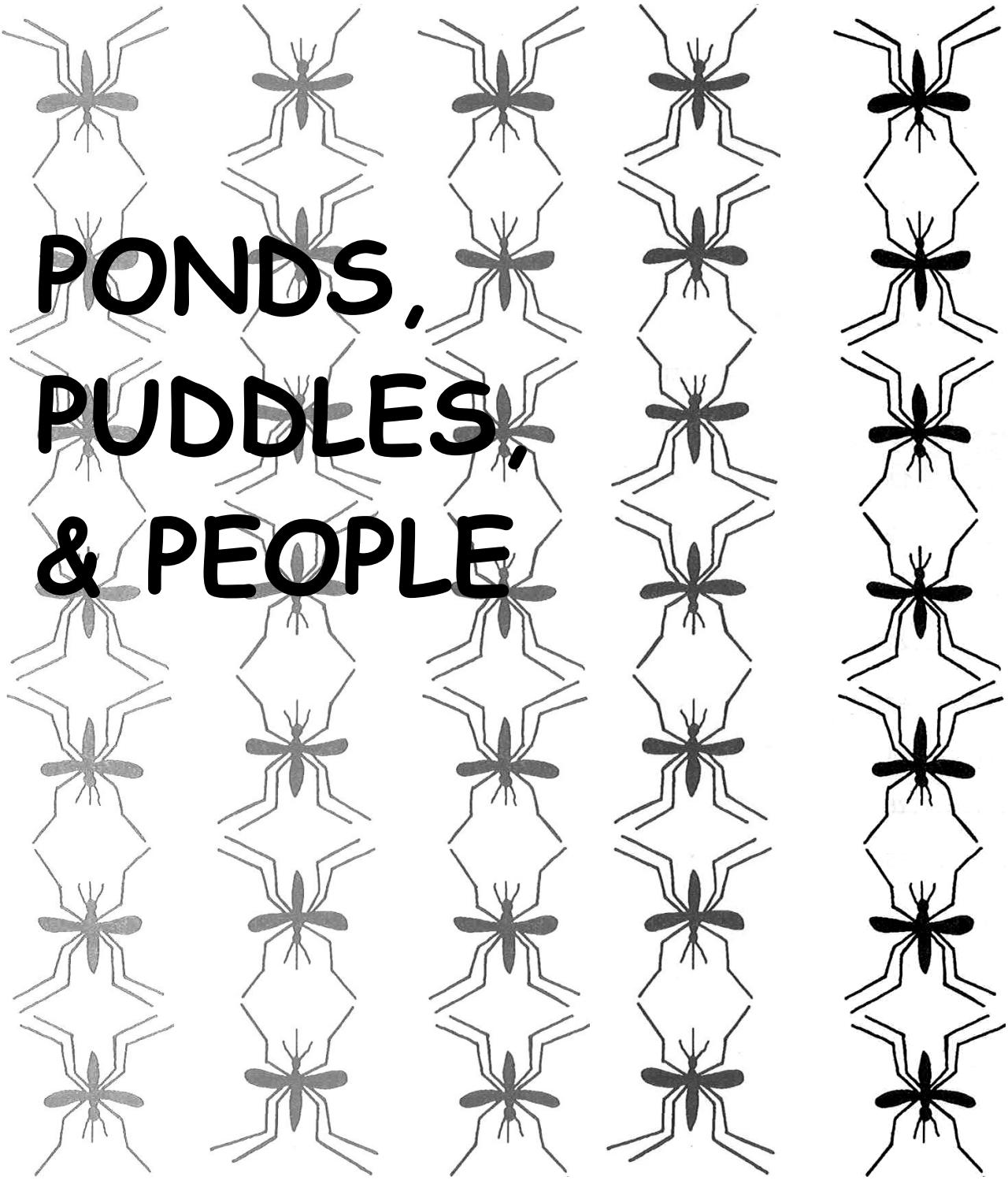
PONDS, PUDDLES, & PEOPLE



An Aquatic Systems/Mosquito Education Unit
Developed by:
The Lee County Mosquito District,
the Department of Environmental Education,
The School District of Lee County
and Florida Gulf Coast University

Aquatic Systems
Mosquito Education Program

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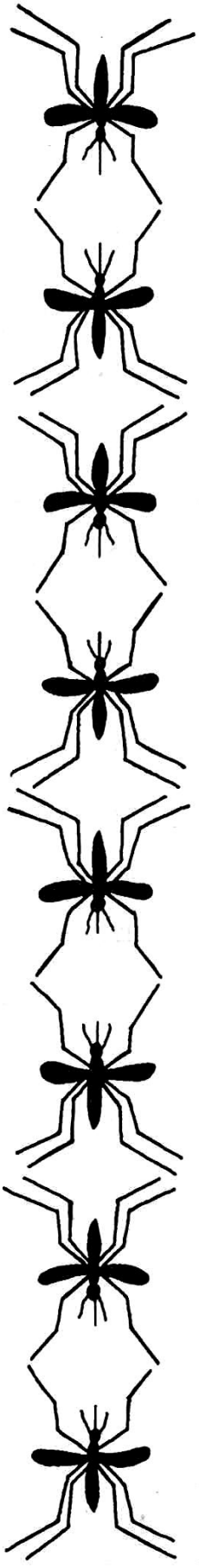

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Introduction

This elementary Aquatic Systems/Mosquito Education unit was created through a cooperative effort between the Lee County Mosquito Control District (LCMCD) and the School District of Lee County. The project is funded by the LCMCD and staffed by two resource teachers through the Department of Environmental Education (EE) and one instructor at Florida Gulf Coast University (FGCU). This booklet was prepared by these educators with consultation and cooperation from mosquito control personnel.

The unit is designed to teach fifth grade students about aquatic systems and, specifically, about mosquitoes. The students will participate in activities that help them learn about the relationship between weather and mosquitoes, the life cycle of mosquitoes, diseases transmitted by mosquitoes and mosquito control methods. Many of the activities were designed to correlate with the Sunshine State Standards in the fifth grade subject areas.

The program takes five 45-minute class periods. The classroom teacher leads the first day's lesson. The cognitive pretest is administered, followed by a discussion and activities that will prepare the class for the presentation by the resource teacher. The second, third and fourth days are taught by the resource teacher. On the fifth day, the classroom teacher administers the post-test and conducts any of the optional enrichment activities, which include building a model mosquito and designing a pamphlet about mosquitoes.

Day 1

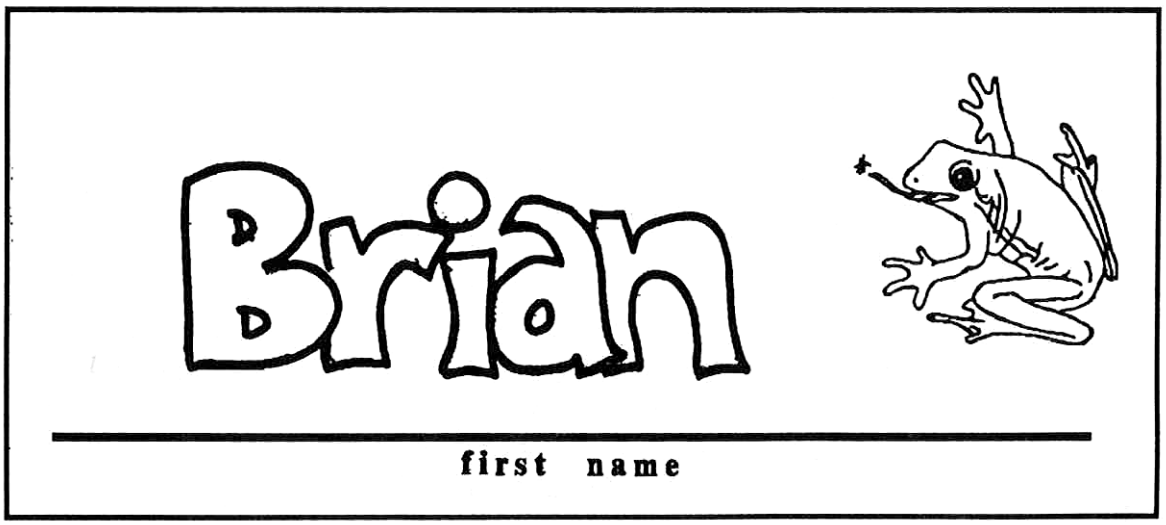
The classroom teacher leads the following activities.

Pretest

The cognitive Pre/Post Test is in the Resources section of this booklet on pages 21 and 22. The classroom teacher copies and administers the pretest.

