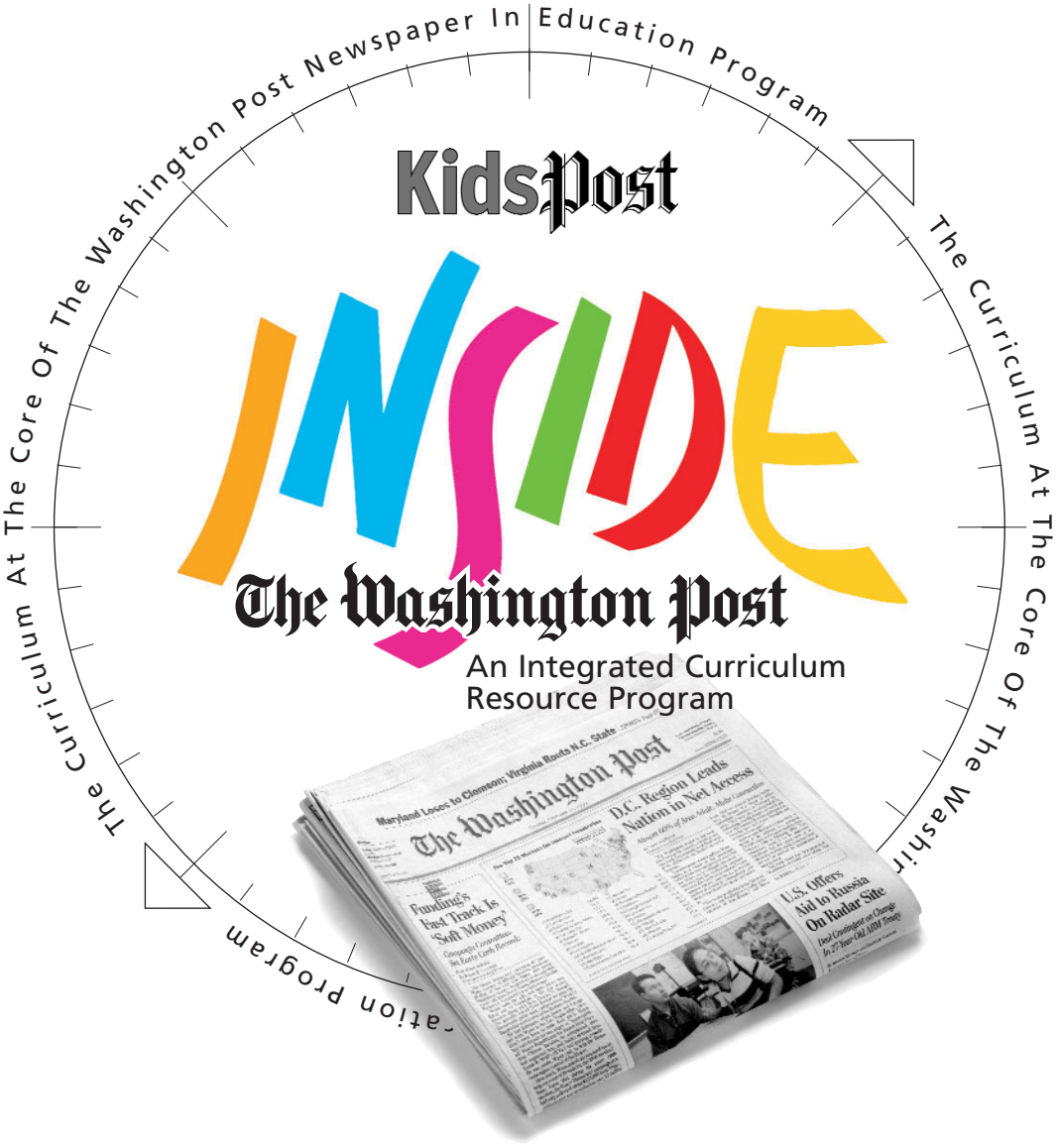
# CURRICULUM GUIDE: INSECT HABITAT




## IN THIS ISSUE

INSIDE The Washington Post
An Integrated Curriculum For The Washington Post Newspaper In Education Program
Volume 1, Issue 5 Oct. 9, 2001

