

Vector Education Program Overview

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I. Introduction

The purpose of this document is to provide mosquito and vector control agencies with a detailed outline of the various steps and materials necessary to implement and maintain an education program with a classroom presentation component. We hope that agencies with an existing program use this document for ideas, and encourage anyone taking on this task to collaborate with us.

II. District Education Program Overview

Education is an important part of the Integrated Vector Management Program utilized by the Marin/Sonoma Mosquito & Vector Control District (MSMVCD). Since 1994, MSMVCD has offered free presentations to any school in Marin and Sonoma counties. Initially, our education program was limited to information on mosquitoes, but we have since expanded our curriculum to offer lessons about ticks and yellowjackets. Currently, there are three major components to our vector curriculum (classroom presentations, life cycle kits, and supplemental curriculum). Each of these components support one another, and together provide a comprehensive program designed to help students make connections between what they learn in the classroom and the real world.

Our classroom lessons introduce simple concepts about the biology, ecology and control of vectors. This curriculum has been a work in progress since the adoption of the Next Generation Science Standards in 2013. Please see our lessons in the “Curriculum” sections of this document to see how we have incorporated specific standards. Each class borrows a life cycle kit, which allows for truly “hands on” learning. Because the life cycle kits stay in classrooms for two weeks, students continue to learn about vectors long after the classroom presentation is over. Our supplemental curriculum is provided in the form of observation journals/activity books for each student. Each journal/book has age appropriate activities that are designed to help students make connections between what they learned and observed in the classroom, and their real-world experience. The journal/book also includes a letter to parents explaining our program and how to contact our District for service. All of our curriculum is available online at www.msmosquito.com/education.

III. Getting Started

A. Why go to classrooms?

Offering an education program with a classroom presentation component requires a significant commitment of time and resources. You might consider other means of getting your agency’s message to the public, such as website/social media posts, providing lesson plans online, or having an educational booth at local events. MSMVCD

currently utilizes all of these methods, and each has advantages and limitations. Unlike the other methods mentioned, the education program model we have developed allows students to have an extended and memorable learning experience that influences their understanding of how they can make their neighborhoods safer from vectors and vector-borne diseases. For example, if a group of students visit an educational booth at a public event, they might be interested to see a display about the mosquito life cycle. After viewing the display, the students would likely move on with their day, and may or may not remember the experience later. In contrast, our model allows for learning to occur in a relatively distraction-free environment (the classroom), where students are given ample time to make observations and ask questions. Additionally, our mosquito life cycle kits are loaned to classrooms for two weeks, and during this time students observe insect metamorphosis up close. The supplemental curriculum helps to guide the learning process long after the classroom presentation is over. Most importantly, the supplemental curriculum offer the means to bring the information home. Our program allows for a rich and memorable learning experience that serves to not only influence behavior of students, but of their families as well.

B. Developing Your Messages and Scope

One of the first important steps is simply to make a short list of what message points you are trying to convey. We have identified the following message points that are emphasized in every classroom presentation, regardless of grade level or topic. These (along with the science standards) have served as a framework for all of our curriculum:

- Students become familiar with the life cycle and habitat requirements for each vector that we study.
- Students learn that vectors have the ability to spread certain diseases.
- Students learn simple actions they can take to stay safer from each vector.
- Students learn about MSMVCD services and are provided with contact information.

C. Getting Permission to Visit Schools

In 1992-1993, MSMVCD staff began the process of developing an education program to present to school officials. MSMVCD staff met with school superintendents for Marin and Sonoma counties, as well as the Sonoma County science curriculum coordinator, to validate program curriculum content. School officials were impressed with the program content and access to classrooms was granted. Prior to contacting your local school officials, prepare a plan for them to review. Be prepared to present the educational materials and your message to a group of school officials and leave them a copy of the curriculum to review. In your plan, make sure to include:

- Basic information about vectors in your area and associated diseases
- The services that are available from your agency

- The scope of your program (presentation topics, grade levels, etc.)
- The main message points you are trying to convey
- Copies of the curriculum that you use (PowerPoints, life cycle kits, supplemental curriculum, etc.)

IV. Preparing to Visit Classrooms

A. Advertising

If you are starting a classroom program from “the ground up”, you will need to consider advertising your program. You probably do not have an enormous budget for advertising, and you need to target teachers specifically because they are the ones who will be scheduling the presentations. The first thing to do is simply find out where local classrooms typically go on field trips (museums, nature centers, regional parks, etc.), and ask to post a flier about your program. Make sure the flier is eye-catching and simple. “Free-Science-Presentations!” and your agency/contact information should do the trick. If you utilize traditional social media platforms for advertising, remember, you need the attention of teachers! Do not be surprised or worried if your requests for presentations start out slowly because if you provide a quality program, teachers will undoubtedly spread the word. We do not currently advertise our program in any way, and the biggest problem our program faces is simply having to turn down teachers because we don’t have any room in our schedule!

B. Scheduling Presentations

Scheduling can be a very time-consuming and tedious process. We have changed the way we have scheduled presentations a few times over the years in an effort to make the process more efficient. Scheduling of school-year presentations occurs in August (for fall presentations) and December (for spring presentations). Our administrative assistant is our contact person for scheduling, and it is primarily facilitated via email. Once our availability has been determined, we send out an email that includes scheduling instructions as well as the dates that we are available. We currently use www.constantcontact.com to send out our scheduling newsletter and to maintain the email list. We find this service to be convenient because educators can remove themselves from the list when necessary. Please see a sample scheduling email below:

Dear Educators,

Let’s get ready for spring! Please read the following scheduling considerations and our available presentation dates. Email _____ to request a presentation.

Scheduling Considerations

- Mosquito presentations include a kit that you keep until the Friday of the following week, so keep that in mind when you choose your date (example: don't schedule a mosquito presentation the week before your spring break). We can also (usually) pick up kits on Thursdays if need be.
- Yellowjacket presentations include a life cycle kit that your class will keep for a day or more depending on our schedule (we only have a few of these kits).
- Pre-K, TK and kindergarten presentations = 30 minutes, so (ideally) space presentations 40 minutes apart.
- All other grades = 45 minute presentations, so (ideally) space presentations 50+ minutes apart.
- "Buddying up" classes is fine if you think your kids can handle it.

Scheduling Instructions

1. **Choose your vector** (Mosquito, Yellowjacket or Tick)
2. **Choose several dates that work for you (see the list of dates towards the bottom of this email)**. These dates are what we have available prior to scheduling anyone. Please give us several dates that work for you to ensure quicker scheduling. Please understand that the schedule is first-come-first-served and it will fill quickly.
3. **Email _____** with your preferred dates, presentation time(s), first and last names (of teachers), phone number, room number(s), school name and address, grade level, and if possible the number of students in each class.
4. **Technology?** We use an iPad for all presentations now. If you have Apple TV/AirPlay set up in your classroom (and you have the Wi-Fi password for your school network), let us know and we won't drag in a projector and other presentation equipment. Another option is connecting our iPad into your projector. If you do not have either, just mention that in your email and we will bring one.

