

Lesson Plan

Lesson Title	Aquatic Habitats and Mosquitoes
Grade Level	2 nd grade
Topic	Mosquitoes
Lesson time	40-50 minutes
Materials Required	<ul style="list-style-type: none">• Digital microscope to examine live mosquito larvae• Aquatic Habitats and Mosquitoes PowerPoint Presentation (available here)• Mosquito Life Cycle Kit• Observation journal (available here)
Standards addressed	<ul style="list-style-type: none">• 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats• 2.MD.D.10: Draw a picture graph and a bar graph (with single unit scale) to represent a data set with up to four categories...

Step 1: Microscope study

For this lesson it is helpful to study mosquito larvae with microscope first. You probably will need to limit this portion of the activity to 10 minutes or you won't get to the rest of it! Get the students settled and focused before you turn on your microscope (if you have never used your digital microscope to examine mosquito larvae, please see the additional instructions at the end of this document). The main points that the students need to take away are from this exercise are:

- Mosquito larvae are aquatic (you may need to have a student define the word for the class)
- Mosquito larvae are very small and can only thrive in still water. If water is moving, they will be swept away.

Step 2: The lesson (Aquatic Habitats and Mosquitoes PowerPoint)

Slide 1: Introduction

It might seem odd to have the introduction after the microscope exercise, but many students have never seen mosquito larvae, so it is a great way to build interest. Now that the lesson has begun, make sure that students know the definition of "aquatic habitats", and have students give examples. Mention that a few common habitats where mosquitoes are found are pictured, but one of the habitats is not suitable for mosquitoes. See if they can figure out which one it is (the rushing creek). When you click or tap, the rushing creek will dry out and leave behind still pools of water where mosquitoes could thrive. The main message here is that there are many different kinds of aquatic habitats, but if the water is flowing, mosquitoes have difficulty surviving there.

Slide 2: Life Cycle

Click or tap through the different stages of the mosquito life cycle. Help students understand the following (asking them works):

- There are 4 stages in the mosquito life cycle (egg, larva, pupa, adult). As a side note, most insects have these same 4 stages.
- Three of the stages occur in or on the water.
- Only the adult mosquito leaves the water.
- Only adult females bite because they need the protein from the blood to lay eggs.
- Adult males and females sip nectar as a source of sugar (energy food).
- Adult males and females can be distinguished from one another by their antennae.
- Warm weather causes the life cycle to go quickly.

Slide 3: Aquatic Habitat Discussion

Ask students to compare these habitats and make an argument about which ones would be suitable for mosquitoes. When you click, the answers are revealed. Even though some mosquitoes thrive in salt water (example: salt marsh mosquitoes), they cannot survive where there are currents or waves. Help students understand that mosquitoes sometimes grow in natural habitats (like wetlands), and human-made habitats (like buckets). They sometimes find hidden aquatic habitats (like a hole in a tree that fills with rain water).

Slide 4: Habitat Diversity

Now that students realize what kind of habitats mosquitoes can grow in. They are ready to start thinking about other aquatic organisms and their requirements. Help students figure out that larger, more complex habitats (like the pond), have a greater diversity, than small habitats (like the bucket). Click/tap through the slide to describe the habitats and where these creatures are likely to live. Also note, that even though the bucket does not have a lot of diversity of aquatic creatures, it can grow large numbers of mosquitoes because predators (like fish) are not present.

Slide 5: Life Cycle

At this point, you can answer questions and review.

Step 3: Demonstrate how to use the life cycle kit and talk about the various tasks they will be responsible for (observing, activity sheets, feeding fish, making nectar, etc.)

Visit the [Mosquito School website](#) for more information or email erice@msmosquito.com

Notes about Using a Digital Microscope in the Classroom

Digital microscopes are a profoundly powerful tool for enhancing classroom presentations. There are a wide variety of relatively inexpensive digital microscopes available, and we currently use a ProScope Micro Mobile made by Bodelin technologies. This particular microscope attaches directly to an iPad (no cords) and uses the camera application that comes preinstalled on iPads. The iPad is either wirelessly connected to an Apple TV (if the classroom is equipped with one) or connected to a projector. Either way enables the entire classroom to study live mosquito larvae at the same time. This can be used to a quick introduction to the main lesson, as a means of generating interest and discussion during a question/answer portion of a lesson, or even as the focus of the lesson (as in our 4th grade “Adaptations of Mosquitoes” lesson). Here are a few suggestions if you plan to utilize this technology:

- Do not attempt to place the microscope directly over a dish of water. Even if there are large numbers of larvae present, they will tend to swim away from the light produced by the microscope. Instead, use a pipette to capture a small number of early-instar larvae in a drop of water, and place the drop on a flat, white surface (we use a plastic lid). If the bubble of water remains intact, you can place the microscope over the drop without displacing it, focus on the larvae, and they will not be able to wiggle away (see photo).
- It is imperative that you prepare students for this exercise prior to showing them a live magnified mosquito larvae. If you suddenly turn on the microscope and students see large, strange-looking creatures wiggling about, you will have an instant classroom management nightmare. Students will giggle, blurt out comments, and you will have to spend valuable and uncomfortable time regaining their focus. Preparing the students for this activity simply involves gaining their attention, informing them what is going to happen, and how they are expected to behave. Hold up the jar with the tiny wiggling larvae, and explain that a microscope will be used to magnify a few of them. Be very clear that when the microscope is turned on, everyone needs to observe silently. If students forget the expectations and are disruptive as soon as you turn it on, simply turn it back off and re-explain the expectations. After a short time of silent observation (30 seconds is more than enough), invite the students to raise their hand if they have a question or observation about what they see on the screen. This exercise can be an extremely valuable tool for generating interest and stimulating conversation about the topic.
- Prior to leading this activity in a classroom, spend a little time observing the mosquitoes on your own, so that you are prepared to help students understand what they are observing. The following list includes some of the behaviors that you are likely to observe:
 - **Feeding:** usually, after the larvae have been under the microscope for a few minutes, they will begin feeding. If small particles of food are present, they will be sucked in.



Some larger particles will get sucked in and then “spit out” the side of the head. You can ask if anyone knows of another animal that feeds in a similar manner (many students are familiar with other filter-feeding animals, especially baleen whales).

- **Thrashing movements:** typically, when the microscope is first turned on, the mosquitoes respond with a flurry of movement. They bump into one another, and students often describe this as “fighting” or “dancing”. You can mention that mosquito larvae have very thin, flexible exoskeletons, and they move by flexing their entire bodies. You can also point out that they have sensory hairs that help them sense what is around them.
- **Breathing:** When the mosquitoes move, their breathing tubes are often visible from the side. Once they calm down, they tend to begin breathing, and the tip of the tube breaks the surface of the water. You can explain how mosquitoes do not have gills, and instead breathe at the surface. For older students you can ask/explore this adaptation and see if they can figure out why it is so important (they can survive in oxygen poor conditions where predators that depend on gills, especially fish, cannot survive).
- **Grooming:** sometimes students will observe mosquitoes bending around, so that their head is touching their “tail”. You can inform the students that this is how mosquitoes clean their mouthparts.
- **Molting:** Occasionally, students will observe a mosquito larva that is in the process of splitting open and escaping from its older exoskeleton. This is a great time to talk about metamorphosis.
- **Defecating:** Fortunately, the mosquito larvae *usually do not* defecate “on camera”, but it does occasionally happen, and there is probably nothing much you can do to prevent a heightened and intense student response. Good luck swiftly regaining the collective focus of the classroom if this happens.