# Insect Habitat

*KidsPost Article: "Mister Bug: Gary Hevel Found a Wild World in His Back Yard"*

**Lesson:** Observing and Classifying Insects

**Level:** Beginning to Advanced

**Subject:** Science

**Procedure**

**Read and Discuss**
Give students copies of "Entomology: Ant's Thermal Window of Opportunity" (see page 4). Explain to students the source of this Science Notebook selection. After students have read and answered the questions, discuss the answers. Tell students that although some researchers will go to faraway places to observe and to discover more about plants and animals, they can make many discoveries in their own back yards.

**Develop Vocabulary**
Give students the Back Yard Vocabulary words to define. This can be done individually, as pairs or as a class.

Depending on the age of your students, you may wish to give them Word Study: a look at entomology before they read the selection. This will prepare them to understand what Gary Havel does professionally.

**Read and Discuss**
Read KidsPost article, "Mister Bug." Give students the following questions and discuss their answers.

1. What is an entomologist? Where do entomologists work?

2. Why do you think Gary Hevel was not surprised to find so many insects in his back yard?

3. So far Mr. Hevel has found "2,200 species" in his back yard. What is a species?

4. In a census, the population is counted. Why is Gary Hevel taking a census of insects in his backyard?

5. Mr. Hevel said he will continue his census until "the 17-year cicada comes back in 2004." What is meant by "17-year cicada"? If the life cycle of the periodical cicada ends in 2004, in what year did it begin?

6. Name three ways Hevel has caught insects.

7. When Hevel mounts an insect, what information is included on the label?

## Insect Resources

*On the Web and in Print*

**ON THE WEB**

**http://www1.bos.nl/~bijlmakers/entomology/begin.htm**
**Entomology For Beginners**
A site for children to introduce the anatomy of adult insects and the metamorphosis of insects

**http://earthlife.net/insects/six.html**
**The Wonderful World of Insects**
Ever wonder what makes an insect an insect? Which is the biggest or smallest insect? The insect with the longest diapause? You'll find out at the Wonderful World of Insects. You will also learn how to join the Bug Club.

**http://www.ent.iastate.edu/misc/insectsasfood.html**
**Insect Recipes**
For the adventurous. The Entomology Club at Iowa State University provides eight recipes that range from chocolate-covered grasshoppers to rootworm beetle dip.

**http://www.insectia.com/**
**Insectia.com**
In English and French
Although Insectia.com promotes the 13 half-hour episodes of Insectia, there is much to be learned from the site itself. Check the profiles of 37 star insects and the travel logs. RealVideo brings them to life. The "Spotlight On" photographs and narrative give just enough information to encourage further research.

**http://www.discovery.com/exp/spiders/spiders.html**
**Spiders!**
If you are studying Australia, you may wish to explore all sections of the Discovery and the American Museum of Natural History expedition. For use with the KidsPost article, click on "In Your Own Backyard." Check out the descriptions and photographs of nine spiders you may find in your backyard.

**http://www.bugbios.com/**
**Bugbios**
A "shameless promotion of insect appreciation" is valuable for its pictures and links to more scholarly sites.

**http://www.bugbios.com/entophiles/index.html**
**Bugbios: Entomological Database of Very Cool Bugs**
Photographs and limited information on 14 insect orders.

continued

8. The ability of insects to adapt has been one of nature's great success stories. Insects represent 80% of all species. Give an example of adaptation in the article.

**Introduce Dichotomous Keys**
You may wish to visit one of the suggested Web resources (see Page 5) if you have very young students. Use "Arthropods and Dichotomous Keys" to introduce students to taxonomy.

**Enrichment**
1. Insects can be friend and foe. You might have students study the relation of birds and insects. For the pro-bird perspective read How Birds Keep our World Safe from the Plagues of Insects (**http://natzoo.si.edu/smbc/Products/Factsheets/fxsht2.htm**).