Once a presentation is confirmed via email, we record the pertinent information in a weekly/monthly planner and print three confirmation letters (see sample below). We keep one copy in a binder for our records, one is mailed immediately to the school, and the third is sent to the school 1-2 weeks before the presentation date as a second reminder.

**Marin/Sonoma
Mosquito & Vector Control District**

595 Helman Lane
Cotati, CA 94931
Phone # (800) 231-3236

School
ATTN:
Street.
City, CA. zip

This letter is to confirm that you have scheduled a class presentation.

Type of class	
Presentation date	
Time	
Grade	
Number of students	
Classroom #	
Life Cycle Kit	
Notes	

Thank you for scheduling a presentation! Please let your front desk staff know when I'll be coming. For all grades (except TK/Kinder) I'll need a few minutes to set up. If you have AirPlay in your classroom, let me know via email and I won't drag in my projector.

Please visit www.msosquito.com/teachers. This site can be used as a teacher "companion site" and includes materials (worksheets, photos, etc.) for pre-teaching concepts before we visit your classroom, or for further investigation of topics after the presentation. You are not expected or required to pre-teach any concepts, but we provide it just in case you want to.

Please note that if you scheduled a mosquito presentation, I will return the Friday of the following week to pick up the life cycle kit and answer questions (unless we make other arrangements). I typically don't schedule specific times for kit pick-up.

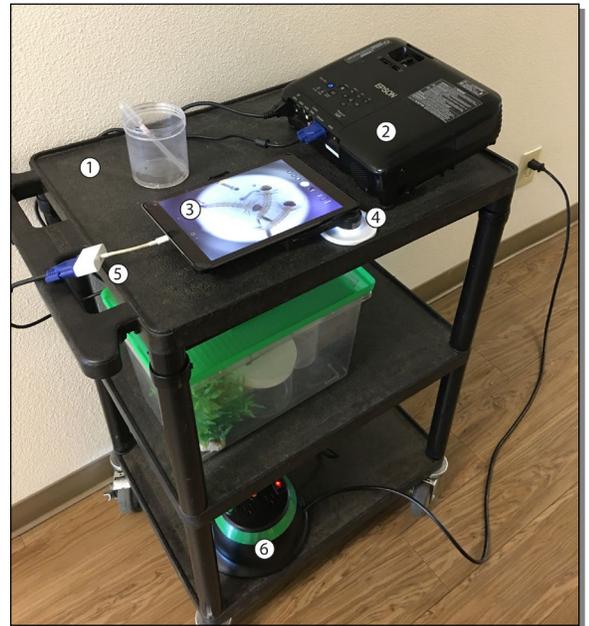
Please email me at erice@msosquito.com if you have any questions, concerns or if the schedule needs to be changed.

Thanks again,
Eric Engh
Marin/Sonoma Mosquito & Vector Control District

Our scheduling process is not perfect, but it has become significantly more efficient in the past decade. We used to have teachers call to schedule presentations. This resulted in huge amounts of time listening to messages and playing “phone tag”. The process of scheduling for a season would typically take several weeks, and our current method takes only 2-3 days. Perhaps a scheduling application (example: Sign Up Genius) could handle this task more efficiently, but we have not had time to investigate this. The application would need to be able to account for travel time from schools that may be spread out geographically.

C. Presentation Equipment

In a perfect world, you would not need to lug around any presentation equipment for your classroom presentations. Unfortunately, this is not the case. All of our presentations utilize a PowerPoint presentation, and in mosquito presentations we use a digital microscope to examine live mosquito larvae. We have seen great disparity in the technology present from classroom to classroom (even at the same school). In many schools, Wi-Fi and projectors are available, and in recent years an increasing number of local classrooms have been equipped with Apple TV/AirPlay. We sometimes find that presentation equipment in classrooms is present, but under-utilized by educators due to a lack of training or interest. For these reasons, we generally bring everything we could possibly need (except in classrooms we have previously visited where the teacher is familiar with the equipment). Over the years, we have selected equipment that is lightweight and allows for quick set-up. In fact, everything can be set up outside of the classroom and simply plugged in once inside, which makes for a smoother transition for the class. Fumbling around with cords and equipment is not a great way to begin a presentation. The following photo and accompanying table summarize the equipment that we currently use.



Presentation Equipment and Considerations		
1.	Plastic utility cart with three shelves	<ul style="list-style-type: none"> The cart we use has three shelves. The top is used for presentation equipment, the middle shelf can fit three mosquito life cycle kits (dimensions of each kit are approx. 13" X 9" X 10"), and the bottom shelf is used to carry the cord reel, promotional items, and the journals/books. Make sure the cart you select has brakes. Choose a lightweight cart.
2.	Projector	<ul style="list-style-type: none"> When comparing projectors, make sure to compare lumens (light output), weight and connection options.
3.	Tablet	<ul style="list-style-type: none"> We used to use a laptop, but switched to an iPad because it starts up quicker, is lighter, and there are microscopes that can attach directly to it without cords. The PowerPoint app is available for free in the App store. If a classroom is equipped with Apple TV/AirPlay, the iPad can wirelessly connect, and no cart, projector or power cord is required. You may also elect to use your smartphone instead of an iPad, but there is the potential that incoming text messages, emails, and phone calls might interrupt your presentation.
4.	Digital microscope	<ul style="list-style-type: none"> The microscope that we use is called a ProScope Micro Mobile (Bodelin Technologies). The microscope comes with an attachment that clips directly onto the tablet and fits over the lens. The camera application is used, so there is no additional software. These microscopes are currently available for various models of iPads and certain smartphones. Visit https://proscopedigital.com/.
5.	Adapters	<ul style="list-style-type: none"> The adapter in the photo allows an iPad to connect to VGA (which is common for older projectors). We always bring another adapter that connects to HDMI (for newer projectors). There are adapters available that have multiple ports and charging.
6.	Cord reel	<ul style="list-style-type: none"> The cord reel we use has a 20" cord which has been long enough for every classroom we have visited, but there have been a few situations where it was barely long enough.

D. Promotional Items

Over the years, we have produced a wide range of promotional items. Each serves the purpose of providing MSMVCD contact information. The list of promotional items includes temporary tattoos, squishy blood drops, puzzles, fly swatters, magnifiers and more (see photo). Out of all these, we have found that the color-changing pencils are most appreciated by teachers and students. The pencils are relatively inexpensive, made in the USA, useful, easy to transport, and are generally not discarded. The fact that the pencils change colors generates more student excitement than we expected.