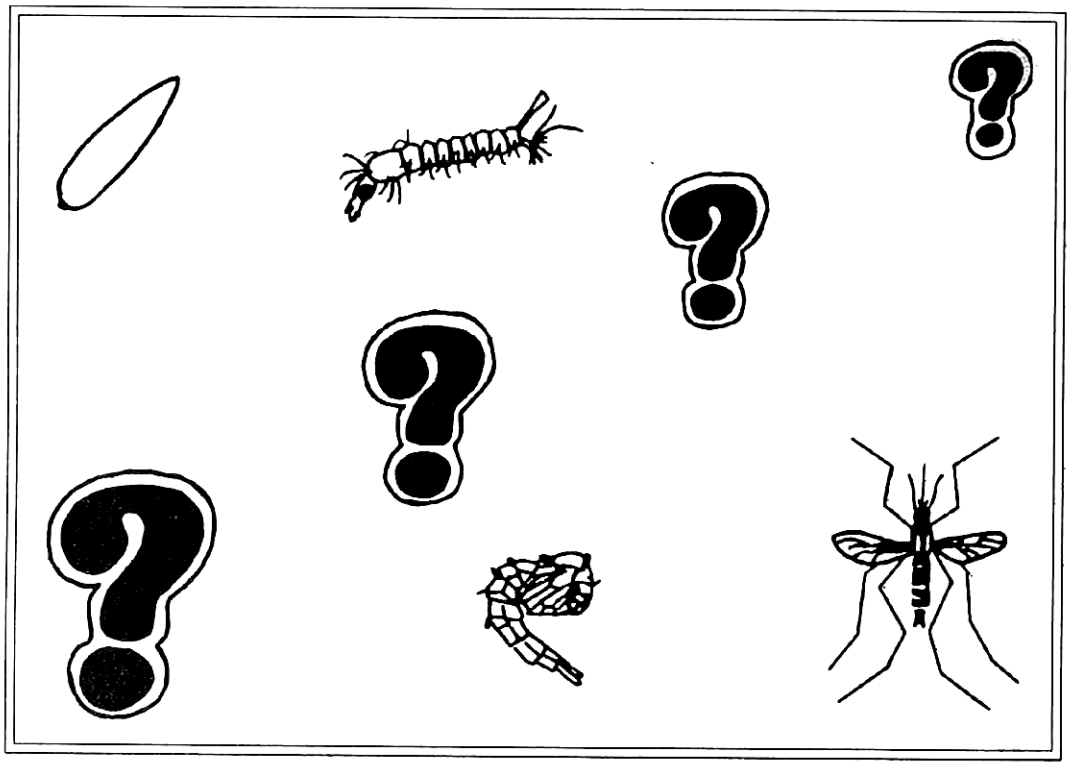
Desktop Nametags

Nametags will be provided for each student. They will arrive through the school mail four weeks before the unit is scheduled to begin. Students should write their first names large and legibly on the nametags with a bold dark marker. The nametags should be displayed on the student desks when the resource teacher visits the classroom. A sample nametag may be found in the Resources section of this booklet on page 23.



What Do You Know? K-W-L Chart
(Group Activity)

The teacher should begin the unit by writing the question "What do you know about mosquitoes?" on the board. Students should work in groups of five for about seven minutes to develop answers to the question. One student in each group should record the answers. A combined list of all groups information can be listed on the board. Using the list of answers as a starting point, the teacher may ask students to explain their answers in more detail to discover the depth of their knowledge.



Fact or Opinion?

After discussing the answers given to the question "What do you know about mosquitoes?" the teacher may have the students classify the answers given as facts or opinions.

For homework, students could be asked to question friends and family members about mosquitoes. Have them share and discuss the homework assignment on the next day. From their responses, make judgments about which statements are fact and which are opinion. Students may need to find out more about mosquitoes and the accuracy of the statements collected.

Day 2

An environmental education/mosquito control resource teacher will conduct instructional activities on days two, three and four.

The resource teacher will conduct a PowerPoint presentation and discussion covering the information below. Students will be provided with a Vocabulary sheet and a Life Cycle sheet. They will be asked to listen for and circle fourteen of the vocabulary words that will be mentioned during the PowerPoint. The students will be given the opportunity to sketch the four stages of the life cycle of the mosquito during the presentation. Samples of the Vocabulary and Life Cycle sheets are provided in the Resources section of this booklet on pages 26 and 27.

Ponds, Puddles, and People (Slide Presentation)

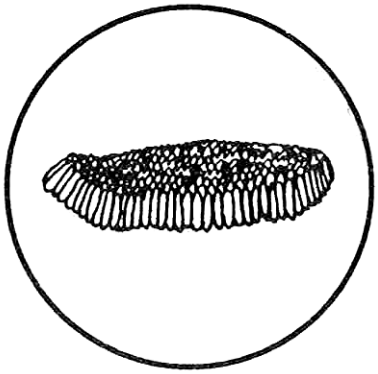
The Water Cycle

Water is continuously recycled. The water that is on the earth today is the same water that was present during the days of the dinosaurs. Water may change from solid to liquid to gas. In the water cycle, water from the earth's surface is **evaporated** and rises into the atmosphere where it **condenses** to form clouds, then falls to the ground as **precipitation**.

After a heavy rainfall, water may collect in puddles or drain into ditches. These new, temporary aquatic environments provide habitat for many animals. Eggs that have been laid on the ground or on plants have been waiting for water so they can hatch into beetles, worms and many other kinds of organisms. Frogs and toads come to the newly formed puddles and lay hundreds of eggs. In just one day, a newly formed puddle can become home to thousands of creatures. Among all of the eggs that have been laid in the soil prior to the rain, there will, inevitably, be mosquito eggs. Once these eggs are covered with water, it takes a very short time for them to hatch.

Metamorphosis

Mosquitoes grow to adulthood through four stages. This process is called **metamorphosis**. Many other insects, including butterflies, moths, dragonflies and beetles, undergo metamorphosis. The four states in mosquito metamorphosis are egg, larva, pupa and adult.



Egg

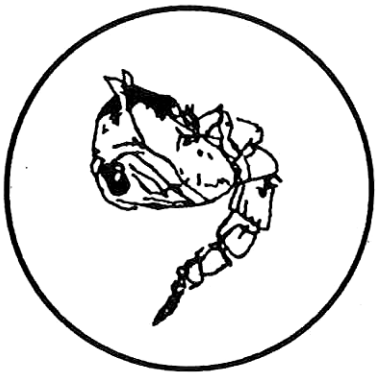
Female mosquitoes, depending on the species, may lay eggs on the surface of standing water in groups called rafts, or individually, on dry or moist ground or on vegetation. All mosquito eggs, regardless of species, need water to hatch. Depending on the availability of water, the eggs may hatch within a few minutes or lay dormant for years before they finally emerge as larvae. One square foot of salt marsh may contain over 10,000 salt marsh mosquito eggs waiting for a high tide or heavy rain to provide conditions suitable for hatching.

Larva

When a mosquito egg hatches, the immature mosquito begins its life in the larval stage. Mosquito larvae live only in water. If their habitat dries up before they have developed into adults, they will die. The mosquito larvae are small, worm-like animals with no legs. They have many hairs, especially around their mouthparts. At the tail there is a tube called the siphon. The larvae stick their siphons out of the water to breathe. Larvae move through the water column by jerking their bodies back and forth. Close observation will reveal their constantly working mouthparts, as they search for small organic particles of food. Mosquito larvae are generally found in shallow water, either fresh or salt, depending on the species.

As the larva eats, it grows to the point where it can't grow further, due to its hard **exoskeleton**. The larva then sheds, or **molts**, its exoskeleton, leaving beneath a much softer one that will stretch as it grows. The larva will continue to eat and grow and will molt four times. Each of the four larval stages is called an instar. A mosquito larva goes through four instars, and during the final molt, the pupa emerges.

Pupa



The pupa resembles a fat comma. It does not feed and has no eyes. This period of time in the mosquito's development is devoted to growth and change. The pupa normally rests at the surface of the water with its two breathing tubes, or **trumpets**, connected to the water's surface. Occasionally, if danger threatens, the pupa will tumble to the bottom. When the pupa is fully developed, it will come to the water's surface one last time to emerge into the adult mosquito.