2. Artist M.C. Escher often used insects in his imagery. Show students examples of his work. Can they identify the insects? "Symmetry E70; Butterflies" is one example (**http://www.WorldOfEscher.com/gallery/SymmetryE70.html**).

3. Learn more about butterflies. Visit a ThinkQuest project created by three students in Germany, Hong Kong and California. Butterflies: On the Wings of Freedom (**http://library.thinkquest.org/C002251/index2.shtml?tqskip=1**) provides scientific information, photographs, an interactive game for younger students and films created by the team. There is even a place for students to post and to read poems about butterflies. "Butterflies at School" will give teachers advice on learning about butterflies and moths in the classroom. Available in English, German and Chinese.

"Mister Bug" can be found at **http://www.washingtonpost.com/wp-dyn/articles/A29094-2001Oct9.html.**

**http://www.ent.iastate.edu/List/insect_collections.html**
**Iowa State Entomology Index: Insect Collections**
Links to insect collections around the world. A resource for the serious entomologist and teachers. Also visit the index of insect sounds.

**IN PRINT**
Boniface, William. Mystery In Bugtown
Illustrated by Jim Harris, published by Accord Publishing Ltd. 1997.
Inspector Cricket's investigation begins when gangster Charlie Roach is nearly murdered at the Bugtown Insects' Ball. Die cut holes show wiggling eyeballs on each of the featured insects which include Police Chief Slugg, Inspector Cricket, Charlie Roach, Miss Ladybug, Ferdinand ant, C-Note Pete (a centipede, which is NOT an insect because it has too many legs), Spider Queen, the Mantis Brothers, and Katy (who did it).
After the wonderfully engrossing story, there is a glossary of all the insects and bug characters from the story with in-depth descriptions and illustrations of them all. Recommended: Children 3 and up.
Davis, Richard. Antics: An Ant Thology. 1995.
Go to "An Ant Thology Home Page" (http://www.ionet.net/~rdavis/antics.shtml) to get an ant-vance look at "Ant" words.

## Back Yard Vocabulary

**Adaptation:** An alteration or adjustment in structure of habits, often hereditary, by which a species or individual improves its condition in its environment

**Biodiversity:** Variety of life

**Bristle:** To be covered or thick with

**Census:** An official usually periodic count of a population

**Entomologist:** One who engages in the scientific study of insects

**Exotic:** From another part of the world; intriguingly unusual

**Impale:** To pierce with a sharp stake or point

**Insect:** Small arthropod animals of the class Insecta, having an adult stage characterized by three pairs of legs and a body segmented into head, thorax and abdomen, and usually having two pairs of wings

**Menagerie:** A collection of wild animals or exhibition; a diverse or miscellaneous group

**Species:** A fundamental category of taxonomic classification, consisting of related organisms capable of interbreeding

**Teeming:** To be full of, swarming

**NAME** _____

## Entomology: Ant's Thermal Window of Opportunity

When the heat of the Sahara's midday sun reaches about 116 degrees Fahrenheit and has driven all other creatures underground, the silver ants burst out from their burrows for the only opportunity they have all day to find food.

Able to tolerate temperatures that would kill other species, they forage for corpses of other insects that came out earlier but failed to retreat in time and died of overheating. Later in the day, when the temperature hits 128, even the silver ants must retreat.

Why don't the ants come out before it gets so hot? Because there is a species of lizard that lives near ant nests and gobbles up any that venture out too early. At about the temperature that forces the lizards underground, the ants come out, signaled by sensor ants that check the temperature at intervals.

Because ants are so small, their body temperature is about the same as that of the air. Even though silver ants can function at the highest temperature of any known land animal, when the temperature has risen another 12 degrees, they must retreat or die.

