Student Handbook
Maine Master Naturalist Program

(revised November 2024)

The goal of this Student Handbook is to articulate the fundamental principles and practices of the MMN program and to provide specific information to help you navigate the course and your work as a naturalist.

Class Attendance

Attending every class and field experience is essential to your success in the program. Your acceptance into the course entails a commitment to attending every class. If you must miss a class due to an unanticipated emergency, contact your mentor and follow up as soon as is practical to discuss possible arrangements for making up the missed class. If the missed learning cannot be made up and you meet specific conditions, your graduation may be deferred until you can make up the class in the following year's course; in other words, missing class should not be taken lightly.

You must be ready to work/learn at the scheduled time, so plan to arrive (or to join online) with enough time to get settled. Coordinators and mentors are generally available for 30 minutes or so before class begins. Plan accordingly if you need to speak with them. Since learning space (in person or on Zoom) is available before class begins, it's also a terrific opportunity to get to know your classmates.

Homework

The MMNP Course Description makes explicit the significant amount of time required outside of class. Class meetings total about 100 hours; we expect that homework and additional independent work will require an additional 100-150 hours. Mentors review homework (including assignments specific to each topic, phenology, delimited site journal, and other assignments) monthly to provide feedback on the quality and accuracy of your work. We cannot emphasize enough that successful progress in and completion of the course requires conscientious, consistent, and thorough work outside of class. Remember that mentors volunteer their time to help you learn; respect their time by making sure your homework submissions are submitted on time and are clearly labeled and organized.

Volunteer Requirements

The mission of the MMN program is to train people to be volunteer naturalists who will enrich nature education in Maine. Throughout the course, you'll have opportunities to engage in experiential learning and to practice teaching; you'll gain confidence to teach others following graduation.

In return for acceptance into the course, graduates must volunteer to teach for 20 hours in the year after graduation and at least 10 hours per year after that. Following your graduation from the program, you will gain access to the Graduates part of the MMNP website. That's where you will report your volunteer hours. You will submit a form (electronically) each time you volunteer.

While there are many kinds of important volunteer work, only face-to-face teaching counts toward the MMNP volunteering requirement, in keeping with MMNP's mission. **To count toward the MMNP volunteer requirement, the volunteering work must:**

- Be done without compensation.

- Be sponsored by an organization or organized group that does not operate to make a profit. Examples include, but are not limited to land trusts, schools, libraries, towns, parks, reserves, government entities, tribes, churches, museums, senior colleges, and other community groups or organizations.
- Not be part of an existing paid job unless the volunteering is an unpaid extension of the job.
- Be conducted face-to-face either in person or over video-conferencing.
- Present nature-related material.

Volunteering that doesn't count:

- Creating a natural history blog, Facebook page, video, book, article, letter to the editor, or brochure.
- Developing curriculum.
- Making or organizing specimen collections.
- Advocating at the legislature or working on a political campaign.
- Citizen/community science such as work on the Bird Atlas or plant surveys. (However, teaching during a citizen/community science event would count as MMNP hours.)
- Physical labor such as trash cleanup, invasive species control, clearing trails, or building infrastructure.
- Projects conducted in isolation from direct users such as desk jobs, data entry, administrative tasks, and committee work.
- Event facilitation such as coordinating speakers, taking registrations, and communicating with attendees.
- Informal instruction of friends, family, fellow workers, or community members about the natural world.

Tips for Running an Safe and Enjoyable Walk

- **Partner with someone for the walk**. Having another person to bounce off ideas and ask questions makes the walk and your job more enjoyable.

- **Know your site.** Visit it ahead of time and check the trails.
  - What will you find? Take notes as to what you might see. Practice using the guides and keys you will use in the environment.
  - Check the footing, elevation gain, areas that may be wet, etc.
  - Map out the trail you will take and make a plan if people need to leave early or if people aren't able to walk the entire trail.
  - Find out who owns the area and, if possible, its history including who made it open to the public.