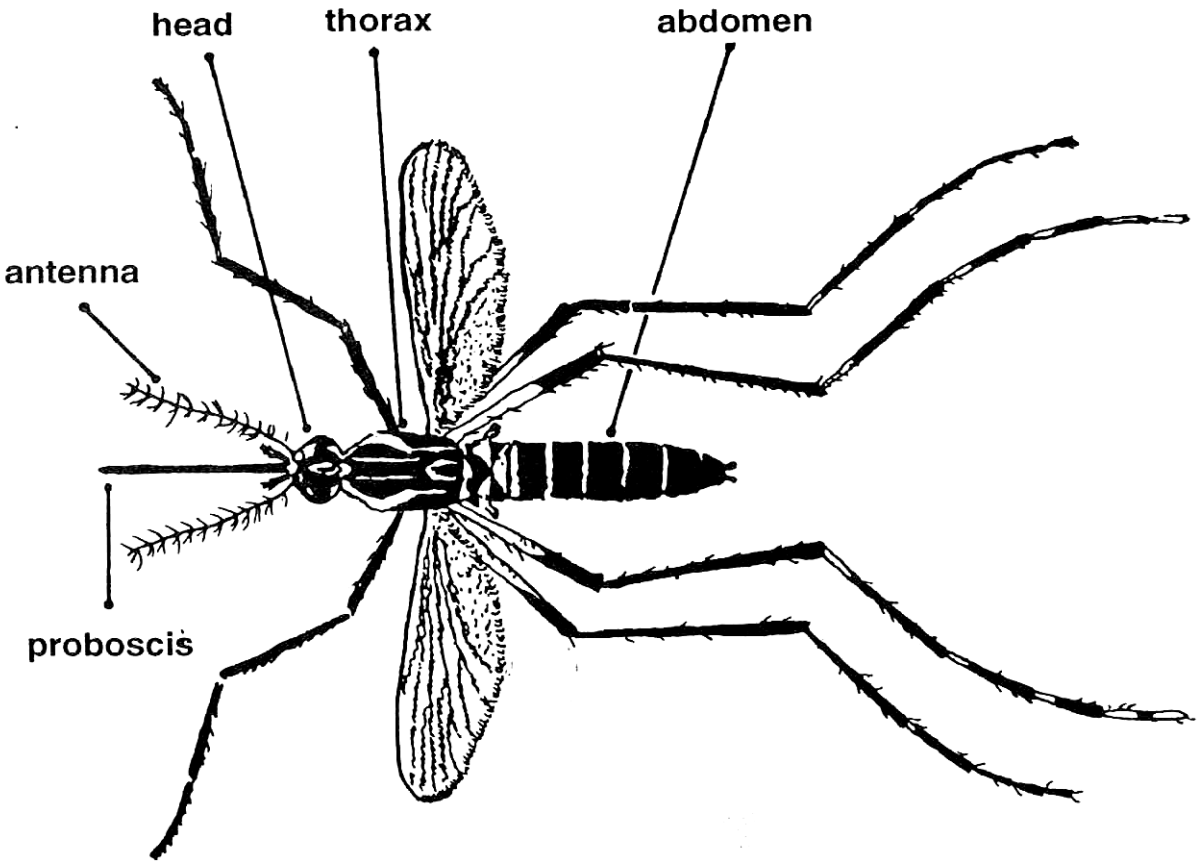
Adult

When the adult mosquito is ready to emerge, the pupa will rest at the top of the water's surface and straighten out its body. The back of the exoskeleton splits and slowly the adult mosquito emerges. Like a scene from a science fiction movie, a creature with very little resemblance to its former self, emerges out of the pupal skin. The adult mosquito rests briefly on the water's surface, then flies a short distance to some surrounding vegetation to rest and allow time for the newly developed wings to dry.

The adult mosquito, like most insects, has three body parts and six legs. The three body parts of the mosquito are the head, **thorax** and **abdomen**. The head of the mosquito is highly specialized for obtaining food. The large compound eyes, antennae and mouthparts, or **proboscis**, are easily distinguished. The eyes and antennae work together to search for food. Adult mosquitoes feed primarily on plant juices and nectar. The legs and wings are attached to the mosquito's thorax.

There are over 3,000 species of mosquitoes throughout the world. Forty-seven species of mosquitoes have been identified in Lee County, Florida.

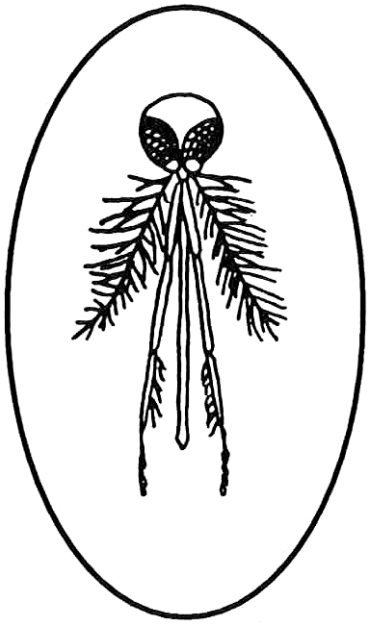
Mosquitoes are classified in the order Diptera with flies and gnats. Dipterans resemble most other insects except they have two wings, instead of four, and their mouthparts are specialized for sucking. The mosquito's abdomen contains most of the vital organs and will store the blood the female mosquito needs to fertilize her eggs.



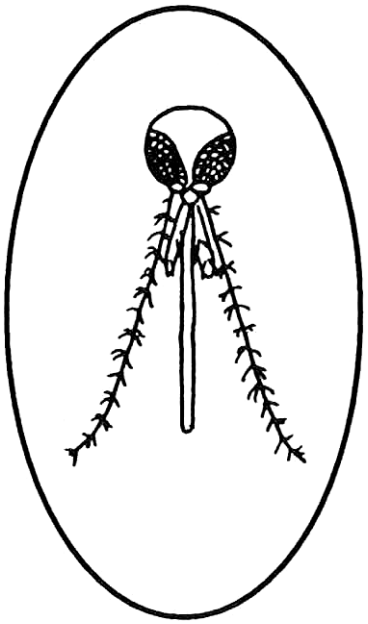
Adult Mosquito Parts

Reproduction

Characteristic of many animals, especially insects, mosquitoes maintain their population by producing large numbers of offspring. Mosquitoes, at all stages of their development, are eaten by hundreds of different kinds of animals. A relatively small percentage of individual mosquitoes actually make it through to the adult stage to reproduce. Once the female mosquito lays her eggs, she has done her part to ensure the survival of the species. Adult mosquitoes do not raise their young.



Male *Culex* Head



Female *Culex* Head

Male mosquitoes tend to hatch out before female mosquitoes. The most obvious difference between the male and female adult mosquito is the male's feathery, or plumose, antennae. In comparison, the female's antennae are much less bushy. The male's feathery antennae are useful in sensing the presence of female mosquitoes. The antennae pick up the high-pitched sound produced by the female's wings, enabling the male to find the female and mate with her. Males generally have a shorter life span than females, living only a few weeks compared to the two-month life span of certain species of female mosquitoes.

After mating, and before laying her eggs, the female mosquito (of most species) needs a blood meal. The protein contained in the blood is a necessary ingredient for the development of the eggs. Mosquitoes don't just feed on humans; other mammals, birds, reptiles and amphibians also fall victim to the blood needs of the female mosquito. Certain species of mosquitoes will, however, feed only upon a particular animal or group of animals. This is fortunate for people. Of the many species of mosquitoes found in a particular area, usually only a few will provide a problem for humans.

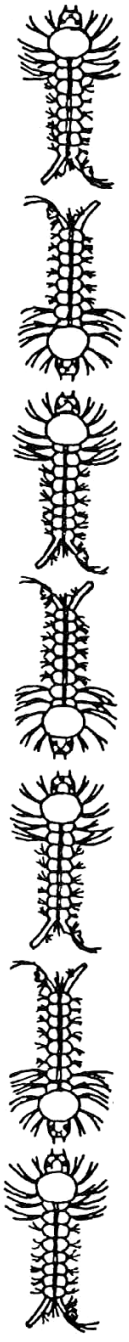
An individual mosquito may feed and lay eggs several times during her life span. It is important that the mosquito lands gently on her victim to avoid detection. She quickly pierces the surface of the skin with knife-like stylets located on the tip of her proboscis. She inserts her proboscis, pierces an available capillary and injects saliva into the blood. This saliva contains and anti-coagulant and makes it possible for the mosquito to suck the blood through her tiny proboscis. Saliva left in the host's body may cause an irritation in the form of bumps or sores.

After the female mosquito has mated and consumed a meal, she will search for the proper environment to lay her eggs. Some mosquitoes lay their eggs on the surface of standing water, on plants or on moist soil where the eggs may lay for months or even years before they are covered with water and hatch into larvae.

Day 3

Review

The resource teacher will conduct a quick review of the information presented on Day 2 to emphasize how much the students were able to retain and to set the stage for the day's activities. Some of the review questions might be:



∴ How many species of mosquito are there throughout the world?

∴ How many species are there in Lee County?

∴ How many stages are in the life cycle of the mosquito?

∴ The term for "insect life cycle" is _____.

∴ Name one stage in insect metamorphosis…another…another…the last.

∴ During which stage(s) does the mosquito not eat?

∴ During which stage(s) is the mosquito an aquatic insect?

∴ The breathing tube on a larva is called the _____.

∴ The breathing tubes on a pupa are called the _____.

∴ The term for a mosquito's mouthparts is _____.

∴ How is a mosquito different from most other insects?

∴ How many body regions does an insect have?

∴ Name the body regions of an insect.

∴ Name three differences between the male and female mosquito.

∴ What is the advantage of the male adult mosquito having bushy antennae?

∴ What part of the mosquito makes the humming noise?

∴ What do male mosquitoes eat?

∴ What do female mosquitoes eat?

∴ Why does the female mosquito require a blood meal?

∴ Explain the feeding process of the female mosquito.

∴ Why do people often get sores or bumps from mosquitoes?

∴ Explain why mosquitoes have the ability to transmit diseases.