***—Boyce Rensberger***

1. The daily cycle of an animal's activities are influenced by such factors as temperature, availability of food, humidity, rainfall, searching for mates, day/night cycle and threat of a predator. Which of these factors is evident in "Entomology: Ant's Thermal Window of Opportunity"? Give an example of each factor.

2. Describe the relation of the following six elements. The relationship may be depicted in a paragraph, an illustration with labels and captions or a narrative told from the point of view of one of the "characters."

a. Sahara silver ants

b. 116

c. Underground burrows

d. 128

e. Fringe-toed lizard

f. Sensor ants

3. Why do the ants not seek food earlier in the day or later in the evening?

4. The diurnal fringe-fingered lizard, *Acanthodactylus dumerili*, whose favorite food is the silver ant, has eyelids with interlocking scales and fringes on its fingers and toes. How might these adaptations help it to survive in its habitat?

5. Why do you think the three researchers studied and reported on the behavior of Sahara silver ants? Why would the Post report it to its readers in metropolitan D.C.? Why is such knowledge important to us?

6. What do you think would happen to silver ant behavior if a colony were relocated to the sands of the Virginia or Maryland coastline? What would happen to the colony's organization? What would happen to the sensor ants and the job they traditionally perform? Would the dramatic change kill them or would the less hostile environment cause the numbers to flourish? What else do you need to know about the Virginia and Maryland coastlines before you can make a hypothesis about the ant's potential for survival?

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Read Science Notebook and Science articles on Monday in the Post for exploration and explanation of aspects of science affecting our society and an introduction to recent discoveries.

This Science Notebook piece was published in The Washington Post in 1992. In it former Post science writer Boyce Rensberger was reporting on the study of researchers in the Department of Zoology at the University of Zurich (Rudiger Wehner and Sybil Wehner) and the Department of Zoology at the University of Namibia in Africa (A.C. Marsh). Their study had just been published in Nature.

## Arthropods and Dichotomous Keys

**Lesson:** An introduction to dichotomous keys

**Level:** Beginning to Advanced

**Subject:** Science

**Procedure**
Swedish naturalist Carolus Linnaeus (1707-1778) developed a system of categorizing organisms. Called binomial nomenclature, the system is still used today to classify new species that are discovered.

Structurally similar organisms are placed into a group called a **species**.

Similar species are grouped into a larger group called a **genus**, and a similar genera into a **family**.

Similar families are placed in an **order**; similar orders, in a **class**, and similar classes, in a **phylum**.

Phyla are placed in one of five **kingdoms**.

More than 80 percent of all animal species belong to the Phylum Arthropoda.

This lesson plan introduces students to arthropods, the methodology of classification and dichotomous keys.

What are the distinguishing characteristics of arthropods?

Teachers should collect specimen (either alone, with your family or on a class field trip). Or on one of those back-to-school days, go with colleagues on a hunting expedition. If you work with colleagues, you could have quite a collection. Remember to bring small bags or jars in which to place your finds. Be sure to record the date and location where each was found. Species identification will be added later.

Examples of arthropods should be grouped by distinguishing characteristics. To create each display, 8-inch by 8-inch boxes, 8-inch by 8-inch Styrofoam sheets and long pins will work. Read to learn preservation techniques if you plan to use this arthropod collection annually.

If instructors have five groups of arthropods, they should divide the class into five groups. Place students with

### ON THE WEB, KEYS TO ORGANIZING

*Introductions to dichotomous keys can be found at the following Web sites.*

**http://www.iit.edu/~smile/bi8611.html**
**Constructing a Dichotomous Key**

**http://www.enchantedlearning.com/subjects/plants/activity/key.shtml**
**Dichotomous Key: Classroom Activity**

**http://ericir.syr.edu/Virtual/Lessons/Science/Process_Skills/SPS0002.html**
**Dichotomous Key: An AskERIC Lesson Plan**