- **Be Confident –** You know a lot but, of course, not everything. It is ok to say "I don't know." It is very powerful to work through a question or identification with those on the walk.

- **Encourage your group participants to share.**

- **Safety** – While you are not required to bring a first aid kit or provide first aid, it's best to confer with the sponsoring agency about first aid and safety protocols.

  Maine's Good Samaritan Law Link
  Title 14, §164: Immunity from civil liability (maine.gov)

  Red Cross First Aid Kit Suggestions
  Make a First Aid Kit | Supplies & Contents | American Red Cross

  Red Cross First Aid Training in Maine
  First Aid Classes, Training & Certification in Maine | Red Cross

Your Delimited Observation Site

Select a Delimited Study Site.
"Delimit" means to fix or mark the limits or boundaries of something. You will delimit an area at which you will make and record observations throughout the year; i.e., your delimited site. The site can be anywhere but should be accessible for frequent observation and of a manageable size such as a plot of forest, a marsh, a pond, a section of rocky coastline.

Spend at least one hour per month for a minimum total of 10 hours over the course of the year and record your observations in your nature journal. You do not need to observe for a full hour each time you visit your site, but should observe for at least an hour occasionally. Some students spend many hours observing their delimited site. You might decide to complete some homework assignments there as well. In any case, try visiting at different times of the day, using all your senses, and observing from different vantage points: close-up, mid-distance, and as if hovering over the site.

Learning outcomes. As a result of study at your delimited site, you will

- hone your powers of observation
- describe components of your site using correct vocabulary
- apply concepts learned throughout the course
- experiment with different methods of recording observations (written notes, sketches, photographs, etc.)
- articulate new questions and hypotheses

Tools to Have with You When You Visit:

- Journal
- Pens, pencils, and/or paints
- Hand Lens
- Binoculars
- Ruler
- Field Guides
- Camera
- Whatever else you might need to make yourself comfortable!

Things to Consider Recording throughout the year.

Each delimited site is different and all have innumerable opportunities for observation. Below are suggestions that might help whenever you get "stuck" deciding what to observe or whenever you need ideas for focusing on a single element/concept.

- Record what you observe with your sense of smell, hearing, and touch.
- Identify examples of nutrients and the flow of energy and matter.
- Describe aspects of trophic structure that seem important or that you witness.
- Explore species diversity and density at your delimited study site.
- Examine the layers of the vertical community.
- Notice and describe behavior and specific ecological interactions among the species at your site.
- Observe and record any interesting or notable birds and their behavior at your site.
- Record observations from your MMNP learning such as tracks, animal signs, insects, wildflowers, ferns, fungi, lichens, etc.

Phenology

Phenology is the study of cyclical (seasonal) phenomena, such as migration or blossoming, in relation to climatic conditions. Phenology is important because it helps the observer notice and understand the natural world and, by combining ecology and climatology, phenological records reveal the impact of climate disruption on nature. Phenological observations–such as habitat changes, when pollinators and food are available, and environmental restoration projects–have served as sources for scientific and historical research.

Keep track of phenological observations (e.g., temperature, weather events, the appearance and behavior of birds and other animals, blossoming and fruiting of plants, and other seasonal changes) on at least a weekly basis, using the phenology form or instructions supplied by your course coordinators. Submit your phenology to your mentor each month.

Nature Journaling

Nature journaling (a process) and the nature journal (a product) are important tools for naturalists.
A nature journal is, quite simply, a record of your time spent in nature. It can include images (sketches, drawings, doodles, photos, rubbings, diagrams, photographs, cutouts from other media) and words (data, lists, prose, poetry) about observations, questions, experiences, encounters, reflections, and emotions. Naturalists throughout history have kept journals, many of which led to some of the great nature literature we have today.

Keeping a nature journal is an essential element of the MMNP curriculum. At minimum, you will record observations of your delimited site in your journal. You may also, however, use it to record other observations and experiences. Some students integrate their homework assignments into the nature journal; others reserve the journal for delimited site observations and keep homework separate. Both the nature journal and your homework assignments are central to your learning in the program.