Check Out Those Dead "Skeeters"
(Mosquito Lab)

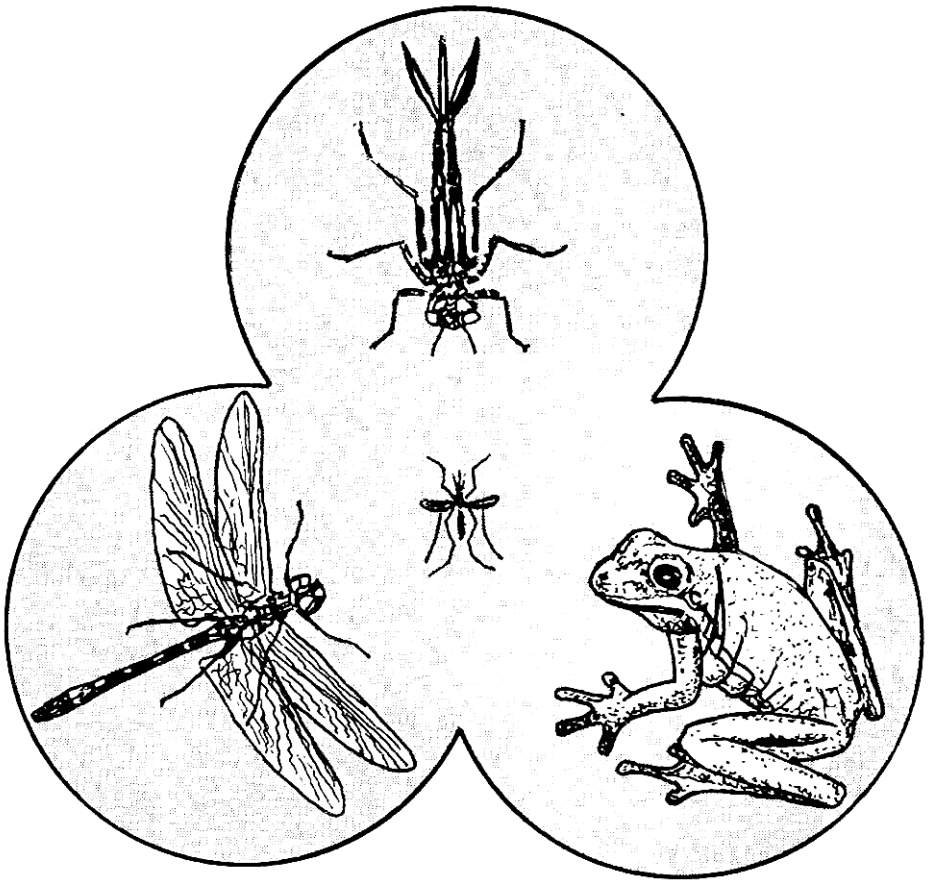
Materials for this lab include a student lab sheet and two plastic "see boxes", each containing a dead mosquito. The two species of mosquitoes compared are *Psorophora ciliata* and *Culex nigripalpus*. *Psorophora* mosquitoes are big floodwater mosquitoes that occur in large numbers during times of heavy flooding. They are not considered a disease threat in southwest Florida. *Culex* mosquitoes are smaller and lighter in color. They have the ability to transmit the disease St. Louis encephalitis.

In this lab, students will be introduced to the science of taxonomy (classifying organisms and using **scientific names**) and will compare the physical characteristics of two different species of mosquito. A sample lab sheet may be found in the Resources section of this booklet on page 27.

"Skeeter Eaters"
(Observation Lab)

Many animals feed on mosquitoes at the larval, pupal and adult stages. Water beetles, dragonfly nymphs, ducks and many kinds of fish may eat mosquitoes as larvae and pupae. As adults, mosquitoes are eaten in large quantities by dragonflies, frogs, toads, nighthawks, swallows, martins and many other animals. This interdependence of mosquitoes with other organisms in the environment is very important. Mosquito control personnel recognize the value of this interdependence and utilize biological control agents to control mosquitoes whenever possible. For instance, fish populations in larger ditches, ponds or lakes will naturally prey on mosquito larvae. Rarely do larval populations increase to the level where mosquito control would become necessary. Exceptions may occur in heavily vegetated areas where the fish can't get through to the larvae.

The resource teacher will provide live "skeeter eaters" in containers for the students to observe. A brief explanation of what the organism is and its relationship with mosquitoes will be explored using a handout with information on our most common "skeeter eaters". Sample "Skeeter Eaters" sheets may be found in the Resources section of this booklet beginning on page 28.



Day 4

Mosquito Control
(Slide Presentation)

Mosquitoes and Disease

When pioneers first settled Lee County, many people died from diseases. Later it was discovered that mosquitoes carried many of these diseases. The mosquito's disease carrying ability comes from its blood sucking behavior. If a mosquito is infected with a disease, the disease may be transmitted during feeding, when the mosquito injects the anti-coagulating saliva into her victim. Some diseases spread by mosquitoes are listed below.

malaria

yellow fever

dengue

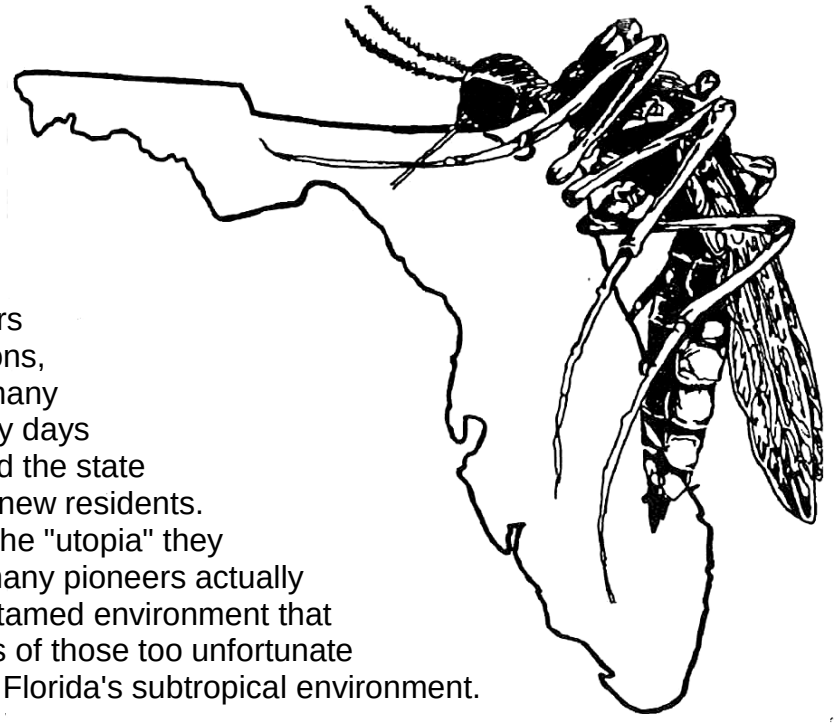
encephalitis

heartworm

Mosquitoes have the ability to carry many diseases, but they do not transmit all diseases. Not all mosquitoes carry the same disease. For instance, only the Anopheles mosquito, which is only one of sixteen groups of mosquitoes, can transmit malaria. From the research conducted to date, there is no evidence that mosquitoes or other insects can transmit the AIDS virus; it appears the AIDS virus has not adapted to living in mosquito tissue.

Once mosquitoes were found to carry many serious diseases, controlling their populations seemed a reasonable way to reduce the amount of human sickness caused by these diseases. Because mosquito populations are being controlled, many mosquito-borne diseases have been completely eliminated in the United States. Encephalitis, sometimes called the sleeping sickness, still exists in the United States, and dog heartworm is still common today. It is important to know that many diseases in Florida and the United States have been eliminated because mosquitoes are controlled; in many parts of the world people still die from malaria, dengue, yellow fever, and many other mosquito-borne diseases.

Early Pioneers and Mosquitoes



People first moved to Florida for many of the same reasons that they still come today. The climate of Florida offers year round, comfortable weather. Farmers can utilize two growing seasons, and the weather is ideal for many kinds of livestock. In the early days of Florida, many areas around the state experienced a great influx of new residents. People were eager to live in the "utopia" they thought was Florida. What many pioneers actually experienced was a harsh, untamed environment that occasionally claimed the lives of those too unfortunate or inexperienced to deal with Florida's subtropical environment.

But the people still came, systematically altering the peninsula. With every house, store or road constructed, the scenery was gradually changing. Many animals, like the alligator, were over-hunted or out competed for habitat, and their population plummeted. Some animals, like the bald eagle, to avoid living in close proximity with the pioneer population, simply retreated to remote areas. Not all animals found the newcomers intolerable. Rats and roaches learned to live comfortably in the filth and garbage produced by the newcomers. Another animal, the mosquito, easily adapted to conditions provided by the settlers.

Due to their blood-sucking behavior, mosquitoes transmitted deadly diseases to many of the settlers, especially in low-lying areas. Malaria and yellow fever claimed the lives of thousands of people, turning this land of paradise and opportunity, for many, into a land of disappointment and despair.

History of Lee County Mosquito Control

Once the link between mosquitoes and disease was discovered, efforts began to reduce mosquito populations in areas inhabited with people. Through the 1940's and 1950's, most of these independent operations in Lee County came together and formed the Lee County Mosquito Control District. Today the LCMCD is located in Buckingham at the site of the old Air Force training center. Approximately 100 people work for the district on a full or part time basis.