**http://www.zoo.utoronto.ca/able/volumes/vol-12/7-timme/7-timme.htm**
**How to Construct and Use a Dichotomous Key**

*Help with preserving and displaying insects can be found at this site.*

**http://master.ph.utexas.edu/TxVC/TreeOfLife/JMcFarland/mcfarland/insects/identify/idorde~1.htm**
**Identifiable Features and Collecting Tips For the Adult Form of Some Insect Orders**

## Habitat Vocabulary

**Biota:** The animal and plant life of a region; flora and fauna.

**Community:** The plants and animals within a certain habitat.

**Ecosystem:** A community plus the nonliving environment.

**Eradication:** To remove, destroy.

**Habitat:** A place where living things naturally grow and live.

**Hypothesis:** An educated guess.

**Niche:** Organism's role, or job, in its habitat

**Population:** The number of individuals representing a species in a given area.

**Prey:** An animal that is hunted and eaten by a predator.

**Reproduction:** The natural process by which new individuals are generated and the species perpetuated.

**Species:** A group of living things of the same kind that can reproduce with one another.

**Survival:** The process of ensuring that a species, or individual, will live to maturity and reproduce.

**Taxonomy:** The science of identifying, classifying and naming organisms.

different strengths in each group. Students will rotate in a group to each specimen grouping. For each group of specimen, students should be asked to

- Examine the groups of arthropod specimen.
- List three distinguishing characteristics they all share.
- Draw sketches to illustrate the chosen characteristics.

The data collection sheet does not need to be elaborate:

GROUP ONE

Characteristic 1:

Characteristic 2:

Characteristic 3:

Sketch:

- **What are the traits of Phylum Arthropoda?**

When students have completed data collection, ask students to examine all five lists of characteristics. What characteristics do all groups share? These would be Phylum Arthropoda traits.

Traits of the Phylum Arthropoda include chitinous exoskeleton and a segmented body to which jointed appendages are articulated in pairs. "Arthro" comes from the Greek root *arthron*, meaning joint.

- **How do scientists classify a new, unidentified organism?**

Introduce students to dichotomous keys which scientists use to place unidentified organisms into related groups. A dichotomous key has two choices and each choice will either identify the organism or send it on to additional choices. A dichotomous key for classes of the Phylum Arthropoda might look like this:

1. a. Arthropods with six legs . . . . . Class Insecta
   b. Arthropods with more than six legs . . . . . go to #2
2. a. Arthropods with four pairs of legs . . . . . Class Arachnida
   b. Arthropods with more than four pairs of legs. go to #3

If you were establishing a dichotomous key for insects, you might first ask students what is true of all insects. They have six legs, jointed legs and wings. Then they must observe more closely to distinguish one insect grouping from another.

Teachers would have a chart of the distinguishing characteristics for their own reference. This would include Neuroptera, Hymenoptera, Coleoptera, Odonata, Hemiptera, Orthoptera and Diptera. Specimens for all of these can be found in the metropolitan area. Mosquitoes and true flies are of the order Diptera, while crickets, cockroaches and grasshoppers of Orthoptera, for example. The order Diptera is distinguished by a single pair of membranous wings and a pair of club-shaped balancing organs. The characteristics you would have for Orthopterans would include folded membranous hind wings covered by narrow, leathery forewings and mouthparts that are adapted for chewing.

When finished, put the lids on the boxes, and store your mini-museum for next year.

# Visit the Smithsonian NMNH

**National Museum of Natural History**

The National Museum of Natural History had 9.4 million visitors in 2000, making it the most-visited museum on earth.

The paleobiology area has many insect fossils and the Burgess Shale at the entrance to the dinosaur hall has many arthropods (insect relatives). The giant eurypterid model in the paleo hall is a great insect ancestor. Life in the Ancient Seas has many trilobites, extinct insect relatives. Zuni pottery on the first floor has some insect icons on the pottery itself. Africa Hall has insect icons on some artifacts.