Together, your nature journal and homework assignments constitute your portfolio, a log of your discoveries and reflections throughout the program. However you decide to organize your work–and deciding this is a struggle for many students as they begin the course–in the end, your portfolio will document your delimited site and phenology observations and will house the drawings, observations, and

research you do for homework assignments throughout the course. As you will discover, there are many ways to organize your portfolio and figuring out what works for you is part of the fun.

The process of nature journaling serves many valuable purposes; it

- helps focus observations
- aids identification
- supports memory
- fosters curiosity
- records data
- creates a historical record of what you see, hear, smell, think, and wonder
- helps you build a relationship with the natural world around you

See the MMNP Nature Journaling Handbook for more nature journaling ideas and resources.

Maine Wildlife Protections & Cautions

Naturalists should be aware of basic laws related to wildlife and be knowledgeable about how to engage safely in the practices of natural history teaching and learning. What follows is some key information about federal and state law as it relates to our work as naturalists.

Birds

The federal Migratory Bird Treaty Act of 1918 prohibits the killing of birds and the possession of dead birds (as well as feathers, bones, eggs and nests) for more than 800 species.

There are two exceptions:

- The House Sparrow and European Starling are excluded from the list because they are not native to this country.
- You can possess the parts of legally-killed game birds and ducks taken under a hunting license, duck stamp, etc.

Marine Mammals

Federal law also protects all marine mammals. The Marine Mammals Protection Act (MMPA) prohibits the "taking" of any marine mammal species in U.S. waters where "take" means to hunt, harass, capture, or kill any marine mammal or attempting to do so. It also prohibits the import and export of marine mammals and their parts or products.

Birds and mammals

Maine's hunting and trapping laws regulate what we can collect.

http://www.maine.gov/ifw/hunting-trapping/hunting-laws/general-laws.html

The law stipulates that, "The hunting, possession, transporting of any species of wild animal or wild bird, or parts thereof, for which an open hunting season is not specifically provided, and except as provided in the fish and wildlife laws, is unlawful. It is also unlawful to take, possess, or needlessly destroy the nest or eggs of any wild bird except the English or European house sparrow, the European starling and the rock pigeon (a.k.a. rock dove)."

Generally speaking, you should assume that any bird or animal in the state is protected unless you know otherwise. Almost all species of mammals and birds are either protected or the taking or possession of them is regulated. The only exceptions among mammals are coyote, woodchuck, porcupine and red squirrel. English or house sparrow and European starling are the only bird species not protected in Maine.

The law protects wild animals and birds and “parts thereof.” This means that even things like feathers are protected and thus possession of them is prohibited. This is primarily enforcement-related; it would be difficult to be sure that an individual did not kill the bird, then recover the feather.

Birds’ nests are also protected. Maine law states that a person cannot possess or needlessly destroy the nest or eggs of any wild bird. If nest collecting were allowed, collectors could affect reproductive success in some species. In short, possession of bird nests is also prohibited.

It is legal to possess feathers from a bird taken legally or antlers from a deer shot during hunting season. Possession of these specimens or their parts are permitted because they were taken legally in season. In short, if you can legally hunt it, you can legally have it, being mindful, of course, of daily bag and possession limits.

It is also legal to possess a naturally-shed antler. However, if you find a dead deer or moose, or the skeleton of one, it would be illegal to remove the antlers or any other part of the carcass.

Maine’s Department of Inland Fisheries and Wildlife issues permits that allow the collection and possession of mammal and mammal parts. The Maine Master Naturalist Program has a permit (renewed annually) that allows specific instructional staff to pick up roadkill, receive carcasses from hunters, and accept skulls and other bones from other sources. MMNP students and grads who are part of an educational program may wish to look into obtaining a permit. MMNP students and graduates will not routinely or ordinarily be handling dead animals. Occasionally, however, you may encounter animal remains.

Contact with bones and scat

Naturalists should be aware that there are a number of risks related to animal remains, including taxidermied specimens, and scat.