Any of these items can be purchased in bulk from a promotional company. Prior to purchasing any promotional item, make sure to ask for a physical sample—a few years back we had to switch companies because the quality of the pencils they were providing was unacceptable.



E. Tips for Presenting in a Classroom

Fortunately, most students seem to be very interested in our lessons about vectors. Surprisingly, the biggest challenge we face in terms of classroom management is over-enthusiastic students. Before we divulge our secret tips for a successful presentation, it is necessary to define what we consider a successful presentation. In our view, a successful presentation is one in which the speaker gains and maintains the attention and interest of the students, and the teacher does not have to intervene during the lesson. A truly successful presentation results in students asking questions, and their classmates actually listening to the answers. Here are a few tips that we have learned during the more than 2,500 classroom presentations we have provided in the last decade:

- **Set the tone early.** Students need to know that they cannot “walk all over” you. In our experience, there is often a student (or students) in the class that will test early on to see what they can get away with—this is typically accomplished by blurting out a silly comment or question. The presenter’s tone (especially at first) needs to be firm and confident, but also friendly. If students feel they can interrupt the presentation, the lesson will be derailed very quickly. Do not

continue your introduction until every student is paying attention, otherwise they will continue to have side conversations throughout the lesson.

- **Set expectations early.** After a brief introduction, we inform the class that there is a life cycle kit that they will be allowed to borrow if they earn the trust of the presenter. In order to earn this trust, the students simply need to follow the expectations. The expectations are very simple:
 1. The presenter needs to see the students' eyes.
 2. Everyone needs to take turns when he/she speaks.
- **Use engaging speech.** Your presentation should sound more like a conversation than a lecture. This can be accomplished by asking the students lots of questions. When asking questions, explain if you want everyone to answer or just one person (raising hands). We use a combination of both. We also have students fill in the blanks to build upon what they already know. Example: "Vectors are creatures that sometimes spread dis..._____". Using engaging speech takes practice, but results in a presentation where the students are doing much more than listening.
- **Be careful about questions.** A sure sign of a successful presentation is thoughtful questions from students. With younger groups (K-2nd) we save questions until the end, otherwise you will be flooded with so many questions (and stories) that you won't get to the lesson. With older groups we encourage students to raise their hand during the presentation if they have a question. Occasionally, presentations can get derailed by a series of "what if..." questions that challenge the old adage, "There is no such thing as a stupid question". In these situations we attempt to patiently guide the conversation back to the lesson.

V. Mosquito Curriculum

A. Mosquito Lessons and the Next Generation Science Standards

In 2013, State Board of Education adopted the Next Generation Science Standards for California public schools (<https://www.nextgenscience.org/>). Around that time, educators began contacting us because they wanted to make sure that our lessons supported these standards. Since this time, we have worked with educators to reorganize and bolster our curriculum so that specific topics and activities in our curriculum relate directly to the standards. The following table provides a simple overview of each lesson, as well as a few of the specific standards and how they are addressed. The mosquito lessons we currently use are available for any agency, and can be accessed at www.msmosquito.com/mosquito school.

Kindergarten Mosquito Lesson (The Brave Knight and the Royal Pond)

Lesson Overview	Specific Standard	How standard is addressed
<p>Students are read a story titled: “The Brave Knight and Royal Pond”. The story focuses on the mosquito life cycle, common places where mosquitoes grow, and how to prevent mosquitoes from becoming a big problem.</p>	<ul style="list-style-type: none"> • K-LS1-1: Use observations to describe patterns of what plants and animals need to survive 	<ul style="list-style-type: none"> • Students observe mosquito metamorphosis and learn that these changes occur in a predictable pattern.
	<ul style="list-style-type: none"> • K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live 	<ul style="list-style-type: none"> • Students learn that mosquito larvae cannot survive out of the water. They learn that people often unintentionally provide mosquitoes with additional habitat in the form of buckets, toys, and other items that fill with water.
	<ul style="list-style-type: none"> • K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment 	<ul style="list-style-type: none"> • In the story that is read during the lesson, students learn ways to prevent mosquitoes from growing without harming other organisms.

Grade 1 Mosquito Lesson (The Backyard Mystery)

Lesson Overview	Specific Standard	How standard is addressed
<p>Students are read a story titled: “The Backyard Mystery: Case of the Itchy Insect Bites.” The story focuses on how mosquito larvae survive in very simple habitats (like buckets of water) and can cause big problems for people, pets and wild animals.</p>	<ul style="list-style-type: none"> • LS1.A: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find and taking in food, water and air 	<ul style="list-style-type: none"> • The story describes how mosquitoes use their body parts (antennae, eyes, wings, etc.) to survive. • Students observe live mosquitoes in their mosquito observation habitat, and witness typical activities (feeding, breathing, shedding exoskeleton, grooming, etc.). • Students learn that mosquitoes use their body parts in different ways during the various stages of metamorphosis.

Grade 2 Mosquito Lesson (Aquatic Habitats and Mosquitoes)

Lesson Overview	Specific Standard	How standard is addressed
<p>Students learn that mosquitoes grow in many different aquatic habitats. They compare different aquatic habitats and study how this affects mosquitoes.</p>	<ul style="list-style-type: none"> 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats 	<ul style="list-style-type: none"> Students learn how the characteristics of water in specific habitats determines whether mosquitoes and other aquatic organisms can survive or thrive in that particular habitat. Students compare how mosquito larvae survive in the two habitats in the life cycle kits (one with predators and one without).
	<ul style="list-style-type: none"> 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... 	<ul style="list-style-type: none"> In their observation journals, students use bar graphs to compare habitats.

Grade 3 Mosquito Lesson (How Mosquitoes Grow)

Lesson Overview	Specific Standard	How standard is addressed
<p>Students learn the various habitat requirements for all stages of the mosquito life cycle.</p>	<ul style="list-style-type: none"> 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death 	<ul style="list-style-type: none"> The life cycle is depicted in the lesson, and students are asked to compare the life cycle of mosquitoes with the life cycle of another animal (especially insects).
	<ul style="list-style-type: none"> 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all 	<ul style="list-style-type: none"> The life cycle kit contains two different habitats. One habitat provides mosquito larvae with everything they need to develop, while the other contains predators (mosquitofish).

Grade 4 Mosquito Lesson (Adaptations of Mosquitoes)		
Lesson Overview	Specific Standard	How standard is addressed
Students study live mosquito larvae with a digital microscope and discover the various adaptations that allow mosquitoes to thrive in certain habitats. Students compare how mosquito larvae and pupae are adapted for life under water, while adult mosquitoes have adaptations that allow them to survive on land.	<ul style="list-style-type: none"> 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction 	<ul style="list-style-type: none"> Microscopic study of mosquito larvae during the classroom presentation allows students to observe and discover mosquito larvae using external structures for specific functions (eating, breathing, swimming, etc.)
	<ul style="list-style-type: none"> LS1.D Information Processing: Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. 	<ul style="list-style-type: none"> Students learn how mosquitoes sense the environment, and how these perceptions guide their actions. For example, adult female mosquitoes sense carbon dioxide when humans exhale, which mosquitoes use to locate a host.