**Smithsonian Butterfly Habitat Garden**

Wetland, meadow, wood's edge and urban garden habitats demonstrate the partnership between plants, butterflies and bees. The second phase continues the key concepts from the first garden and adds several new ones—a pollination station that highlights the role bees play in habitat health and signs that provide clues to seasonal butterfly behavior. The central goal of the garden is to help people of all ages observe and learn about the interactions that are going on around them and to encourage them to plant vegetation that will nurture plant and insect diversity, which, in turn, affects the health of the environment. The garden provides practical information on how to do this.

Go to **http://photo2.si.edu/bfly/bflybuild.html** for background on this outdoor addition to the Mall.

**O. Orkin Insect Zoo**

Climb inside a replica of a termite mound. Interact with live spiders, roaches and other insects. Visit the house to meet some hitchhikers. Docents are available to answer questions. Prepare for your visit with a virtual tour at **http://www.mnh.si.edu/museum/VirtualTour/Tour/Second/InsectZoo/index.html.** No reservations needed.

**How to Arrange a Tour**

Teachers, call 1-800-563-4687 and ask for the PLANET INSECT video and teacher guide. It is a free 10-minute video for teachers and students about the insect zoo; the guide has materials for use in the classroom.

Docent-led lesson tours in the National Museum of Natural History are offered without cost, weekday mornings on a pre-scheduled basis. Application for tours and programs is found at **http://www.mnh.si.edu/museum/education/2000/tour_app.html**; these must be submitted at least 4 weeks in advance to the Office of Education. You must have one adult for every 10 students, grades 3-7.

Regular museum hours: 10:00 a.m. to 5:30 p.m. every day of the year except Christmas Day. An estimated 8 million people visited the NMNH in 2000. Plan your visit. Call 202-357-2700 for information.

**Naturalist Center**

Discover the Naturalist Center!

Imagine having resources, once only available to professional researchers ... right at your fingertips. Now you can explore a vast "library" of over 30,000 objects from the Smithsonian Institution's natural history collections, and use books, microscopes and other tools to help you study them.

Discover how scientists solve mysteries by solving real mysteries yourself.

The Naturalist Center is a unique educational facility of the Smithsonian Institution's National Museum of Natural History. It is designed especially for students, collectors, teachers, artists and others who have a serious interest in natural history.

Examine, study, draw, photograph, measure, research, identify, compare and find answers to intriguing natural history questions. YOU are the investigator at the Naturalist Center.

The Naturalist Center in Loudoun County, Virginia, is located just two miles from the Dulles Toll Road Extension (the Greenway) in the Leesburg Air Park, an easy drive from Washington, free of traffic and stop lights. There is plenty of parking for cars and buses. The address is 741 Miller Drive SE, Leesburg VA 20175. Call 703-779-9712 or 1-800-729-7725 for directions and scheduling information.

**Hours:** Tuesday through Saturday, 10:30 to 4 p.m.

Closed: Sundays, Mondays, and all federal holidays

## Word Study: A look at entomology

You know a classical language—Greek. Greek words are found in many of our English words. They can be a prefix, a root word and a suffix.

Entomon is Greek for insect. Its root is *entomos*, meaning cut in two, or *tomos*, section. Early observers noticed that insect bodies were divided into parts.

Do you recognize "logy" at the end of "entomology"? You have seen it in "biology" and "zoology." This suffix is also of Greek origin. "Logy" means "study of."

**Entomon + logy** = entomology, the study of insects

Insects belong to the phylum Arthropod. This is the large group of animals that are all jointed. Its Greek root is *arthron*, meaning joint. All arthropods have a chitinous (look up its Greek etymology) exoskeleton and a segmented body with pairs of jointed body parts. Entomologists are individuals who study Insecta, a particular class of arthropods.

There are thousands of arthropods. There are many other animals and plants and organisms. A Swedish scientist decided that scientists needed a way to organize all species. He grouped them by their similarity. A plan for classifying is called a taxonomy. The Greek roots for "taxonomy" are *taxis*, meaning arrangement + *nomie*, meaning method.

The largest, or first, division of the taxonomy of life is kingdom. There are five kingdoms: Animalia (animals), Plantae (plants), Fungi, Prokaryotae (bacteria) and Protoctista (algae, protozoans, slime molds).