Zoonotic diseases, or zoonoses, are diseases caused by harmful germs like viruses, bacteria, parasites, and fungi when the germ is transmitted from its non-human host to people. Zoonotic diseases spread in a variety of way, not exclusive to naturalists, including, according to the CDC.

> **Direct contact:** Coming into contact with the saliva, blood, urine, mucous, feces, or other body fluids of an infected animal. Examples include petting or touching animals, and bites or scratches.
>
> **Indirect contact:** Coming into contact with areas where animals live and roam, or objects or surfaces that have been contaminated with germs. Examples include aquarium tank water, pet habitats, chicken coops, barns, plants, and soil, as well as pet food and water dishes.
>
> **Vector-borne:** Being bitten by a tick, or an insect like a mosquito or a flea.
>
> **Foodborne:** Eating or drinking something unsafe, such as unpasteurized (raw) milk, undercooked meat or eggs, or raw fruits and vegetables that are contaminated.

Waterborne: Drinking or coming in contact with water that has been contaminated with feces from an infected animal.

Animal Scat. Zoonotic diseases can be transmitted via contact with animal scat. Your instructors have collected specimens of animal scat in order to teach you how to identify them. We recommend that you do not collect scat yourself. Some animals carry and pass infectious parasites in their scat. *Baylisascaris,* in particular, is a roundworm genus that infests more than fifty animal species. Maine species include:

- *Baylisascaris procyonis* (of raccoons)
- *Baylisascaris transfuga* (of bears)
- *Baylisascaris columnaris* (of skunks)
- *Baylisascaris devosi* (of fishers and martens)

If an animal passes the eggs in its feces, the eggs become active a month later and can remain viable for many years despite being subjected to cold and heat. Parasites can enter humans through either the digestive or respiratory systems. Children who handle scat and then eat food without washing, adults who pick up scat to dispose of it and then eat without washing, and inquisitive naturalists who break open dry scat to investigate its properties all run the risk of ingesting or inhaling eggs.

The best route is avoidance: Do not handle or smell scat from raccoons, bears, skunks, fishers or martens. If your skin does come into contact with scat from these animals, wash skin thoroughly to avoid ingestion. **This parasite cannot be treated; it goes into the human brain, causes seizures and coma, and kills the host.**

Owl pellets are not scat but are the undigested part of an owl's food, regurgitated (coughed up through its beak). Other birds, including herons, corvids, and kingfishers also produce pellets. As part of the course, you will dissect an owl pellet. The pellets are obtained from a science supplier and have been sterilized.

Taxidermy. Naturalists occasionally have the opportunity to work with taxidermied specimens belonging to other organizations (eg. Audubon, land trusts, museums, etc.). We should treat such specimens, especially older ones, with considerable care since prior to the 1980s, many were treated with toxic preservatives like arsenic, mercuric chloride, strychnine, DDT, ethylene oxide and others to protect specimens from infestation and decay. In large collections (for instance, in universities and museums), older specimens are now stored and displayed behind glass and curators wear personal protective gear, including Tyvek suits, gloves, and masks when handling specimens. Naturalists should be aware of these risks and take precautions if handling older specimens.

Plants

With cameras on phones, it's easy and often helpful (and rewarding) to take pictures of plant specimens. As part of your coursework, however, you will collect, dry, press, and preserve plant specimens (ferns and tree leaves). Preserved specimens have several advantages over photographs.

- Photographs are not life-size. In the world of photos, true size is often obscured unless the photo includes a scale or reference object.
- Photographs cannot show all key identification features. (Good identification guides – think of Newcomb's wildflower guide – often use illustrations.)

- Photographs do not yield details to a hand lens. You can look for tiny hairs on the underside of a pressed leaf, but even if you photographed the underside of the leaf, you might not be able to see those hairs even with a macro lens.

As part of your MMNP training, you will collect only ferns and tree leaves; the information below applies more broadly, however, as you may choose to collect other plant specimens in your work as a naturalist.