Grade 5 Mosquito Lesson (Ecology of Mosquitoes)		
Lesson Overview	Specific Standard	How standard is addressed
Students learn the various roles that mosquitoes play in the ecosystem (consumers, prey, vector, etc.).	<ul style="list-style-type: none"> 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment 	<ul style="list-style-type: none"> The classroom presentation presents a digital model of an ecosystem, and explains the various roles that mosquitoes play in food webs.
	<ul style="list-style-type: none"> 5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. 	<ul style="list-style-type: none"> In their journals, student fill in the various roles that mosquitoes and other organisms play in an ecosystem, and can trace the energy gained from each interaction back to the sun.

B. 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 as a quick introduction to the main lesson, as a means of generating interest and discussion during a question/answer portion of the 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 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 hands 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

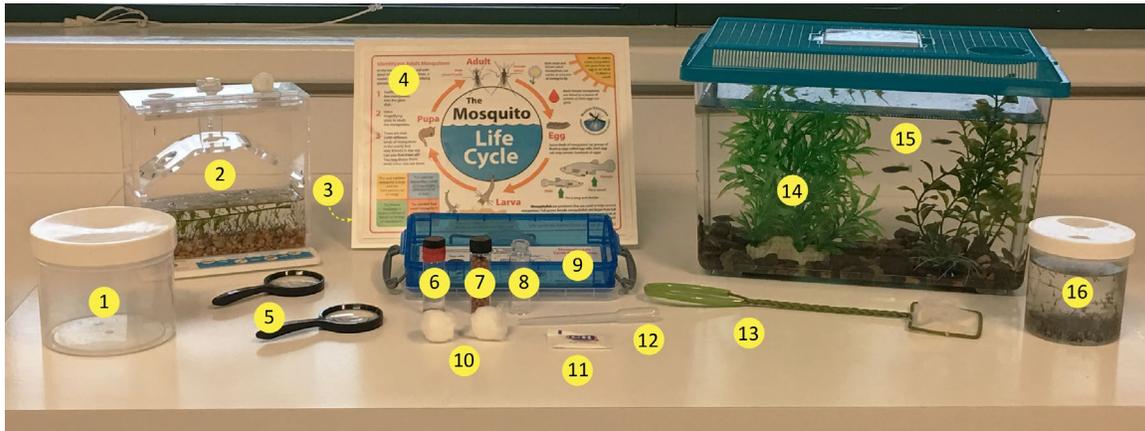
another animal that feeds in a similar manner (many students are familiar with other filter-feeding animals, especially baleen whales).

- **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 explore this adaptation and ask 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.
- Due to time constraints, we generally limit the microscope study portion of our lessons to 2nd grade and up.

C. Mosquito Life Cycle Kits

Our mosquito life cycle kits allow students to safely observe mosquito metamorphosis up close. The kits remain in the classroom for two weeks, and include live mosquito larvae and 3-4 mosquitofish. It takes approximately 10 minutes to show the students the various components of the kit, and the simple tasks they will need to do during the time the kit is in the classroom (see instructions below). The kits become the center of attention in the classroom, as students check daily (perhaps hourly) for changes as the mosquitoes develop. Not only do the life cycle kits allow for an extended

The following photo and accompanying table outline all of the components of our mosquito life cycle kits. We have listed the vendors that we use (for convenience), but many of the items can easily be found at other retailers. Some of the items could be substituted for something similar, but we have selected these particular items because the entire contents of the kit can fit into a large, rectangular 3 gallon Lee's Kritter Keeper (for transport and storage).



# in photo	Item/Catalog #	Number needed	Notes	Vendor
1.	Large plastic jar/lid #JR001, JR002	1 per kit	<ul style="list-style-type: none"> For transporting mosquitofish and mixing “nectar” for adult mosquitoes You may also find a similar sized substitute 	Bioquip (310) 667-8800 Phone order this item
2.	Mosquito observation cage	1 per kit	<ul style="list-style-type: none"> This is where the metamorphosis happens An alternative is using a “Mosquito Breeder #1425” from www.Bioquip.com 	Tap Plastics (see plans below)
3.	Gibson Holders 6A 2-wire display stand (not pictured)	1 per kit	<ul style="list-style-type: none"> These are used to display the laminated instructions 	www.amazon.com
4.	Laminated directions	1 per kit	<ul style="list-style-type: none"> These double-sided laminated directions help teachers who forgot to pay attention during the lesson 	www.ms mosquito.com/mosquito school
5.	Magnifying glasses #602217	2 per kit	<ul style="list-style-type: none"> 2.5 and 5X magnification 	www.carolina.com
6.	Mosquito egg rafts (in glass vial)	1 per kit	<ul style="list-style-type: none"> We preserve these in a vial with ethanol and place red tape around the lid of the vial so that students do not open it 	Local bird baths, green pools, and other forgotten places
7.	Fish food (in glass vial)	1 per kit	<ul style="list-style-type: none"> We provide classrooms with dry fish food pellets 	Any pet store
8.	Screw-cap vials #8804P (for measuring water)	1 per kit	<ul style="list-style-type: none"> We provide a glass vial for mixing sugar with water to make “nectar” for adult mosquitoes 	www.bioquip.com
9.	Really Useful Plastic Storage Box 0.55 liter	1 per kit	<ul style="list-style-type: none"> Use for holding vials, magnifying glasses, pipettes, etc. in kits Laminated descriptions of contents of box are affixed to bottom with tape 	Any office supply store Artwork available at: www.ms mosquito.com/mosquito school