Larviciding/Adulticiding Program

Through extensive entomological research, methods of controlling mosquitoes have advanced dramatically throughout the years. Most of the efforts of the LCMCD are directed toward **larviciding**, or killing mosquito larvae. Only when the mosquito problem becomes severe, is the **adulticiding** program utilized.

The larviciding program involves a well-coordinated team of field inspectors, **entomologists**, **pesticide** applicators, and equipment. Before an area can be sprayed, a field inspector surveys the area looking for mosquito larvae and records all areas where mosquito larvae are discovered in significant numbers. Once larvae are discovered and weather conditions are deemed favorable for application of pesticide, the actual larviciding is conducted. In the more remote areas of the county, most larviciding is achieved by helicopter. Trucks and boats are also utilized to larvicide areas inaccessible or impractical for helicopters. Often, an area that has been larvicided will be "backchecked" to make sure the application was successful.

During periods of high rainfall or uncommonly high tides, it becomes impossible to larvicide the entire county effectively. If the adult mosquito population becomes too great, the adulticiding program will be utilized.

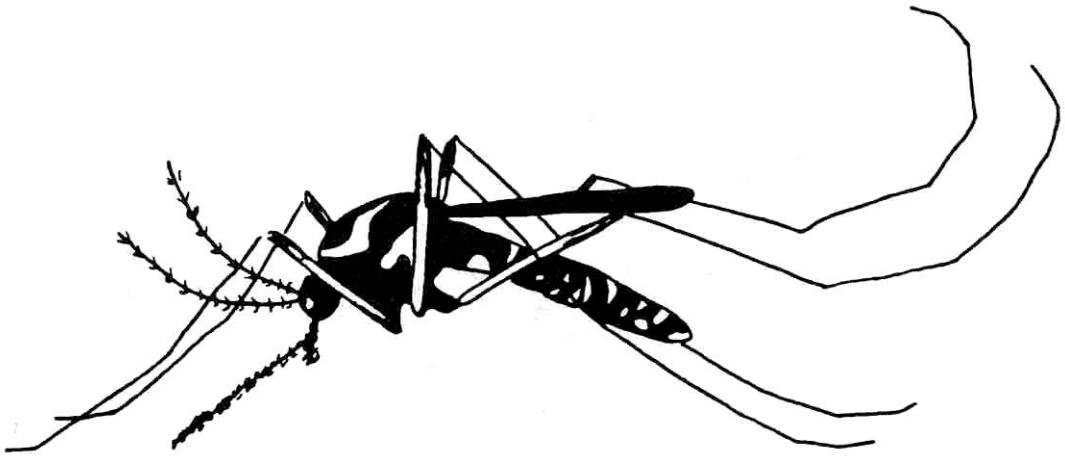
Adulticiding involves using trucks or airplanes to spray insecticides into the air to kill adult, biting mosquitoes. Before an area is adulticided, traps are set at specific locations throughout the county to assess the adult mosquito problem. Adult mosquito populations are also monitored by service request calls received at the mosquito control district office. Adulticiding is conducted in areas inhabited with people who are experiencing a mosquito problem.

Monitoring Saint Louis Encephalitis and West Nile Virus

Another major responsibility of the LCMCD is to monitor the presence of Saint Louis encephalitis (SLE) and West Nile Virus (WNV) throughout the county. This is accomplished through a sentinel chicken program. Sentinel chicken flocks are maintained at various locations throughout the county. These chickens are monitored frequently for the presence of SLE and WNV antibodies. If either is discovered in Lee County, control efforts are concentrated in the areas of concern, and citizens are warned of the potential health hazard. SLE epidemics occurred in Central and South Florida throughout the 1970's. During the summer of 1990 approximately 200 cases of human SLE were diagnosed in Florida, and by January 1991, ten people had died from the disease. WNV was first reported in the United States in 1999, in New York City. It quickly spread throughout the US and is now found up into Canada and down into Central and South America. Fewer than 800 people have died in the US from WNV in the seven years since its arrival in 1999.

Other Research

The LCMCD maintains a research facility that is actively involved in testing pesticides, biological control agents, and other methods of control. Scientists employed by the LCMCD are involved in an international network, which exchanges research and looks for solutions to global health problems that use environmentally sound practices.



Day 5

The regular classroom teacher leads the lessons in this section. Activities include a post-test (to compare the students' cognitive gains as a result of experiencing this unit), and several enrichment activities the teacher may want to use to reinforce the concepts presented.

Post-Test

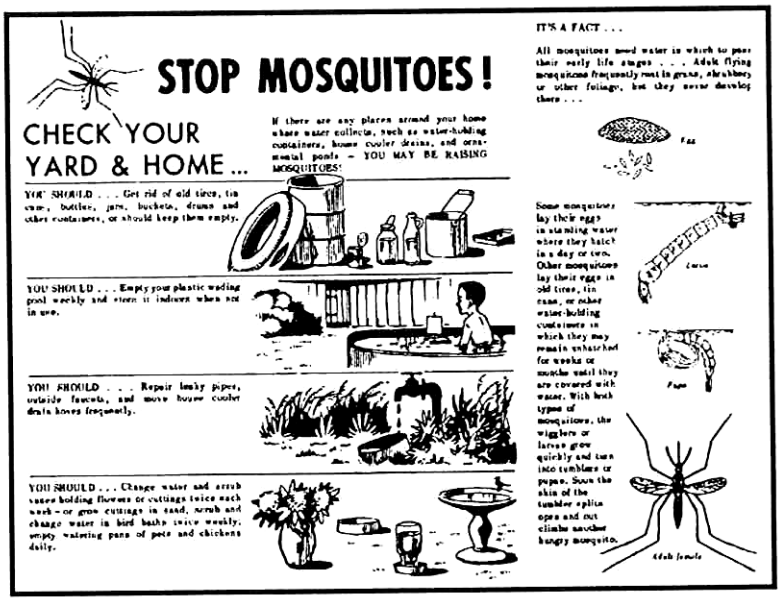
The Cognitive Pre/Post Test is found in the Resources section of this booklet on pages 21 and 22.

Mosquito Model

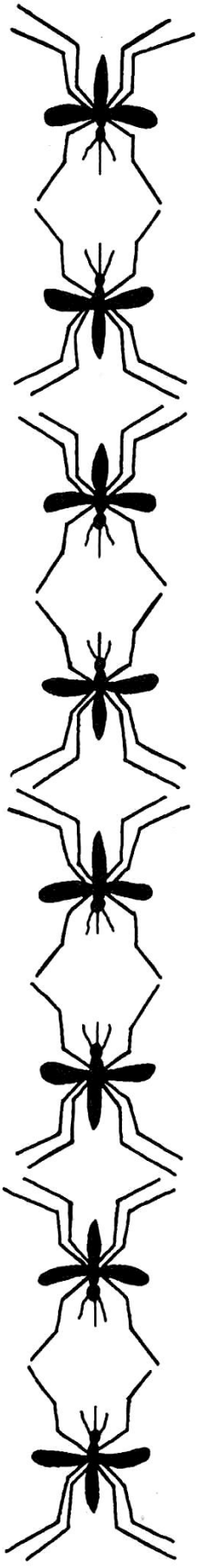
The resource teacher will provide materials for the students to construct a model of a mosquito. The activity is designed to reinforce the students' knowledge of the parts of an insect and the differences between a mosquito and other insects, as well as to stimulate and encourage the students' creative abilities. Directions for constructing mosquito models are included in the Resources section of this booklet on pages 32 and 33.

Mosquito Pamphlet

The resource teacher will provide blank pamphlets for the students to complete. The purpose of this activity is to give the students the opportunity to organize information in a meaningful way and to present newly learned ideas to others in a creative manner. A blank pamphlet is located in the Resources section of this booklet on pages 34 and 35.



Resources



Sunshine State Standards Connections

(LA.C.1.2.4) - The student uses listening strategies effectively.
The student listens attentively to the speaker, including making eye contact and facing the speaker.

(SC.D.1.2.2) - The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.
The student **knows** that 75 percent of the surface of the Earth is covered by water.

(SC.D.1.2.3) - The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.
The student knows that the water cycle is influenced by temperature, pressure, and the topography of the land.

(SC.D.2.2.1) - The student understands the need for protection of the natural systems on Earth.
The student knows that using, recycling, and reducing the use of natural resources improve and protect the quality of life.

(SC.F.1.2.3) - **The student describes patterns of structure and function in living things.**
The student **knows** that living things are different but share similar structures.

(SC.G.1.2.5) - **The student understands t he competitive, interdependent, cyclic nature of living things in the environment.**
The student **knows** that animals eat plants or other animals to acquire the energy they need for survival.

(SC.G.2.2.3) - The student understands the consequences of using limited natural resources.
The student **understands** that changes in the habitat of an organism may be beneficial or harmful.

(SC.H.1.2.4) - The student uses the scientific processes and habits of mind to solve problems.
The student knows that to compare and contrast observations and results is an essential skill in science.

(SC.H.2.2.1) - The student understands that most natural events occur in comprehensible, consistent patterns. The student understands the world from its beginnings.
The student knows that natural events are often predictable and logical.