The primary goal is to collect and preserve a plant so that the user can observe all the key features needed for a definitive identification.

Selecting specimens

- Collect only from large healthy stands. Leave solitary plants in place. Collect only common plants. Avoid anything that may be threatened or endangered. The Maine Natural Areas Program provides information on rare, threatened, and endangered plants, including a list of species.
- A good focus for a plant collection is roadside species - plants that are common and grow prolifically.
- Choose a healthy, representative sample when the plant is flowering. If the plant flowers before it leafs out, you can collect flowers and leaves separately. If possible, include fruiting structures.
- Select a plant that shows typical characteristics, If the species usually has opposite leaves and purple flowers – but sometimes has sub-opposite or alternate leaves and/or pink flowers – then collect a plant that shows the former.
- Roots and rhizomes are usually required for herbarium specimens as underground characteristics are often needed for identification. MMNP prefers that you collect only the above ground portion of the plant to avoid killing it.
- Remove dirt, dead leaves, and insects or their cocoons or galls.
  For herbaceous plants: If possible, take the entire plant; if the plant is too large, collect the flowering/fruiting structure, the top, and the base excluding roots and rhizomes.
  For woody plants: Take a sample 12 - 14 inches long from the end of a branch.
  For ferns: Include the entire frond from the base of the stipe to the top of the blade. Include a separate fertile frond if possible.
- You do not have to preserve every branch, twig, or leaf. In fact, too many leaves or flowers can obscure the size and shape of a structure as well as how that structure joins the plant.
- Assign the plant a number and record the name, genus/species (if you know it), location, habitat, date, and any other noteworthy information.
- Collect carefully into a bag and press at the earliest opportunity but no more than a few hours later.

Labeling Specimens

Each specimen must be properly labeled in order to make it most useful to you, and as time goes on, to others who may want to use your specimen. Data on each label should include:

1. **Common Name**
2. Plant **Family** usually in Latin
3. **Scientific Name**
4. **Location**. GPS coordinates in decimal degrees (i.e., 44.307099, -69.781257) are preferred but at least the town and short description are required.
5. **Habitat** of collection site which can be written as a short description noting slope, substrate, moisture content, shade, etc.

6. Any **Notes** you want to include. These can include the range of plant sizes, fruit to flower ratio, other species, etc.
7. **Date Collected**
8. **Name of Collector** (in most cases, you!)

Pressing & Drying

- Open a sheet of newspaper and arrange the plant in a natural, pleasing manner. Generally, you want the plant to occupy half or less of a full sheet of newspaper.
- Flatten and spread out the leaves so they can be used for identification. Carefully arrange the inflorescence and arrange them to best show the flower's features.
- If the plant is quite tall, then bend the stem into a zig-zag. For large leaves or plants fold as few times as possible to fit it on the page.
- Turn at least one of the leaves or pinnae over so that the user can observe the lower surface.
- Cover the arranged specimen with multiple additional sheets of newspaper. Allow ample pieces of newspaper between plants (3-6), as the paper will be absorbing moisture that eventually exits from the edges.
- If you have pieces of corrugated cardboard large enough to cover the entire specimen use those to create a multi-layer sandwich of newspapers & cardboard. The bottom and top of the stack should be cardboard even if you do not have enough to make a multi-layer stack.
- Place the stack of pressed specimens in a warm, dry place.
- If you have a large board, place that on top. Weight the pressed specimens with books, stacks of magazines or other heavy objects.
- Allow the plants to become completely dry. Depending upon humidity and the thickness of the stems this can take anywhere from a few days to a few weeks.

Preserving Specimens in Plastic

MMNP has developed a method of encasing pressed specimens in contact paper and vinyl. This method allows for much better durability than herbarium sheets while allowing nearly as much detail to be seen. Some of the program's specimens are more than a decade old and still in good condition. Here is a video in which Dorcas Miller, an MMNP founder, demonstrates the process.

