

Mosquitoes in Your Backyard

Diversity, life cycles and management of backyard mosquitoes

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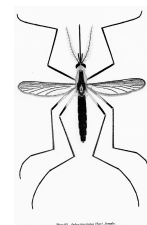
Websites: Dr. Martha Reiskind's: <http://burfordreiskind.com/outreach/lessons/>

Mosquito outreach: <http://vectorecology.org/outreach/>

Mosquito research: <http://vectorecology.org/research/>

Introduction:

The goal of this lesson is to use a familiar organism in our backyards, the mosquito, to introduce students to the insect life cycle that includes both an aquatic and terrestrial stages and compare and identify common mosquitoes in our backyard. In addition, it will provide students with the background to discuss why and how we control mosquitoes at the egg-laying, larval, and flying stages. An extended component can be included that discuss the diseases the mosquitoes carry. In this case we developed a malaria example (likely more appropriate for the 8th grade level, see 8th grade lesson plan) and how those diseases are transmitted. This would expand this lesson plan from the local mosquitoes and disease they may carry to global movement of disease. NC essential standards: Bio.2.1.3; 2.G.3; 3.G.1.2; 2.L.1; 4.L.1; 5.L.2



Learning objectives:

1. **Describe** the mosquito life cycle
2. **Compare** and **identify** two common mosquitoes
3. **Discuss** habitats for mosquitoes in your backyard
4. **Integrate knowledge** of the life cycle with effective mosquito control

Appropriate grade level:

2nd – 5th grade (also see 8th grade lesson plan)

Resources for students:

Work sheet & pen &/or pencil

Resources for educators:

Projectors or computer

Laminated pictures from handout

Masking tape, hand lens, flashlights

Website for Part1:

<https://www.youtube.com/watch?v=OrzF57R6kas>

Appendix:

- Background treehole mosquitoes life cycle & habitat
- Worksheets
- Information on the collecting kits for an extension or supplement to these activities

Lesson Activities Overview:

Students will form groups of 2 to 3

Part 1a: Treehole mosquito Life Cycle (1 hour)

Students will watch a short video (only 30 seconds) that shows larvae and pupae in water. What are they? The students then explore the mosquito life cycle, similar to the butterfly. The students will arrange the life cycle from egg to larva to pupae to adult and will identify which parts are aquatic and which are not. The groups will come back together and educators can tape out a circle for the water part of the life cycle, and all students will place the stages that are aquatic inside the circle.

Part 1b: Mosquito Diversity in your back yard and identification of two common mosquito adults (30 minutes)

Two common treehole mosquitoes (*Aedes albopictus*, the Asian tiger mosquito, and *Ochlerotatus triseriatus*, the eastern treehole mosquito) are presented in slides, students will use the worksheet provided to describe differences such as color, shape, patterns, in the adult female and males of the two species.

Part 2: Where do we find mosquitoes and why and how do we manage them? (1.5 hours)

Using the provided slides or handout, have the students list the items that are found in backyards that might support the aquatic part of the life history. What other things can they think of that would simulate a treehole? An important point to include is that it takes time to get from the egg to the pupae phase (approximately 7 days). An exploratory part of this learning activity, which is optional, would be to have the students explore around the schoolyard for places were water pools. They can use hand lens and flashlights to see if there is anything wiggling in these habitats. The student will discuss how to management mosquitoes at different life cycle stages. How would we manage the flying adults? How would we prevent egg laying habitat? How can we manage the larvae in the water? See attached sheet for discussion points.

Background for Part 1a:

See the slides attached for a key to identifying the different parts of the mosquito life cycle. Note that we have a blue circle drawn around the aquatic versus the terrestrial or flying phase of the mosquito life cycle. There is also a slide at the end of this lesson plan that should be color copied, cut out, and laminated. Each group will have the laminated cards to arrange and build the life cycle (see the appendix slides).

We think it is an interesting point that most of the mosquito life cycle actually takes place in water and want to emphasize this. As suggested above this could be a group activity after the students arrange the life cycle, where the educator bring the student groups back together and they put the stages of the life cycle in a large circle on the floor (we suggest masking tape) to indicate the aquatic phase.

- All mosquitoes have a two-part life cycle: an aquatic (in water) immature phase that starts with laying eggs and a terrestrial/aerial (on land/air) adult phase that usually involves sucking blood.
- For treehole mosquitoes, this starts with an egg, which is also the stage that gets the mosquito through the winter. These drought resistant eggs hatch when they are exposed to water with nutrients in them.
- The immature mosquitoes, called larvae, go through five stages before becoming adults. The first three stages last a total of about three days, while the final larval stage can last another three to four days.
- Once the larvae have fed enough, they pupate. The pupae do not feed but are active.
- After one to two days, the adult mosquito emerged from the pupae, and crosses from the aquatic phase to the terrestrial (and flying!) phase of the mosquito life.
- At this point, the mosquito becomes the familiar, if annoying, creature we all know. Or at least the female mosquitoes, as they are the ones that need blood to produce eggs and bite. Male mosquitoes only exist to fertilize eggs of females. A fun fact, male mosquitoes will take nectar from flowers for energy!