(SC.H.3.2.1) - The student understands that science, technology, and society are interwoven and interdependent.
The student understands that people, alone or in groups, invent new tools to solve problems and do work that affects aspects of life outside of science.

(SC.H.3.2.2) - **The student understands that science, technology, and society are interwoven and interdependent.**
The student **knows** that data are collected and interpreted in order to explain an event or concept.

(SC.H.3.2.4) - The student understands that science, technology, and society are interwoven and interdependent.

The student knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas.

(SS.B.2.2.3) - The student understands the interactions of people and the physical environment.

The student understands how human activity affects the physical environment.

(SS.B.2.2.4) - The student understands the interactions of people and the physical environment.

The student understands how factors such as population growth, human migration, improved methods of transportation and communication, and economic development affect the use and conservation of natural resources.

PRE/POST TEST

1. Precipitation is _____ .
    a. rain, snow, sleet or hail
    b. the process in which water turns to gas
    c. the process in which liquid water turns to solid

2. Mosquitoes are most closely related to _____ .
    a. flies
    b. dragonflies
    c. bees

3. Which is true?
    a. Both male and female mosquitoes bite animals.
    b. Only male mosquitoes bite animals.
    c. Only female mosquitoes bite animals.

Name 3 animals that might be found in a temporary puddle or ditch community.

4. _____

5. _____

6. _____

7. Mosquitoes complete their life cycle in what order?
    a. egg, pupa, larva and adult
    b. egg, larva, pupa and adult

8. Mosquito pupae breathe out of _____ .
    a. structures on their back called trumpets
    b. a structure near their tail called the siphon
    c. structures along their abdomen called spicules

9. Mosquito larvae breathe out of _____ .
    a. structures on their back called trumpets
    b. a structure near their tail called the siphon
    c. structures along their abdomen called spicules

10. The wings and legs are attached to what part of the adult mosquito?
    a. head
    b. thorax
    c. abdomen

11. Blood is stored in what part of the mosquito's body?
    a. head
    b. thorax
    c. abdomen

12. Why do mosquitoes suck blood?_____ _____

    _____

13. Mosquitoes_____.
    a. only suck the blood of humans
    b. only suck blood from warm blooded creatures
    c. suck blood from many animals including reptiles, amphibians, birds and mammals.

14. Which drawing of the mosquito heads is male?

a. 

b. 

15. Mosquitoes are known to carry what diseases?
    a. malaria, yellow fever, encephalitis, pneumonia
    b. encephalitis, AIDS, yellow fever, heartworm
    c. malaria, yellow fever, encephalitis, heartworm

Name three animals that eat mosquitoes.

16._____

17._____

18._____

19. Name an animal that undergoes metamorphosis. Do not use the mosquito.

    _____

20. Mosquito Control in Lee County works mainly on _____ .
    a. killing mosquito larvae before they can become adults
    b. draining wetlands so the larvae dry and die
    c. spraying adult mosquitoes from large planes

Pre/Post Test
Answer Key

1. a.

2. a.

3. c.

4., 5. and 6. Possible answers: tadpoles, beetles, dragonfly nymphs, damselfly nymphs, mayfly nymphs, mosquito fish, minnows, worms, etc.

7. b.

8. a.

9. b.

10. b.

11. c.

12. to nourish the developing eggs in her body.

13. c.

14. a.

15. c.

16., 17. and 18. Possible answers: dragonflies, damselflies, toads, frogs, birds, bats, spiders, lizards, fish, insect larvae and nymphs, beetles, etc.

19. Possible answers: frogs, toads, butterflies, dragonflies, flies, bees, wasps, ants, etc.

20. a.

fold dotted lines

cut

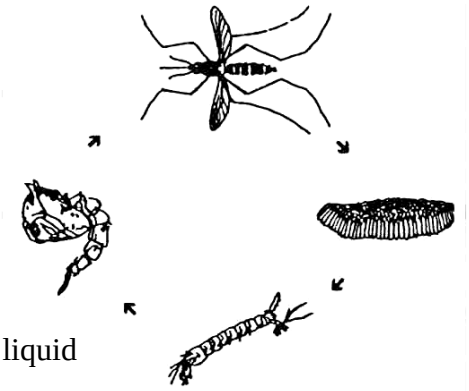
First name

cut

fold dotted lines

Name _____

Vocabulary



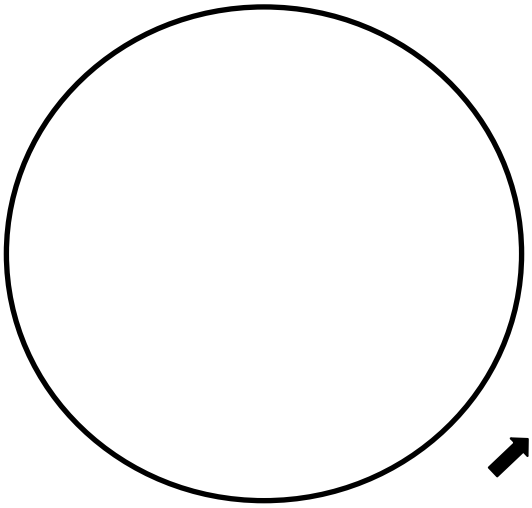
1. **abdomen** -the rear body region of an insect.
2. **adulticide** -to kill adult mosquitoes
3. **condensation** -the process in which water vapor turns to liquid
4. **entomologist** -a scientist who studies insects
5. **evaporation** -the process in which liquid water turns to water vapor
6. **exoskeleton** -the hard, outer, protective covering of insects
7. **insecticide** -a poison used to kill insects
8. **larva** -(larvae, pl) the aquatic feeding stage of immature mosquitoes
9. **larvicide** -to kill mosquito larvae
10. **metamorphosis** -the changes an insect goes through in its development
11. **molt** -shedding of the exoskeleton
12. **pesticide** -a poison used to kill pests
13. **precipitation** -any form of rain or snow
14. **proboscis** -the long mouthparts of some insects
15. **pupa** -(pupae, pl) the aquatic nonfeeding stage of immature mosquitoes
16. **scientific name** -the proper two word name used by scientists to refer to any plant or animal
17. **siphon** -the breathing tube of a mosquito larva
18. **species** -a group of plants or animals that look alike and reproduce
19. **thorax** -the middle body region of an insect where the head, abdomen, legs, and wings attach
20. **trumpets** -the breathing tubes of a pupa

Diseases carried by mosquitoes:

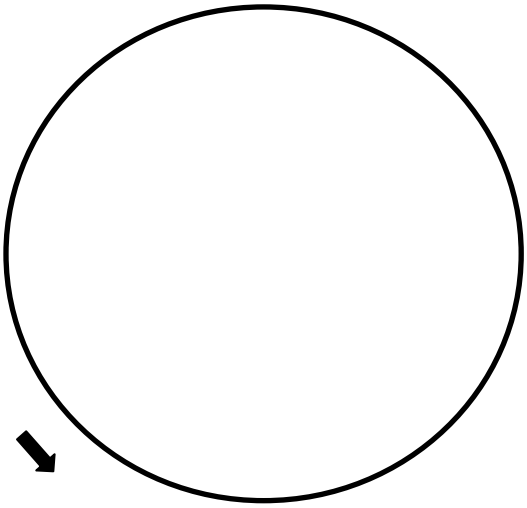
dengue	**malaria**	**Saint Louis encephalitis**
heartworm	**yellow fever**	**West Nile encephalitis**

Name _____

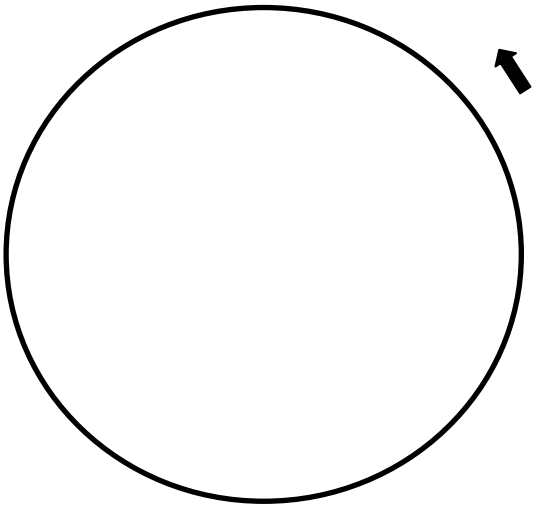
The Mosquito Life Cycle



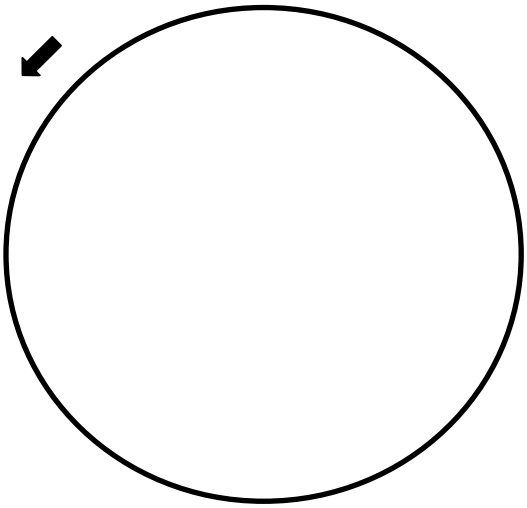
Egg



Larva



Adult



Pupa

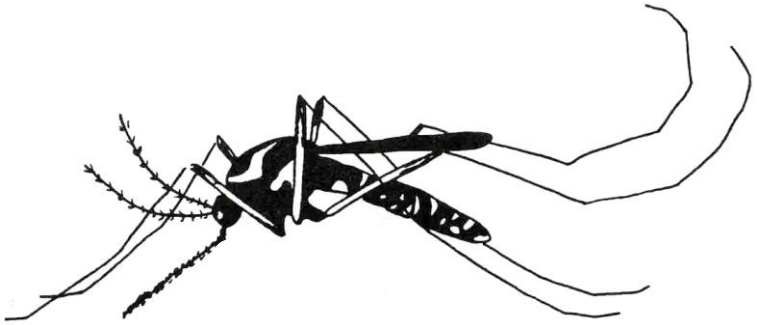
There are over _____ species of mosquitoes in the world.