- Assemble clear Contact paper and clear vinyl. We recommend rolls that are 18 inches wide.
- Open the roll of Contact paper across a flat surface, paper side up. Use canned goods or other small heavy items to hold it in place.
- Position the specimen on the paper to see how much room you need, leaving at least a 1-inch border all around (half an inch with small specimens). Cut the Contact paper to size.
- Remove paper layer and position the Contact paper sticky side up.
- Carefully place specimen on sticky side. You may need to press some parts of the plant into place with your fingers
- Put the completed **label** in the lower right corner.
- Use the discarded paper layer on a sheet of vinyl to use as a template. Cut the clear vinyl at least an inch (half an inch for small specimens) outside the paper layer. The extra vinyl will ensure you cover everything when you place it onto the sticky contact layer, even if you are a little off center.
- Review this video to see the technique for applying vinyl to the Contact paper and pressed specimen.

Storage

Store your specimens flat. Plastic underbed containers work well especially for larger specimens.

Insects

The MMNP course requires students to make an insect collection. Students may use insects they find that are already dead, or they may capture live insects to make collections for their own education and for use in future teaching.

Both within and beyond the naturalist community, there are thoughtful conversations about the moral and ethical considerations involved in collecting and preserving insect specimens. MMNP appreciates that students may have different views on these matters. The MMNP course requirement for students to make an insect collection for purposes of learning and teaching is not inconsistent with ethical considerations and does not require killing insects.

Guidance for Collecting Insects

1. **What to Collect:** You will need insects from seven basic orders: diptera, hymenoptera, orthoptera, hemiptera, lepidoptera, coleoptera and odonata. Since you may not know these groupings yet, just collect!

2. **How to Collect:** You can find insects almost anywhere; just keep your eyes open. Look in fields and the woods, on your window sill, by the side of the road, in your garden and in pool filters. You will be amazed how many insects are out there.

    - Use a net or set traps. (See sections below for more details.)
    - Get your friends and family to help. Never leave home without a collecting container. (Old pill bottles work great!)

3. **Collecting, euthanizing and preserving insects**
    - **Freezer method-** place insects in a container in the freezer for a couple weeks. When you remove it from the freezer, place it on a paper towel to dry it out.
    - **Jar method**: Take a glass jar, put some cotton balls (or plaster of paris) in the bottom and saturate with fingernail polish remover (containing acetone). Catch insects with a net or directly into the jar. Remove the insects once they are dead.

    Pin insects once you take them out of the jar or freezer. They are easier to pin when their bodies are soft. See notes below on this.

4. **Collecting Dead Insects-** Look for dead insects:
    - by the side of road where they land after being hit
    - in pool filters
    - around bug zappers
    - on window sills
    - in gardens- If you are an organic gardener you know that one way to protect crops from pesky insects is a daily bug pick off.
    - trade insects. If you collect more than one of a certain type insect, bring the extras to class to trade.

5. **What to do with your collected insects**

Once they are dead you will want to pin them right away before their bodies harden. Pin them into a piece of styrofoam. Later you will get a special box to mount them in. Pin them through the thorax between the wings. See details below.

6. **Labeling Insects**
    - You should record the date and location (environment and town) of the insects you collect.
    - Label them by their common name if you know it (or a good description if you don't know the name, such a large blue dragonfly)

Insect Collecting Methods

You can increase your chances of finding different insects by using different collecting methods

1. **Sweeping grass with a net**
    - Drag your net back and forth through tall grass, wild flowers and low shrubs.

2. Shaking bushes and over turning rocks and rotting logs
- Spread a light-colored sheet on the ground under a shrub and shake the shrub.
- Look under rocks and rotten logs.

3. Insect Ground Trap
- Bury a small can in soil so that the rim is level with the ground.
- Put a small amount of jam in the can (to lure in insects) and spread a thin layer of peanut butter around the inside of the rim (to trap them).
- Leave the trap for several hours or overnight.

