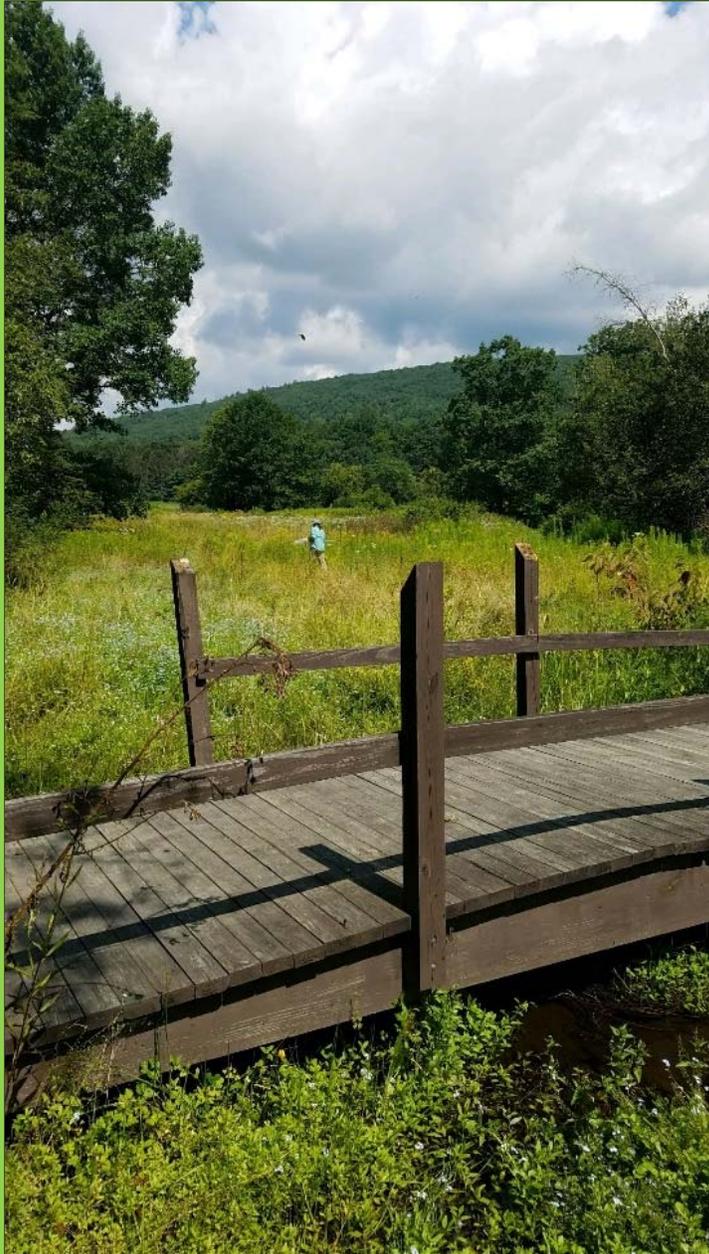


Empire State Native Pollinator Survey Participant Handbook

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New York
Natural Heritage
Program



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Cover Photos: Project Logo by Anna Droege, Left: Robert V. Riddell State Park by Ashley Ballou, Top Middle: Stewart Creek, Wilcox Lake Wild Forest by Erin L. White, Middle: Colgate Lake Wild Forest by Matthew D. Schlesinger, Right Middle: *Bombus ternarius* by Larry Master, Bottom Right: Berry Mill Flow, Hammond Pond Wild Forest by Erin L. White

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Project Need and Background

Native insects play an essential role in pollinating a wide variety of flowering plants, including wildflowers, trees, garden plants, and cultivated crops. However, some native pollinator species have suffered population declines over the last few decades, and recently the federal and state governments have stepped



up conservation efforts. The Federal Pollinator Task Force was established by President Obama in 2014, leading to two national strategies on pollinator management and research. In New York, several species of bumble bees (*Bombus* spp.) were designated as High-priority Species of Greatest Conservation Need in the revised [State Wildlife Action Plan](#). Also in 2015, New York Governor Andrew Cuomo assembled a Pollinator Task Force to recommend management practices, education, and research and monitoring strategies aimed at conserving wild and managed pollinator populations in New York. The resulting [New York State Pollinator Protection Plan](#) included the following action item under Research:

“DEC...will begin a multi-year evaluation of New York’s myriad native pollinator species. This assessment will show the current state and distribution of native pollinators and serve as the foundation for developing and implementing future conservation practices.”