There are _____ species of mosquitoes identified in Lee County.

Of those in Lee County, only about _____ species are a pest problem for people.

Name_____

Check Out Those Dead Skeeters



Aedes aegypti

Compare the two mosquitoes in the see boxes.
Write your observations for mosquito #1 in the spaces to the left; write your observations for mosquito #2 in the spaces to the right.

MOSQUITO #1

1. What is the scientific name of this mosquito?

   _____ _____

2. How many legs should it have? _____

3. How many legs does it have? _____

4. How many wings does your mosquito have? _____

5. Is it a male or female? _____

6. See if you can find the following regions or body parts. Check off each after you observe it.

o	head	o	proboscis
o	thorax	o	antennae
o	abdomen	o	eyes

MOSQUITO #2

1. What is the scientific name of this mosquito?

   _____ _____

2. How many legs should it have? _____

3. How many legs does it have? _____

4. How many wings does your mosquito have? _____

5. Is it a male or female? _____

6. See if you can find the following regions or body parts. Check off each after you observe it.

o	head	o	proboscis
o	thorax	o	antennae
o	abdomen	o	eyes

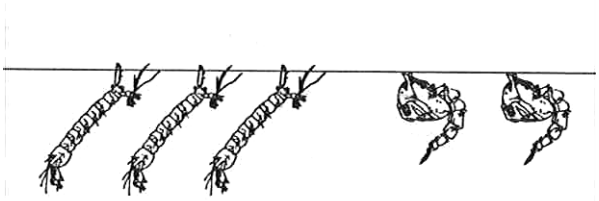
How is mosquito #1 different from mosquito #2?

_____

Skeeter Eaters

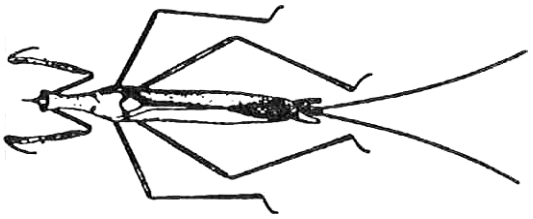
Mosquito Larvae and Pupae

Mosquito larvae and pupae can live anywhere there is standing water. The larvae grow to about 15mm long and breathe through a tube called the siphon. The pupae are up to 6mm across and breathe through two tubes on their back called trumpets. The larvae eat constantly on pieces of dead plants and animals. The pupae never eat. Mosquito larvae and pupae are eaten by many different kinds of animals.



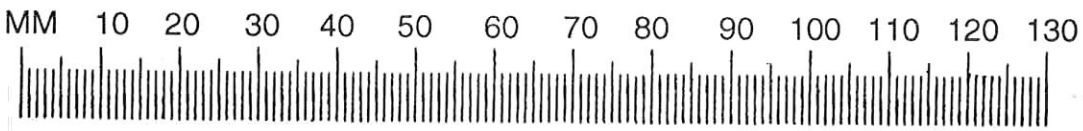
Water Scorpion

The water scorpion grows to 75mm long and has front legs that are modified for grabbing prey. They use the two long breathing tubes coming from the end of the abdomen to reach up to the surface to get air. They feed on insects and small fish. During mating season, water scorpions leave the water and fly in search of a mate. They will occasionally mistake a parking lot or a black car for a pond, land on it, and quickly die from the heat.



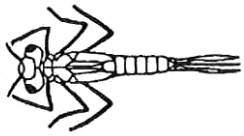
Mosquito Fish

Mosquito fish are also called *Gambusia*. They grow up to 50mm long. The male is much smaller than the female. Gambusia feed on small animals at or near the surface. Because they eat large numbers of mosquito larvae, they have been used throughout Florida for mosquito control.



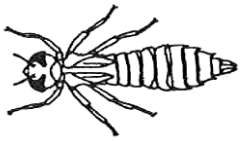
Damselfly Naiad

A naiad is similar to the larva and pupa stages combined into one stage. Naiads always live under water. Damselfly naiads grow up to 25mm long and are either green or brown. They are often found in ponds or streams crawling on plants in search of food. They feed on small animals that live in the water. The three structures sticking out from the tip of the abdomen are gills, with which the damselfly breathes.



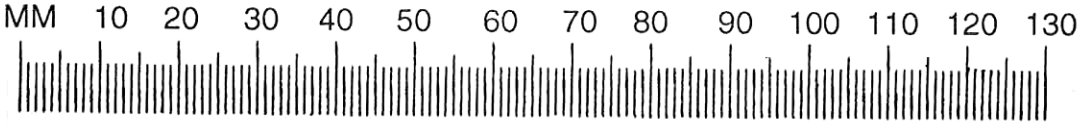
Dragonfly Naiad

Dragonfly naiads grow up to 75mm long and their bodies are fairly wide. They have a long lower jaw to help them catch their food. Dragonfly naiads feed on aquatic insects and other small animals. As adults, dragonflies are also called mosquito hawks because they feed on mosquitoes. They have four large wings that are held out to the sides when they are at rest.



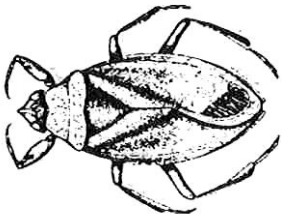
Mayfly Naiad

These aquatic insects are active swimmers. They grow to about 25mm long. There are rows of leaf-like gills along the sides of the abdomen and three feathery tail-like structures. They feed on small animals in the water. When they mature into adults, mayflies have four wings and may live for only a few hours.



Smaller Giant Water Bug

The smaller giant water bug can grow up to 25mm in length. They feed on insects, tadpoles and small fish. Giant water bugs grab prey with large front legs and inject a poison into the animal with their proboscis. This poison turns the animal's insides into a jelly, which the water bug then sucks out. The male smaller giant water bug will carry the eggs on his back until they hatch. **Giant water bugs can bite. Do not touch them.**



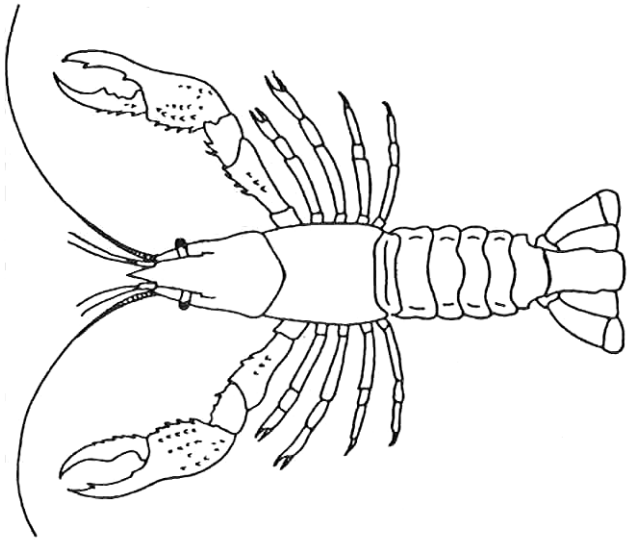
Water Beetle

There are many different kinds of beetles that live in the water. Some feed on plants, some feed on animals and some feed on dead things in the water. Water beetles breathe by carrying an air bubble with them under the water. When this air supply runs out, they swim to the surface and get a new air bubble.

Beetle Larva

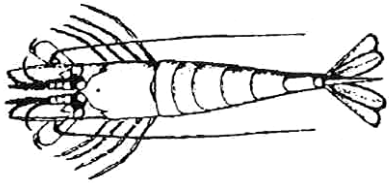
The larvae of water beetles are active swimmers. They eat insects and small fish in the water. Beetle larvae use a breathing tube similar to the mosquito larva's siphon to get air from the surface of the water.

Crayfish



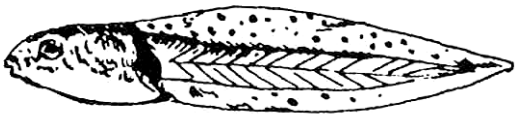
Crayfish live in freshwater ponds, lakes, ditches and streams. Crayfish are related to crabs, lobster and shrimp. They grow up to 125mm long and have ten legs. They usually eat plants, however, they will eat other animals. During the dry season they hide in tunnels that they dig into the mud. Their tunnels are easy to find because crayfish use mudballs to build "chimneys" around the entrance hole.