4. Funnel trap
- Cut off the narrow part of a funnel so that the opening is about 1 cm across.
- Rub a piece of fruit over the inside of the funnel or pour some fruit juice on it so it is sticky and sweet smelling. Place the piece of fruit in a wide - mouth jar.
- Place the funnel in the mouth of the jar with the narrow part pointing down.
- Observe!

5. Observing moths - (Best done at night)
- Sugaring - Mix up some sugar (or molasses) with rotten or very ripe fruit. (Bananas are recommended) and some beer or wine. Make slurry that you will be able to apply to a tree trunk with a paint brush. Return later to observe moths.
- Many different sugaring recipes can be found online.
- Leave an outside light on overnight. Even better, hang a sheet on the side of the building near the night. In the morning you should find lots of moths.

6. Insect Sucker - Upper

You will need a glass jar with lid, two flexible straws or aquarium tubing (one needs to be big enough to fit the insects you will be sucking up) cheesecloth, duct tape.
- Make 2 holes in the lid of the jar that just fit the straws.
- Insert the straws in the holes and use tape to seal around them.
- Tape a piece of cheesecloth over the bottom of one tube (to prevent you from sucking insects into your mouth!)
- Place the lid on the jar.

- To catch an insect, place the tube with the cheesecloth attached in your mouth and place the end of the other tube over an insect and suck hard.

Pinning Insects

- **Forceps**

  You risk damaging specimens whenever you handle insects by hand. Forceps minimize the damage and can be bought at a biological supply company. Tweezers can be used but are not designed to handle insects and are more likely to accidentally injure specimens than forceps.

- **Relaxing jar**

  It is best to pin insects soon after they die and while they are still relaxed to minimize breaking any body parts. If this is not possible, you can soften insects in a relaxing jar.

  A relaxing jar should have a wide mouth (to easily place and remove specimens) and a tightly fitting lid. Place an absorbent layer (such as sand, cotton, cloth, sponge) in the bottom of the jar. Saturate the material with water and add a little ethyl acetate to inhibit fungus development. Place a protective layer (such as cork, cardboard) over the absorbent material. Place insects that need to be softened on the top layer for several days until they are relaxed.

- **Spreading board and pinning block**

  Spreading boards are useful for laying the wings of insects out flat and holding them in place while the specimen dries. They can be bought at a biological supply company. A pinning block can be any piece of styrofoam (styrofoam used for packing appliances in boxes, for instance). A pinning block is useful to position legs and other body parts before the insect dries. A pinning block can also be used as a mounting board by cutting a rectangular slit large enough to position an insect's body and allow the wings to lay flat. Different-sized slits are necessary for different-sized insects.

- **Insect pins and labels**

  Insect pins are long, slender pins made specifically for mounting insects. They are available from a biological supply company. Size #2 and #3 are the most useful for general collectors.

  Labels for pinned specimens should be made on relatively heavy stock paper (about 120 pound). You can purchase blank labels from a biological supply company or you can make your own with unlined index cards or heavy paper. Each label should be approximately 1/2 x 3/4 inch in size or smaller. For neatness, all labels should be close to the same size.

  The following information should be included on your labels:

  - **location** (nearest town, county, and state)
  - **date** specimen was collected (day, month, and year)
  - **name** of the collector
  - **environment** from which specimen was collected (feeding on oak leaf, on goldenrod, on surface of pond, under log, at black light, etc.).

  Use a permanent ink pen, pencil, or a computer to write labels. Do not use ball point ink or other nonpermanent ink that can run or smear when wet. For computer printing, type up your label, and then change the font size to shrink the entry to the desired label size.

- **Storage boxes**

  You can store your insect collection in Schmidt boxes or similar insect storage boxes available at biological supply companies. Cigar boxes and small cardboard boxes may be used but only for short-term storage. Carpet beetles and other scavenging insects can get into these boxes and destroy specimens. Cut out a piece of corrugated cardboard or styrofoam the same size as the bottom of the box to make it easier to place the specimens in the box.

  Larger collections can be stored in glass-topped display cases. Display cases can be bought from a biological supply company or constructed at home (**Figure 2**).