Beginning in 2016, the NY Natural Heritage Program (NYNHP) worked under a Memorandum of Understanding with the NYS DEC to design the native pollinator study described above. We worked with a team of advisors and taxonomic experts to develop a sampling design and survey methodology, which we field-tested the summer of 2017. The Advisory Committee consisted of scientists and managers from an array of organizations (see page ii).

Goal of the Survey

The goal of the Empire State Native Pollinator Survey is to determine the conservation status of a wide array of native insect pollinators in nonagricultural habitats.

In other words, which native species are of conservation concern? What are the rare and common species, and which ones may have declined?

Conservation status is typically determined from data on a species' rarity, trends, and threats. For the Natural Heritage network overseen by NatureServe, this is the S-rank for states and G-rank for the global population. Determining this status ideally entails collecting current distributional data from recent field observations and new field surveys (rarity), historical distributional data from museums and other sources (trend), and reviews of literature and discussions with experts (threats). Status can be determined with a subset of this information when, for instance, information on historical distribution is unavailable.

Native insect pollinators are species native to the northeastern United States. This is specified mainly to distinguish the targets of this survey from *Apis mellifera*, the European honey bee, a managed pollinator that is the focus of many other efforts. We are focusing efforts on at-risk or understudied native bees, flies, beetles, and moths. Please see the Target Species section for more specifics.

Ways to Participate

We've come up with a variety of ways that you can participate in the Survey based on your interest, availability, and ability or comfort level with the various survey methods (

Table 1). We are enlisting the help of volunteer citizen scientists who want to contribute to this study and learn more about NY's native pollinators, and we'll offer workshops to train you in our methodology and pollinator biology. No prior experience identifying or surveying for pollinators is necessary to contribute records to the Survey, but we do ask that participants be willing to learn our survey methods and follow our instructions for data submission.



Your help will allow us to gather much more information than we would otherwise and allow us to cover a much larger portion of the state. Other participants will include NYNHP staff and student field crew, Advisors, and colleagues from NYNHP partner organizations. NYNHP staff and students will review museum collections and conduct directed habitat and species surveys for specific targets as well as the “extensive surveys” described below. We anticipate non-NYNHP participants can contribute in one or more of the ways described below, all of which will provide important data for the effort.

Since insect pollinators are not as well-known as other kinds of wildlife, our project requires vouchers in the form of photographs or specimens. Some species cannot be confirmed without a specimen voucher, and we will defer to experts to identify photographic and specimen vouchers and determine whether they can be identified confidently to species level and therefore, whether a record can be accepted. We offer tips for photographing and capturing pollinators below.

We encourage all participants to **register** for the ESNPS project at <http://signup.com/go/yxaxrgQ> under “register as a participant”. By doing so, you have agreed to follow our protocol outlined in this handbook when completing surveys for our project. You’ll be kept abreast of workshop opportunities and other announcements, and signing up will allow us to keep track of how many participants we have and organize gatherings. To contribute records to the project, we encourage all participants to complete training by NYNHP staff at a project workshop or scheduled field survey. We will cover basic pollinator biology, survey methods, and how to submit photographic and specimen records at these workshops. To determine how to participate, please read the following descriptions of ways to contribute to find the best fit for you.

Table 1. Ways to contribute to the Empire State Native Pollinator Survey

	Photographer Submits photographs to us using iNaturalist project page	Netter Catches insects with a net and sends specimens and data form to us	Bowler Deploys bee bowls and sends specimens and data form to us	Surveyor Deploys bee bowls in transects and nets insects in timed searches; sends specimens to us
Wants to contribute to pollinator monitoring and conservation in New York	✓	✓	✓	✓
Is skilled at catching insects with a net		✓		✓
Is comfortable and confident using lethal methods		✓	✓	✓
Does not mind storing dead insects at home temporarily		✓	✓	✓
Is allergic to bee stings or does not want to handle insects that could sting	✓		✓	
Wants to follow a standard, time-constrained protocol and has 5 + hours to spend				✓