Worksheet for Part 1b Mosquito Diversity in your Backyard:

Circle the description that best fits each of the species shown on the slides in the front of the classroom or in your handout

Asian Tiger mosquito

Eastern Treehole mosquito

**Adult Females
Overall Color**

Black
Brown
Gray
Bright White

Black
Brown
Gray
Bright White

Body Pattern

Striped legs
Striped thorax
Striped abdomen
Solid legs
Solid thorax
Solid abdomen
White stripe on head & thorax
Dark stripe on head

Striped legs
Striped thorax
Striped abdomen
Solid legs
Solid thorax
Solid abdomen
White stripe on head & thorax
Dark stripe on head

**Adult Males
Overall Color**

Black
Brown
Gray
Bright White

Black
Brown
Gray
Bright White

Body Pattern

Striped legs
Striped thorax
Striped abdomen
Solid legs
Solid thorax
Solid abdomen
White stripe on head & thorax
Dark stripe on head

Striped legs
Striped thorax
Striped abdomen
Solid legs
Solid thorax
Solid abdomen
White stripe on head & thorax
Dark stripe on head

Antennae

Large feathered antennae
Small feathered antennae
Plain antennae

Large feathered antennae
Small feathered antennae
Plain antennae

Background & Discussion points for Part 2

Background: Anything that holds water for a duration long enough to complete the life cycle will have the potential to increase mosquito populations. If we think about the life cycle and how much of the life cycle depends on water, then one of the most effective ways to control mosquito populations is during this part of the life cycle. Dosing ourselves with insect repellent or spraying our houses may help, but getting them before they emerge is an effective way to control mosquito populations. For the malaria mosquitoes, there have been attempts to drain ditches, drain swamps, etc. etc. to control mosquito populations. In Florida there is active spraying for mosquitoes as well. The idea is that the insecticide will end up in the water and hopefully stop the life cycle before the mosquitoes emerge.

Things to consider are once the eggs are wet they will hatch, but the water needs to be in place for a period of time that lets the mosquito complete its life cycle to emergence. So something that holds water for a short period of time is not as risky as containers that have water in them for longer periods of time (approximately 1 week). In addition, temperature (how warm or cold it is) and food in the water are also important for how long they will remain in the aquatic stage. If it is very cold and there are few nutrients it takes longer for the mosquito to transition from the larval stages to pupal stage. If it is warmer and there are lots of nutrients in the water, then the mosquito will transition quickly through the different aquatic stages.

Exploration: An activity suggested for this part is to have students explore their surroundings and look for standing water. It can be small pools like that found in an upturned leaf, larger pools in sandbox toys left out, or actual tree holes. Flashlights are helpful for looking into tree holes and to see if anything is moving. Hand lenses are also nice for looking at small pools of water for wriggling organisms.

Group discussion points for the end of the Part 2 activity – Note we are available to Skype into classrooms for discussion (either one of us or one of our graduate students)

Why should we control mosquito populations?

There are two different subjects to discuss here. First, mosquito bites hurt and itch and humans have a variety of reactions to the actual mosquito bite. For example, some people have a strong reaction and can swell while others are slightly annoyed for a bit and then are fine. Second, mosquitoes carry diseases. Malaria is something students may be aware of, but mosquitoes carry other diseases as well, including dog heartworm, West Nile virus, dengue virus, chikungunya virus, and in the past yellow fever, which was an epidemic in the United States. Most of these diseases are not here in North Carolina, but we still want to control mosquito populations to avoid an outbreak of any of these diseases.

How can we control mosquito populations?

Here there are also two different subjects to discuss. First, how do we try to control the flying biting stage? There are a variety of strategies here, including spraying yards and houses, sleeping nets, spraying ourselves with bug repellent and burning coils. Second, how do we control the aquatic stage? There are different parts to the aquatic stage. The source is important because females will seek out water sources to lay their eggs. If there are limited water sources then there are limited areas for the mosquito to lay its eggs. Once the larvae and/or pupae are in the water source, then we can try to alter that water source either with predators or chemicals that limit the completion of this part of the life cycle.

Resources:

Univ. of Kentucky homeowner mosquito control
<http://www2.ca.uky.edu/entomology/entfacts/ef005.asp>

American mosquito control association: <http://www.mosquito.org/control>

Worksheet for Part 2:

Circle all the items shown in the slide or handout that have the potential to provide habitat for treehole mosquitoes?

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K

What are conditions that help mosquitoes to complete their aquatic life cycle?

How to collect mosquitoes!

We have collecting kits that we provide for students around the country. Please contact Dr. Martha Reiskind (mbreiski@ncsu.edu) or Kristen Hopperstad (kahopper@ncsu.edu) and we will put together the kit for you to use. Students can use them on the school grounds. The kit is a cup with egg paper in it that you fill half way up with water. You leave them out for approximately 1 week and then dry the egg papers. Students can look at the eggs under a dissecting scope (see picture below). The students can then put the egg papers into a closed jar of water and observe the life cycle unfold from the larvae to the pupae phase, right to adult emergence. Let us know if you are interested!! For specific information on how to set up the kit and to download the collection protocol please go to the website (<http://vectorecology.org/outreach/modules/mosquitoes-in-your-backyard/>) and download the documents. Coming soon there will be video clips on the set up and how to create your own rearing chambers.

Collecting cups about the size of a drinking cup with information on the side, with egg paper and with water. Note that the water only comes up to the half way mark on the paper. Female mosquitoes like to lay their eggs on the water line.



Mosquito eggs are easily visible with a hand lens or a dissecting scope.



Educator Assessment

Please let us know what you think about this lesson plan:

1. Was this an effective tool for you?
2. Do you believe it helped you achieve the objectives stated and did it in fact allow you to cover the NC essential standards stated?
3. Please provide any feedback for what did and did not work?
4. Was it helpful to have it broken up into parts? Did you do all the parts on one day or did you break it up between days?
5. Did you collect your own larva and pupa with the kit from the Reiskind lab?

Appendix Slides