## Taxonomy Outline

Kingdom
- Animalia
- Plantae
- Fungi
- Prokaryotae
- Protoctista

Phyla
- There are 36 phyla in Animalia.
- Arthropoda is one of them.

Class
- There are 4 classes of Arthropoda:
- Crustacea
- Myriapoda
- Chelicerata (Arachnida)
- Uniramia (Insecta)

Orders
- Insecta is divided into 29 orders.

Family

Genera

Species

Most animals and plants are known by their genus and species names.
Use a capital letter for the genus. Use lower case for the species. Use italics for the pair.

NAME _____

# Seen in Silver Spring

*Insects can be found throughout the world, but we will look for them in Silver Spring. Can you locate the following insects and associated words? Find and circle the items listed. Words run left to right, right to left, top to bottom, bottom to top and diagonally.*

| | | | | | |
|---|---|---|---|---|---|
| Ant | Cranefly | Mantis | Silver Spring | Butterfly | Net |
| Cicada | Locust | Rove | Bug | Moth | Wasp |
| Lady bug | Roach | Breeze | Gnat | Tree | |
| Pins | Beetles | Glove | Mosquito | Buzz | |
| Bees | Fly | Mite | Snail | Insect | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T | B | E | Z | S | B | R | E | E | Z | E | W | N |
| B | N | G | Z | N | M | O | S | Q | U | I | T | O |
| E | E | M | U | A | Y | A | S | I | T | N | A | M |
| E | T | O | B | I | J | B | D | E | R | A | H | S |
| S | I | T | Y | L | F | E | N | A | R | C | N | D |
| S | M | H | G | U | B | T | S | U | C | O | L | G |
| B | S | I | L | V | E | R | S | P | R | I | N | G |
| P | I | N | S | T | C | R | O | A | C | H | C | U |
| Y | P | S | A | W | G | L | O | V | E | E | E | B |
| L | B | E | E | T | L | E | S | E | E | R | T | Y |
| F | R | C | S | S | T | Z | Z | G | R | A | S | D |
| A | N | T | G | R | A | S | S | G | R | E | E | A |
| B | U | T | T | E | R | F | L | Y | G | R | M | L |

For extra credit: Find the first person objective pronoun that also might be seen in Silver Spring.

NAME _____

# Meet the Insects

*Which insect said it? Place the letter of the introduction under the appropriate picture of that insect.*

1. _____

2. _____

3. _____

4. _____

5. _____

**A. Tiger Swallowtail Butterfly**
In French I am a papillon, so you should not be surprised that I am *Papilio glaucas*. I am a strong flier with distinctive yellow and black markings on my wings. My hindwings end in long "tails" that some think look like the pointed tails of swallows.

**B. Mantispid**
This is the second verse of a poem about me written by D. Keith McE. Kevan. Can you guess who I am?

"I am" she said,
"for I have fed
"When young on
spider's eggs,
"But now,
instead, for daily
bread, "Gnats
catch I with my
legs—"My claws
embedded 'til
they're dead—
With mantid
spine-like pegs."

**C. Longhorn beetle**
My ancestors had it good. The scarab was a religious symbol in Egypt. The Tamamushi reliquary in a temple in Japan is adorned with 9,000 forewings of another distant ancestor, the *Buprestid Chrysochroa fulgidissima*. I come to America and they call me a pest. Some reactionaries even say I could do more damage than Dutch elm disease, chestnut blight and gypsy moths combined. I can't help it. I never saw a hardwood I didn't like.

**D. Damselfly**
When I am a nymph, I must be careful. Trout like to eat me. I swim slowly like a fish moving my tail back and forth. I prefer the clean shallow water of marshes, ponds and lakes. When it's time to mature, I cling onto land vegetation as my skin breaks along my wing case. I have a narrow body and fine features, including large but delicate wings. If you go fly fishing, you may see me on the tip of your rod.