Photographer: Photographing target pollinators

If you can successfully photograph identifying characters of native pollinators and submit records to our online project in iNaturalist, you can participate in the Survey by photographing. This method does not necessarily involve handling potentially stinging insects, so if this appeals to you because of a bee allergy or otherwise, we hope you will consider this option. We also realize that not everyone is comfortable with killing insects, even though the level of collecting that we anticipate for this project should not affect populations or pollination services the insects provide (see “Considerations in the Lethal Collection of Specimens section for a full description). If you would like to participate in this method, please see “Photography: Instructions for Participants.”

Netter: Hand-netting target pollinators

If you can successfully catch native pollinators with an aerial insect net, or can learn to do so, then you can participate in the Survey by hand-netting. This method involves handling pollinating insects, collecting live specimens, dispatching them, pinning and mounting them, and storing them temporarily until they can be delivered or shipped to us in Albany. These factors, previous experience, or giving it a try at our workshops, may help you decide whether hand-netting is right for you. Please see “Hand-netting: Instructions for Participants” below for further



Berry Mill Flow wetland, Hammond Pond Wild Forest (Erin L. White)

information on this collection method. You will choose where to survey on your own and contact landowners for permission to access private properties.

Some of you may be concerned about working with insects that might sting. Only a few groups you might capture using hand-netting could have significant stings. These include *Apis* (honeybees), *Bombus* (bumble bees), Pompilidae (spider wasps), Polistinae (paper wasps), Vespinae (hornets and

yellowjackets), and some other wasps (Droege 2015). However, these are large, showy, and easily identified, so their stings can be avoided. With most bees and even these species, unless you physically grab a bee or trap it against your hand, you are not going to get stung (Droege 2015, Maine Bumble Bee Atlas 2015). We do not anticipate bites or stings from target flies, beetles, or moths. That said, if you have a known allergy to bee stings, you will want to carry an epi-pen with you during your surveys. Also, remember that you can always submit photographic records via iNaturalist. All participants should be aware of the signs of an allergic reaction in the event you or someone you are with is stung. See the “Resources” section for more information.

Bowler: Bowl-trapping target pollinators

If you want to set out bowl traps in the morning by 10am (yellow, white, and blue 3.25 oz cups filled with soapy water) at a site with one or more of the following habitat types: Forest, meadow, wetland, and/or roadside, and retrieve them that day (at least 5 hours later), collecting and preserving any captured insects into bags of alcohol, you could help us by bowl-trapping. This could be a good Survey technique if you are concerned about netting live insects. Other factors to consider for this method are being able to follow specific instructions for setting up the bowls, working with ethyl alcohol to preserve the specimens, processing specimens (drying and pinning), then getting them to us. Another factor to consider is that with this method there is greater potential for collecting non-target species or “bycatch”. For bowl-trapping, you will again choose where to survey on your own and contact landowners for permission to access their properties.

Surveyor: Performing “extensive surveys” and/or “targeted habitat surveys”

These surveys will primarily be performed by NYNHP’s student field crew and staff, although we may involve trained and experienced volunteers. They involve both hand-netting and bowl-trapping at a site, following specific, prescribed methods, and will occur in specific locations in NY based on the statistically informed sampling design outlined in our study plan (http://nynhp.org/files/Pollinators/EmpireStateNativePollinatorSurvey_StudyPlan_June2017.pdf).

Briefly, Extensive Surveys will be conducted in all the state’s major ecoregions on protected

lands, while Target Habitat Surveys will supplement these by focusing on rare habitat types. If you are interested in conducting this kind of structured survey, please contact us for approval and assignments, as we are following a systematic sampling approach and will need to ensure sites and surveys are comparable for analysis.