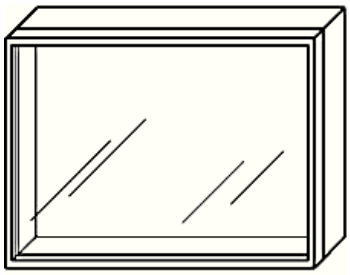

Figure 2: Collection display case.

- **Pinning insects**

  Rest the specimen on a pinning block and steady the insect by either holding it with your fingers or holding it in place with a forceps. Place the insect pin into the insect body. Insects are generally pinned through the thorax on the right side (**Figure 3).**

  Approximately 3/8 inch of the pin should be showing above the insect body, enough so you can comfortably hold the pin with little risk of accidentally touching the specimen **(Figure 4).**

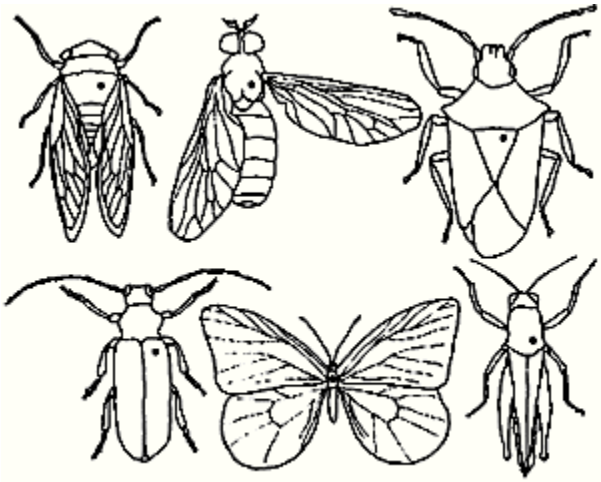

Figure 3. Proper insect pinning.

  Once the insect is pinned you can spread the wings by placing it on the spreading board so the wings are level with the top of the board. Position the wings where you want them, then use strips of paper anchored by pins to hold the wings down. If it is necessary to position any body parts, place the specimen on a pinning block and use insect pins to maneuver the body part into the position you want.

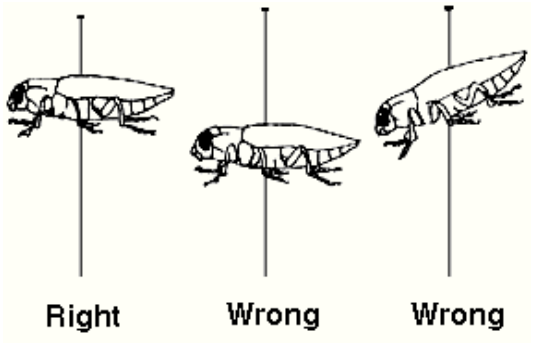

Figure 4. Placement of the pin.

  Insects too small to pin can be placed on a paper point. Use stiff paper, such as an index card, and cut out to the shape and size shown in **Figure 5.**

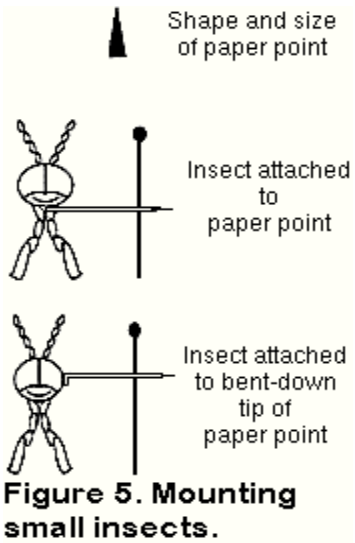

Figure 5. Mounting small insects.

  Place an insect pin through the point on the wide end. The tip of the point can be left as is or bent. Apply a small drop of glue to the tip of the point. Place the insect so the right half of the body is on the point (if the point is left unbent) or place the bent tip against the right side of the body **(Figure 5).** You may have to hold the insect with forceps until the insect dries enough and won't fall of