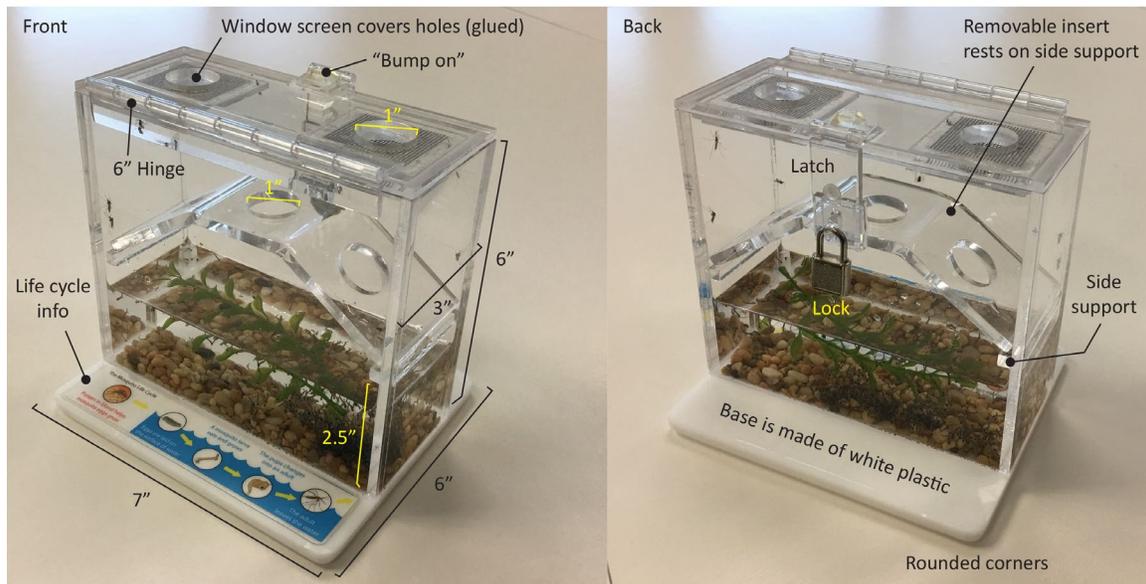
10.	Cotton balls	2 per kit	<ul style="list-style-type: none"> Used for feeding “nectar” to adult mosquitoes 	Nearby cotton fields
11.	Sugar packet	1 per kit	<ul style="list-style-type: none"> Mixed with water to make “nectar” for adult mosquitoes 	Break rooms everywhere
12.	Pipettes #736988	1 per kit	<ul style="list-style-type: none"> Used for catching larvae to feed fish and for microscope activity 	www.carolina.com
13.	Small aquarium net	1 per kit	<ul style="list-style-type: none"> Used for scooping up fish 	Any pet store
14.	Artificial aquarium plants	2-3 per kit	<ul style="list-style-type: none"> These are actually incredibly important because the fish are much less likely to survive if they do not have hiding places 	Any pet store
15.	Lee’s Kritter Keeper (Large, rectangular, 3 gallon)	1 per kit	<ul style="list-style-type: none"> For mosquitofish Holds everything in the life cycle kit during transport and storage 	Use a local pet store to order- if you order them online, you risk receiving damaged cages
16.	Small plastic lar/lid #JR006, JR007	1 per kit	<ul style="list-style-type: none"> Holds larvae to feed fish You may also find a similar sized substitute 	Bioquip (310) 667-8800 Phone order this item

We currently use custom-made mosquito observation cages that were fabricated by Tap Plastics in Santa Rosa, California (www.tapplastics.com). These cages are significantly more expensive than other options for observing mosquitoes in a classroom setting (such as “Mosquito Breeders” available from www.Bioquip.com). We used the Mosquito Breeders for several years and were generally satisfied with the product, but eventually decided to design the observation cages because we wanted to have a classroom habitat that was easier to clean, could be locked, was not a cylinder, and had space to attach information (see photo). For some of our lessons, students count and record the number of mosquitoes, and we found that the reflections due to the cylinder made it very difficult to accurately count the larvae. We have been using the custom-made mosquito observation cages for over five years, and have been extremely pleased with the quality of the cages. A few notes about the observation cages:



- At the time we produced these, each cost approximately \$140.
- We clean them only with vinegar, water, cotton balls and dry them with a microfiber cloth. Do not use glass cleaner or other chemical cleaners as they may damage the plastic. Do not use abrasive pads or the plastic will be scratched.
- When we loan these to classrooms, we lock them and do not provide the teacher with the key, as there is no need for students to ever open these cages.
- We designed these to have a 7”X 6” footprint so they could fit in the life cycle kit when being transported or stored.

Mosquito Observation Cage Specifications:



D. Mosquito Supplemental Curriculum

Our mosquito observation journals were designed to reinforce what was learned in the lesson, and to provide activities to be completed while using the life cycle kit. Most importantly, the journals provide a means for students to take home their learning experience. We generally print these booklets at our office, but you might also consider ordering them in bulk. If you print them yourselves, make sure you don't print them full size or you will use an enormous amount of paper. We print double-sided at 50% size, so an 8 page journal only requires 2 pages (exception: kindergarten activity sheets are printed at 100%). All of our mosquito observation journals are available to view or download at www.msosquito.com/mosquito_school.

VI. Yellowjacket Curriculum

A. Yellowjacket Lessons and the Next Generation Science Standards

In 2013, California adopted the Next Generation Science Standards. Around that time, educators began contacting us because they wanted to make sure that our lessons supported these standards. Since this time, we have worked with educators to reorganize and bolster our curriculum so that specific topics and activities in our curriculum relate directly to the standards. The following table provides a simple overview of each lesson, as well as a few of the specific standards and how they are addressed. The yellowjacket lessons we currently use are available for any agency, and can be accessed at www.msosquito.com/yellowjacket_school.

Yellowjacket Lesson (Grades K-2)

Lesson Overview	Specific Standard	How standard is addressed
<p>Students are read a story titled: “The Yellowjacket Queen”. The story follows the life cycle of a yellowjacket queen through the seasons as she builds her colony. Students learn why yellowjackets are dangerous and compare them to honey bees.</p>	<ul style="list-style-type: none"> • K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live 	<ul style="list-style-type: none"> • The story describes all of the resources (nest materials, food, etc.) that yellowjackets require in order to build a thriving colony.
	<ul style="list-style-type: none"> • LS1.A: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find and taking in food, water and air 	<ul style="list-style-type: none"> • The story reveals how yellowjackets use different body parts to accomplish a wide variety of tasks (hunting for insects, building nests, digging, etc.).
	<ul style="list-style-type: none"> • 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats 	<ul style="list-style-type: none"> • During the classroom lesson, students discuss how certain habitats are more attractive to yellowjackets and compare the habitat requirements for yellowjackets and honey bees.

Yellowjacket Lesson (Grades 3-5)

Lesson Overview	Specific Standard	How standard is addressed
<p>The presentation focuses on how yellowjackets benefit from human activities, as well as the natural life cycle of a colony of yellowjackets. Students learn steps they can take to stay safer from yellowjackets.</p>	<ul style="list-style-type: none"> • 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death 	<ul style="list-style-type: none"> • Students learn the life cycle of yellowjackets and compare it to other organisms (especially insects).
	<ul style="list-style-type: none"> • 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction 	<ul style="list-style-type: none"> • The lesson focuses on how yellowjackets survive and thrive near human habitations. Students learn the specific body parts that allow yellowjackets to accomplish certain tasks (mandibles, wings, sting, etc.).
	<ul style="list-style-type: none"> • 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment 	<ul style="list-style-type: none"> • Students learn about the resources that yellowjackets are able to exploit near human habitations, and how this differs from the resources collected by honey bees.