Target Species

Determining the conservation status of all native pollinators in one four-year project would be an untenable goal, so we developed a set of “target species” or “focal taxa”—species or groups of species on which to concentrate our efforts. To highlight the important role a variety of native insects play in pollination, we wished to include at least one species group from each of the primary insect orders known to pollinate native plants: Hymenoptera (bees, ants, and wasps), Diptera (flies), Coleoptera (beetles), and Lepidoptera (butterflies and moths). Within these orders, we selected groups of species that 1) have been documented or are suspected to be important pollinators; 2) have poorly understood conservation status (although some knowledge of regional or global status is



Elderberry Borer (*Desmocerus palliatus*) (Matthew D. Schlesinger)

helpful for context, and see #3); 3) contain known or suspected at-risk species in the Northeast or elsewhere, including those that are naturally rare and those whose populations have declined or distributions have decreased; 4) are not so diverse that determining the conservation status of most of the species may be an unreachable goal; 5) may feasibly be identified to species by trained biologists, experts who may be project partners, and/or citizen scientists; and 6) may be appealing for a citizen-science effort.

We identified ten insect groups that lack basic distributional information that will be studied: four groups of bees, two groups of flies, two groups of beetles, and two groups of moths (Table 2). The conservation status of most butterflies has previously been assessed, so that group was not selected for the statewide surveys. Known rare species that are not expected to be detected with sufficient frequency using the extensive approaches, particularly those needing

resurveys of specific locations, will be the focus of Target Species Surveys completed by NYNHP staff. Such surveys will focus on revisiting areas where rare species were collected in the past and new searches in appropriate habitats.

We recognize that it is not always possible in the field to determine whether a species is one of the focal taxa, and that many non-focal species, especially of bees and flies, will be collected. And bee bowls attract more than just the focal taxa. Surveyors should get to know the taxa in Table 2, as these groups are the focus of our study, and with practice, can avoid killing non-target taxa (see Resources section). We will retain all bycatch and work to find partners in academia or other sectors that are interested in identifying the non-target insects and accessioning them to natural history collections.

Table 2. Focal taxa selected for the Empire State Native Pollinator Survey.

Common name	Scientific name
Hymenoptera	
Bumble bees and long-horned bees	Apidae: <i>Bombus</i> , <i>Melissodes</i>
Mining bees	Andrenidae: <i>Andrena</i> , <i>Calliopsis</i>
Leafcutter bees	Megachilidae: <i>Megachile</i> , <i>Osmia</i>
Oil bees	<i>Macropis</i> , <i>Melitta</i>
Diptera	
Bee flies	Bombyliidae: <i>Bombylius</i>
Saproxyllic (decaying wood) hover flies	Syrphidae: ~80 species in two subfamilies
Coleoptera	
Flower longhorn beetles	Cerambycidae: subfamily Lepturinae
Hairy flower scarabs	Scarabeidae: <i>Trichiotinus</i>
Lepidoptera	
Hawk (sphinx) moths	Sphingidae: 26 species that feed as adults
Flower moths	Noctuidae: <i>Schinia</i>

Where should I survey?

Since we are focused on collecting distributional information for at-risk pollinator species native to our area, participants can make significant contributions to the project by submitting photographs to our iNaturalist project site or conducting surveys virtually anywhere in the state. By sending in your data, you will allow us to gather much more information on these important



Azalea Sphinx Moth (*Darapsa choerilus*)
(Stephen Diehl and Vici Zaremba)

organisms than we would otherwise and will help us cover a much larger portion of the state. Participants are asked to survey sites of their own choosing in order to document the species present. We allow records to be submitted from anywhere in NY for any pollinator (but remember to really focus your efforts on what you think could be target species in Table 2), photos or specimens, but we do have suggestions of the kinds of places to concentrate your efforts.

As mentioned above, our goal is to target certain native pollinator taxa (Table 2) in nonagricultural habitats. A survey site is the location where you conduct your survey. The site can include multiple habitat types, generally within a reasonable walking distance from each other. If the participant drives to another place or property to survey on the same day, it will generally be considered a separate survey site.