Freshwater Shrimp

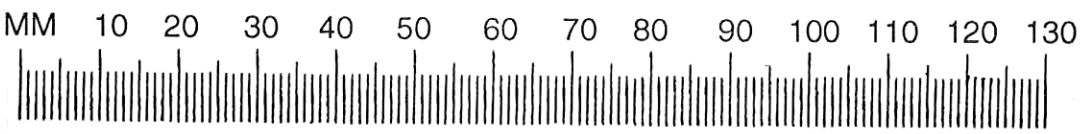


Another name for shrimp is prawns. They are generally 25-50mm long and their body is usually clear. They are found in shallow water, living among the plants. They feed on dead and decaying pieces of plants and animals. They are related to the shrimp we eat.

Tadpole



The tadpole is a young frog or toad. They grow up to 75mm long and are green, brown or black. They can be found in shallow ponds and streams. Tadpoles eat mostly dead plants and animals. Tadpoles live up to two years before they change into a frog or toad.



Make Your Own Mosquito

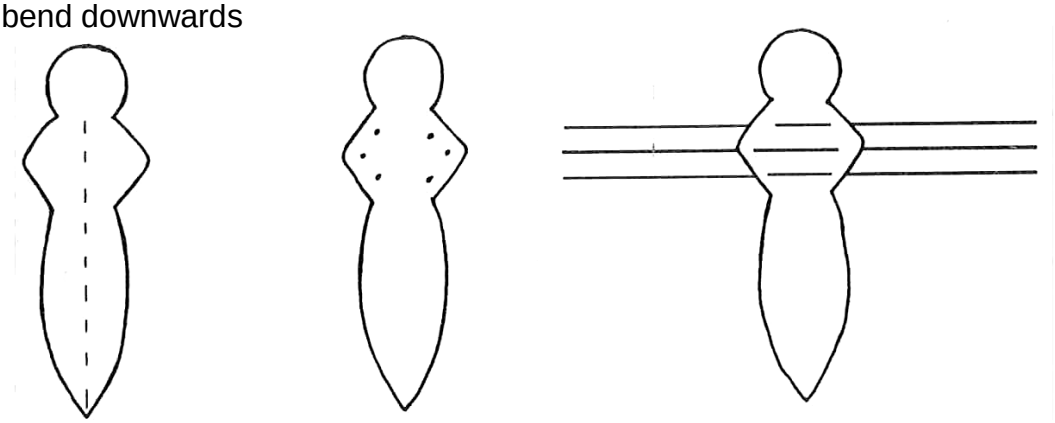
Materials:

tag board
black markers
proboscis wire
black pipe cleaners
white construction paper
glue
5/16" round adhesive labels
push pin or small hole punch
stencils-body and wings
pencil
scissors

1. Trace mosquito body on tag board.
2. Cut out body.
3. Write name on one side.
4. Color other side black with magic markers.
5. Bend body along center (figure a).
6. Push 3 holes on either side of thorax with push pin (figure b).
7. Carefully push 3 pipe cleaners through holes (figure c).
8. Glue pipe cleaners. Put a dab of glue next to each hole.
9. Glue antennae and proboscis wire in place. See page 27.
10. Let dry thoroughly.
11. Stick two adhesive labels on head for eyes.
12. Draw criss cross pattern on eyes.
13. Place mosquito on bending page. Bend legs.
14. Cut wings out of white paper.
15. Draw wing vein pattern.
16. Glue on wings.

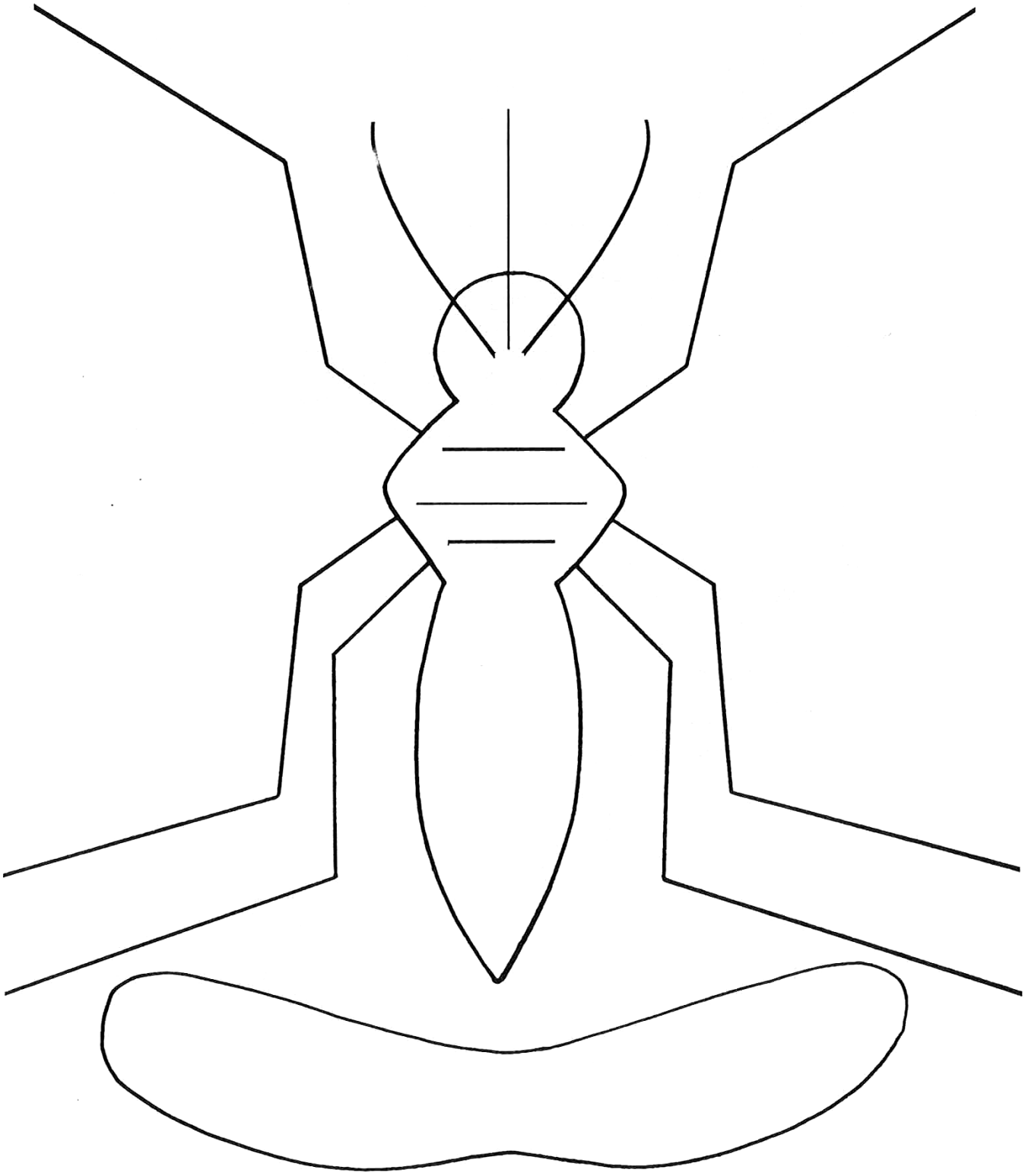
<u>2 Bends Per Leg</u>

2 legs bend upwards
4 legs bend downwards

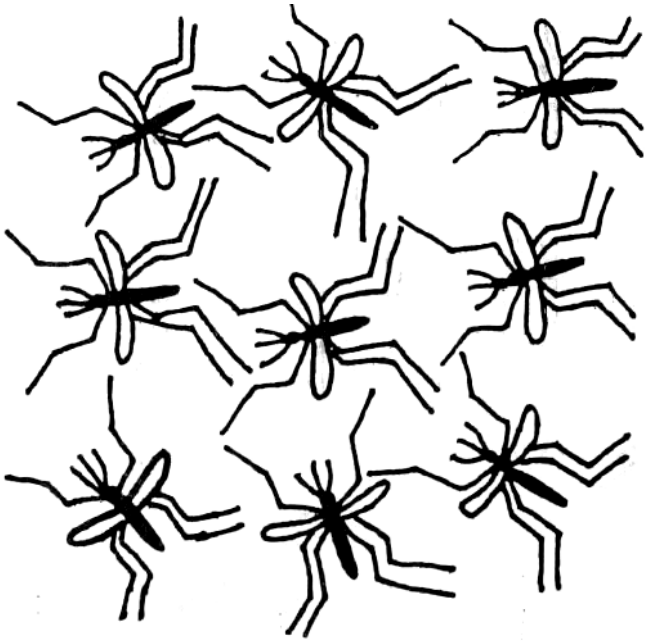


a b c

Make Your Own Mosquito
(Bending Page)



Controlling Mosquitoes



Mosquito Facts

Life Cycle