B. Yellowjacket Life Cycle Kit

Our yellowjacket life cycle kits reinforce the topics learned in the classroom presentation and provide the basis for the activities in the supplemental curriculum. The following photo and accompanying table describe the various components of these kits. We have also included the plans for the life cycle wheel (which can be modified for use with the tick life cycle kit).

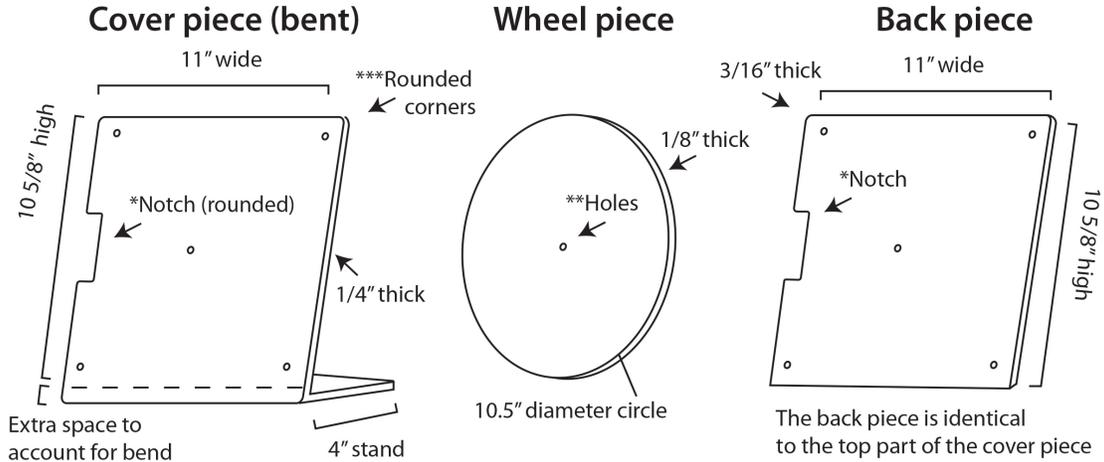


# in photo	Item/Catalog #	Number needed	Notes	Vendor
1.	Yellowjacket life cycle wheel	1 per kit	<ul style="list-style-type: none"> Students turn the wheel to see the life cycle of a yellowjacket colony See plans below Contact erice@msmosquito.com for artwork files 	Tap Plastics (see plans below)
2.	Plastic display case (for holding a football)	1 per kit	<ul style="list-style-type: none"> These cases are a convenient size for holding a yellowjacket nest 	Many online vendors
3.	Yellowjacket nest	1 per kit	<ul style="list-style-type: none"> We typically use nests made by western yellowjackets (<i>Vespula pensylvanica</i>) This particular nest was found in ivy, and nests built in bushes can often be removed without damaging them (unlike nests in the ground) 	A brave soul with a beekeeper's suit
4.	Houseworks 67140 18" wood crate	1 per kit	<ul style="list-style-type: none"> Everything fits into the crate, and it doubles as a stand for the nest 	www.amazon.com
5.	Magnifying glasses #602217	2 per kit	<ul style="list-style-type: none"> 2.5 and 5X magnification 	www.carolina.com
6.	Insect display case (1041BP)	1 per kit	<ul style="list-style-type: none"> The insect collection includes a variety of bees and wasps that are commonly encountered in Marin and Sonoma Counties In addition to the preserved specimens, there is information about the nests that each makes Contact erice@msmosquito.com for artwork files 	www.bioquip.com

Life Cycle Wheel Plans

Questions? Contact Eric Engh at erice@msmosquito.com

The life cycle wheel has 3 main plastic components- the front cover piece, the circular wheel piece, and the back piece. The 3 pieces attach to one another with five plastic 1/4" screws/posts, and are spaced with washers. The diagram below is not to scale, but dimensions are provided. Tap plastics in Santa Rosa (707.544.5772) fabricated the pieces, and have their own version of these plans on file.



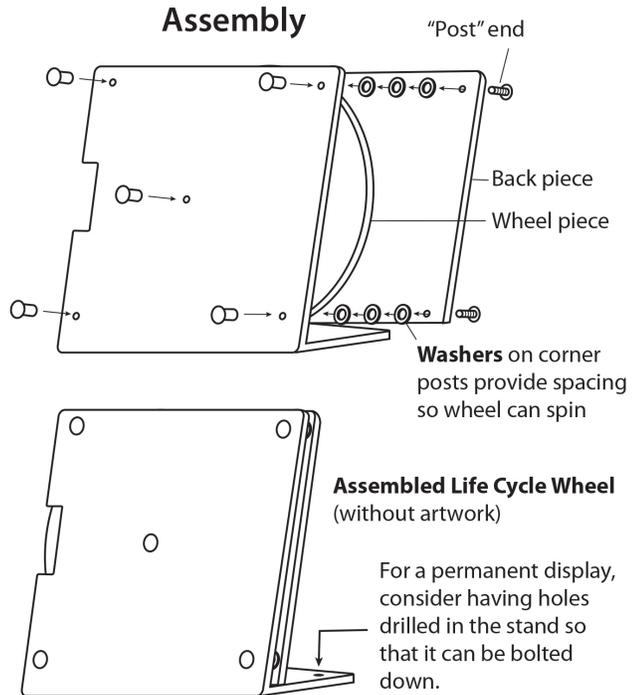
*** Notches:** the notches in the cover piece and back piece are 2.5" high, and 0.75" wide, and centered. They must be aligned exactly because they allow people to spin the wheel.

**** Holes:** All holes are 1/4". The cover piece and back piece have 5 holes and the wheel piece has one hole. The four corner holes in the cover and back pieces are 0.75" in from the edges, and 0.75" above/below the bottom/top. All three pieces have a center hole. All holes need to align exactly, so the five screws can be inserted that hold the display together.

***** Corners:** All corners need to be rounded (so that kids don't poke themselves), including the corners on the notches.

Materials: All three pieces are made of clear plastic. The cover piece is the thickest (approx. 1/4" thick), the wheel is 1/8" thick and back piece is approx. 3/16" thick. If plastic of a different thickness is used, you will need to adjust the number/thickness of the washers used to space the pieces when you assemble it.

Assembly: The three pieces attach with 1/4" screws/posts that are spaced with washers so that the wheel can spin with ease. The artwork will be added later once you confirm the wheel works.



C. Yellowjacket Supplemental Curriculum

Our supplemental curriculum was designed to reinforce what was learned in the lesson, and to provide activities to be completed while using the life cycle kit. Most importantly, students take home their activity books and use them to teach their

families what they learned. We generally print these booklets at our office, but you might also consider ordering them in bulk. If you print them yourselves, make sure you don't print them full size or you will use an enormous amount of paper. We print double-sided at 50% size, so an 8 page activity book only requires 2 pages. All of our yellowjacket supplemental curriculum is available to view or download at www.msquito.com/yellowjacket school.