**E. Tiger moth**
It is difficult to get some attention. There's a plane and a band named after me. They are often in the spotlight. I have to be happy under your porch light. If you take the time to look closely, you will find my distinctive markings are quite lovely. If you find me as *Apantesis virgo*, you will love my coloring.

For more information about the Tiger Swallowtail Butterfly, go to
**http://www.enchantedlearning.com/subjects/butterfly/species/Tigersw.shtml**

To read more about and see great pictures of Damselfly, go to
**http://www.flyfisherman.com/bench/features/07-01damsels/**

To read the entire poem about The Mantispid, go to
**http://www.bugbios.com/ced3/dkmce_kevan.html**

To see pictures of Apantesis virgo, go to
**http://bcrc.bio.umass.edu/kunkel/Moths/A_virgo.html**

# Academic Content Standards

*This lesson addresses academic content standards of Maryland, Virginia and the District of Columbia. Among those that apply are:*

**The main lesson addresses these academic content standards of:**

## Maryland

*Science*

Life Science (3.0): Students will use scientific skills and processes to explain the dynamic nature of living things, their interactions and the results from the interactions that occur over time. Biochemistry: By the end of grade 3, students know and are able to: 3.3.12 explain that habitats provide basic needs, (i.e., food, water, shelter, energy) for the organisms living in them. Ecology: By the end of grade 3, students know and are able to: 3.3.12 explain that habitats provide basic needs, (i.e., food, water, shelter, energy) for the organisms living in them. By the end of grade 5, students know and are able to: 3.5.12 cite evidence that individuals and groups of organisms interact with each other and their environment (i.e., food chain, reproduction, decomposition).

Environmental Science (6.0): Students use scientific skills and processes to investigate the interrelationships of the natural world and to analyze environmental issues and their solutions. Interdependence of Organisms: By the end of grade 8, students know and are able to: 6.8.2 identify and explain the interdependency of organisms within the environment in a given ecosystem (i.e., producer/consumer, predator/prey, host/parasite).

A complete list of State Content Standards of Maryland can be found at http://www.mdk12.org/mspp/standards/.

## Virginia

*Science*

Living Systems, Grade 5: 5.5 The student will investigate and understand that organisms are made of cells and have distinguishing characteristics. Key concepts include

- five kingdoms of living things;
- vertebrates and invertebrates.

Grade 6: 6.9 The student will investigate and understand that organisms depend on other organisms and the nonliving components of the environment. Key concepts include:

- producers, consumers, and decomposers;
- food webs and food pyramids;

*Life Science*

Life Science standards emphasize a more complex understanding of change, cycles, patterns and relationships in the living world.

LS.4 The student will investigate and understand that the basic needs of organisms must be met in order to carry out life processes. Key concepts include

- animal needs (food, water, gases, shelter, space); and
- factors that influence life processes.

LS.5 The student will investigate and understand classification of organisms. Key concepts include

- differences in number, color, size, shape, and texture of external and internal structures; and
- variation in method of locomotion, obtaining nourishment, and reproduction.

A complete list of Standards of Learning of Virginia can be found on the Web at http://www.pen.k12.va.us/.

## Washington, D.C.

*Science*

Life Science, Content Standard 2: Observe, investigate, describe and classify living things; explain life cycles, diversity, adaptations, structure and function of cells and systems reproduction, heredity, interdependence, behavior, flow of energy and matter and changes over time. By the end of grade 3, the student will use senses and magnifers to observe and compare living organisms; explain that most living things need water, food and air; describe how animals eat plants or other animals for food and may use plants or other animals for shelter and nesting. By the end of grade 5, the student will explain how changes in an organism's habitat are sometimes beneficial to it and sometimes harmful; observe and conclude that insects and various other organisms depend on dead plant and animal material for food; identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web. By the end of grade 8, the student will describe and use the standard classification system used by biologists.

A complete list of Standards for Teaching and Learning of the District of Columbia Public Schools can be found at http://www.k12.dc.us/.