VII. Tick Curriculum

A. Tick Lessons and the Next Generation Science Standards

In 2013, California adopted the Next Generation Science Standards. Around that time, educators began contacting us because they wanted to make sure that our lessons supported these standards. Since this time, we have worked with educators to reorganize and bolster our curriculum so that specific topics and activities in our curriculum relate directly to the standards. The following table provides a simple overview of each lesson, as well as a few of the specific standards and how they are addressed. The tick lessons we currently use are available for any agency, and can be accessed at www.msquito.com/tick school.

Tick Lesson (Grades K-2)		
Lesson Overview	Specific Standard	How standard is addressed
The lesson focuses on the life cycle of ticks, and the habitats they can often be found in. Students learn a variety of safety tips related to ticks.	<ul style="list-style-type: none"> K-ESS3-1: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live 	<ul style="list-style-type: none"> Students learn that ticks only feed on blood, and that ticks are usually found in certain habitats.
	<ul style="list-style-type: none"> LS1.A: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find and taking in food, water and air 	<ul style="list-style-type: none"> Students learn that ticks are arachnids and sense their environment in surprising ways (example: they smell with their front legs).
	<ul style="list-style-type: none"> 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats 	<ul style="list-style-type: none"> Students learn that ticks are more likely to be present in certain habitats.

Tick Lesson (Grades 3-5)

Lesson Overview	Specific Standard	How standard is addressed
Students learn about the life cycle and habitat of local ticks (especially the western black-legged tick), safety tips relevant to ticks, and the concept that ticks sometimes spread pathogens to wildlife and humans.	<ul style="list-style-type: none"> • 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death 	<ul style="list-style-type: none"> • Students compare the tick life cycle to that of other related organisms (especially arachnids and other arthropods).
	<ul style="list-style-type: none"> • 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction 	<ul style="list-style-type: none"> • Students discuss the various adaptations ticks use to survive for long periods of time without a meal, as well as detecting a potential host.
	<ul style="list-style-type: none"> • 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment 	<ul style="list-style-type: none"> • Students learn that ticks are parasitic arachnids, are sometimes prey for other animals, and can spread pathogens to wildlife and humans.

B. Tick Life Cycle Kits

Our tick life cycle kits reinforce the topics learned in the classroom presentation and provide the basis for the activities in the activity books. The tick life cycle kit includes a tick life cycle wheel (see plans in “Yellowjacket Life Cycle Kit” section of this document), and a wooden display containing preserved tick specimens (see photo). Each glass vial contains specimens of a particular life stage (adults, engorged female, larvae, and nymphs). The vials have a magnet on the bottom, as do the holes in the display. This way the vials can be secured and easily removed by students to examine. The specimens in the vials are preserved in clear hand sanitizer. Students are provided with tick identification cards (available from the California Department of Public Health) which they use to identify the adult specimens. Contact erice@msmosquito.com if you have questions about building one of these displays or need the associated artwork files.



C. Tick Supplemental Curriculum

Our supplemental curriculum was designed to reinforce what was learned in the lesson, and to provide activities to be completed while using the life cycle kit. Most importantly, students take home their activity books and use them to teach their

families what they learned. We generally print these booklets at our office, but you might also consider ordering them in bulk. If you print them yourselves, make sure you don't print them full size or you will use an enormous amount of paper. We print double-sided at 50% size, so an 8 page activity book only requires 2 pages. All of our tick supplemental curriculum is available to view or download at [www.msmosquito.com/tick school](http://www.msmosquito.com/tick-school).

VIII. Maintaining and Improving the Program

A. Budgeting

It is possible to implement and maintain an effective education program with a relatively small budget. The current operating budget for MSMVCD's education program is \$11,000 per year. This figure is adequate for maintaining the program (including replacing presentation equipment, purchasing promotional items and supplies necessary for maintaining life cycle kits, and upkeep of mosquitofish holding tanks). This budget only includes direct costs associated with managing the education program and does not include other expenses such as employee salaries/benefits, or vehicle maintenance/fuel/insurance costs. Implementing an education program similar to the one described would initially require money for items that do not need to be replaced each year, especially presentation equipment.

B. Maintaining a Mosquito Colony

Starting with field-collected egg rafts is the best way to raise larvae. Using field-collected larvae is an acceptable method, but if egg rafts are used, larvae of different ages can be kept in separate trays. This also ensures that the growing larvae are *Culiseta* or *Culex* species, which are capable of emerging during the 10-12 day time period they will be in the classroom. *Aedes* species may take too long to emerge. Agencies outside of California may need to determine what local species of mosquitoes are most suitable for lab-rearing and use in classrooms.

Allow eggs to hatch at room temperature in rearing trays filled with filtered water. If an environmental chamber is available (it is not necessary to have an environmental chamber to rear larvae, but using one allows for a more controlled environment), place trays inside when larvae are a few days old. The temperature inside the chamber can be adjusted to speed or slow larval development. The chambers at MSMVCD are generally set at 14°C from 7:00-3:30pm (this corresponds to the MSMVCD workday) and 13°C at night. Relative humidity is set at 70%. Larvae are fed 2-3 times a week, and trays are cleaned as needed. A complete list of all supplies used by MSMVCD for maintaining a larval colony is provided below:

Item	Catalog #	Notes	Vendor
Rearing trays- clear, 1/1 GN food pan, 2-1/2" deep	12CW-135	For rearing larvae	www.deiequipment.com or a local restaurant supply store
Barnstead B-Pure ½, wall mounted filter	Product # D5839	Water filtration- removes chlorine	www.barnsteadthermolyne.com
Screened cages (for adult mosquitoes)	Catalog # 1450B 12X12 inch collapsible	So they don't get out!	www.bioquip.com
Plastic window screen replacement fabric	NA	Making "nets" to scoop out larvae/pupae	Home improvement store
Coffee grinder	NA	Grinding food for larvae	Home supply store
Portable lab scale	Catalog # 702215	Measuring ingredients for larvae food	www.carolina.com
Cotton balls	NA	Soak with adult mosquito food	Home supply store
Cat food (dry)	NA	Larvae food ingredient	Any local pet store
Brewer's yeast	NA	Larvae food ingredient	Specialty food store
Alfalfa pellets (rabbit food)	NA	Larvae food ingredient	Any local pet store
Single-serving sugar table packets (2.8 grams)	NA	Adult mosquito food ingredient	Costco
Beaker (graduated in mL)	Catalog # 721443	Measuring water for adult food	www.carolina.com
Environmental chamber	Percival Model # I36VL	Growing larvae in a controlled environment	www.percival-scientific.com

Recipes for food for mosquito larvae and adults:

- For larvae: 40 grams cat food + 40 grams alfalfa (rabbit food) + 10 grams brewer's yeast. Combine cat food and rabbit food in coffee grinder and grind until fine. Add the brewer's yeast and grind until well-mixed. Yummy!
- For adults: Use three sugar packets for each 100 mL of filtered water. Stir until dissolved. Store in refrigerator. Soak cotton balls in solution and place on top of cage screen to feed adult mosquitoes.

C. Using and Maintaining Mosquitofish for Classroom Use

Every year MSMVCD provides thousands of mosquitofish for public use. Fish are available free of charge to residents in Marin and Sonoma counties in late spring and summer. This document is not intended to describe the operation of a large-scale mosquitofish program, but instead to describe how the fish are used in the classroom and how to maintain holding tanks to house fish for classroom use year-round. Here are a few notes about using mosquitofish in the classroom:

- We supply each kit with 3-4 mosquitofish.
- We set up the fish habitat for the teacher, and it is vital that tap water from the classroom is treated with water conditioner to eliminate chlorine (otherwise the fish will be dead within hours).

- The size of the classroom habitat is important. We currently use an aquarium that is 3 gallons. In the past, we used a one-gallon aquarium, and fish mortality was significantly higher.
- The life cycle kits do not have filters, but teachers do not need to change the water during the 2 week stay in the classroom.
- The decorative plants in the aquarium are vital to the survival of the fish. If the fish do not have ample places to hide, they are much less likely to survive their stay in the classroom.
- During the classroom presentation, always demonstrate how to catch larvae with the pipette, and stress that the larvae are provided to feed the fish for the first three days of the project.
- Always remind the teacher not to let students over-feed the fish with the pellets (each pellet lasts 3-4 days); overfeeding will cloud the water and reduce fish survivability.
- Mosquitofish are live-bearing; you can let teachers know if they see tiny fish in the habitat, they can put them in a jar filled with aquarium water and feed them a fish pellet.
- Life cycle kits come with a net because occasionally the fish do not survive. Sometimes students or teachers are very upset and express extreme guilt. This becomes a “teaching moment” and in most cases does not indicate that the class did anything wrong. Let teachers know to simply scoop out the fish and dispose of it.
- Always give the fish an entire “week off” between school visits, as this greatly increases their lifespan. We know that mosquitofish can survive the rigors of school life for well over a year (one of our fish had only one eye, and she survived 3 seasons of classroom presentations before she was relocated to a local, well-renowned, mosquitofish water trough retirement facility).

We maintain two fish tanks for approximately 60-70 fish. The water in these tanks is constantly filtered, and periodically 20% of the water is replaced. Two tanks are used so that individual fish are not sent to classrooms on two consecutive weeks. When you set up your holding tanks, allow the water to be filtered for several days prior to adding the fish. The following table includes the equipment we use to house fish for our education program.

Item	Number needed	Notes
40-50 gallon fish tank	2	<ul style="list-style-type: none"> Two tanks are required so that fish are able to have a week "off" between presentations
Filter	2	<ul style="list-style-type: none"> Many effective brands available
Water conditioner	1 per season	<ul style="list-style-type: none"> Follow instructions, add to each aquarium prior to adding water for mosquitofish
Fish food floating pellets	1 per year	<ul style="list-style-type: none"> Use fish food pellets instead of flakes- this way it is easier to control how much students feed the fish
Ammonia test kit	2 per year	<ul style="list-style-type: none"> Test aquarium water periodically
5 in 1 test kit	1 per year	<ul style="list-style-type: none"> Test aquarium water periodically
Artificial plants	Several	<ul style="list-style-type: none"> Providing mosquitofish with hiding areas reduces stress
Gravel	10-20 lb.	<ul style="list-style-type: none"> Make sure to rinse well before adding to the water

D. Special Lessons/Projects

This document outlines the lessons we use most often, but over the years educators have asked for specific lessons that we have used occasionally, most often with older students (middle and high school and college level). These include presentations regarding:

- West Nile virus (middle school)
- Insect identification (high school)
- Parasitism and vector-borne disease (college)

If you are interested in developing or using any of these presentations, please contact erice@msmosquito.com. We also have a web site for teachers planning on "pre-teaching" information about vectors or looking for additional relevant resources: www.msmosquito.com/teachers.

E. Evaluations

One way we measure success is by offering each teacher the opportunity to evaluate our program. Our evaluation form is very simple (see below).

Evaluation



Thank you for inviting us to your classroom!
Please take a few moments to evaluate our program:

What grade level is your class? Pre-K TK K 1 2 3 4 5 6 7 8

Which vector did your students learn about? Mosquitoes Yellowjackets Ticks

Please describe your overall impression of our education program.

Do you have any ideas that would help to improve our program?

Thanks! We take your input seriously and have made many changes to our education program over the years using input from teachers.

If you would like to receive our Education Program Newsletter email, please provide your email address. The newsletter provides updates and a reminder about when it is time to schedule presentations! Your email will not be shared with others and you can be removed from the list at any time. Don't forget to tell us if your email has changed!

Your email: _____

There are several ways to return an evaluation:

- Hand the evaluation to Eric if he is going to return to your classroom
- Fax it to (707) 285-2210
- Take a picture of it and email the photo to erice@msmosquito.com
- Mail it via snail mail or messenger pigeon to 595 Helman Lane, Cotati, CA. 94931

The overwhelming majority of the evaluations we receive simply express gratitude for our education program (especially descriptive quotes are used for our annual report to our board of trustees). The most common request we receive is to expand our program, either by adding more vectors to the curriculum, or adding another educator to our team so that we can visit more classrooms. Occasionally, we receive an evaluation where an educator has thought of a way to improve the program, and we strive to use their input whenever possible. More important than a stack of positive evaluations is the simple fact that educators keep inviting us back. There are many local teachers who have invited us to their classrooms for at least 10 years, and there are even a few that have had us visit each of the last 20+ years!

IX. Conclusion

Vector education programs that include a classroom presentation component can be a worthwhile and effective tool for forging meaningful connections with the public. It is important to realize that we are not only educating the students, but their families as well. We are able to take advantage of a child's natural enthusiasm for science, and use it to deliver specific, valuable messages to them and the rest of their family. Parents often call us for service and mention that their child recommended they do so.

Thank you to all the staff at MSMVCD for supporting our education program, especially Nizza Sequeira, Sarah Brooks, Kristen Holt, Kelly Liebman, Dawn Williams, Paula Delsid, Erik Hawk and Phil Smith. If you have any questions about this document, our education program, or you would like to discuss your own outreach efforts, please email erice@msmosquito.com.