Based on input from our Project Advisory Committee, we have decided to focus on the following habitat types to survey for most of the above species targets: **meadow/grassland, wetland (sampled along edges), deciduous forest, and roadside**. In general, choosing your survey sites based on the presence of flowering plants will have better yields. Timed searches and bowl trapping in natural habitats are likely to be more productive (more insects of different species) than those in unnatural habitats. However, the incidental observations (described below) will often occur while participants are doing other activities such as gardening or walking the dog. That said, powerline corridors, un-mowed fields, and roadsides can attract our target species and can function as meadow habitat. We do recommend visiting as many of these four habitat types as possible, per site, as different species can be present in different habitat types. It will be beneficial for you to read up on target species' habitat preferences (these differ among taxa) to

aid you in habitat selection at sites you visit. Different species also have different flight seasons and surveying the same site at different times throughout the season can add new species to a site list. If you are new to these insects, a good approach could be to visit a few convenient sites throughout the season. However, we do encourage participants to visit new sites in order to gather information at more places in the state, as their time and schedules allow.

As mentioned throughout this handbook, we require the participant to obtain the necessary permissions from landowners in order to access properties they are interested in surveying. Please see the example “dear landowner” letter in the Resources section of this document. If you are doing surveys on someone else’s property, please note who gave you permission to survey in the “notes” field of your data form. We will give you a project participant sign for your car when you complete one of our workshop trainings. This can help you identify yourself to landowners as official. Please also sign up as a registered participant on our sign up page (<http://signup.com/go/yxaxrgQ>), so that we know you are doing project surveys and can support you.

Do not set out bowl traps in a site known to have listed species which may be attracted to the bowls (i.e. Karner Blue Butterfly, Frosted Elfin). Records should be documented with hand-netting and photographs at such sites, and those sites where you anticipate rare species to occur (i.e. historical locations). This way, any listed species captured, may be released.

When should I survey?

Flight seasons for adults of our target taxa vary, even among species within a taxonomic group. In general, we recommend doing observations and surveys from about mid-April through mid-October. Some species are out in April, with most emerging at various times later in the season.

Most of our targets will be most active during the warmest parts of the day, from mid-morning until late afternoon. Our bowl-trapping protocol tries to capture this timeframe by leaving bowls out during peak hours of activity, from 10am to 3pm.



Brace Mountain, rocky summit grassland (*Andrea Chaloux*)

Some of our targets, such as bumble bees and some hoverflies, can be active during cloudy or even cooler weather (below 70), but in general, optimal conditions for seeing these insects will be **warm, dry, sunny days** of at least 70°F.

Photography: Instructions for Participants

Photographing pollinators is a fun, easy, and rewarding method of contributing data to the Empire State Native Pollinator Survey, and you don't have to be a professional photographer with fancy equipment to do it. In the age of digital photography and smartphones, it's never been easier to share quality photographs with experts who can help identify your subjects. In this section, we give tips for taking good pollinator photographs and introduce our project's portal for photographic data submission.

We are using **iNaturalist** as our repository for Survey photographs. The iNaturalist platform is used by millions of nature enthusiasts and citizen scientists for both structured projects like ours and more general nature observation and sharing. It makes use of the expertise of professional entomologists and amateur enthusiasts to arrive at well supported species identifications. It can be used in the field on a smartphone or tablet with GPS, or on a desktop or laptop computer.

Right off the bat, we want to be clear: **It's okay if you don't know the species in your photograph!** We are interested in reviewing your photograph as long as one of the following is true:

- 1) It's a bee, or
- 2) It looks like a bee or wasp (some flies are bee or wasp mimics),
- 3) It's a fly, moth, or beetle on a flower, or
- 4) It's a fly, moth, or beetle that you've observed visiting flowers, or
- 5) You know that it's one of our focal species, or
- 6) You are documenting a nest site for one of our focal species, or
- 7) It's a really, really cool insect pollinator and you just had to share it with us.

While our project runs from 2018-2020, we are interested in older observations as well, and have already linked many existing iNaturalist observations of our focal taxa to the project. If you have older photographs of the focal taxa for which you know the location and date, by all means upload them to the project.

Tips for photographing focal taxa for the Survey

Our main tip is aimed at beginners and amateur photographers: Get to know your camera! Many of us know only the most basic features of our cameras, and use only the default settings. Users' manuals are of course a great place to start, but those who learn best by being shown may benefit from a class or time in the field with someone knowledgeable about your brand of camera.

We have adapted tips from the citizen-science program Bumble Bee Watch on taking photographs of bumble bees (<https://www.bumblebeewatch.org/photo-tips/>) and expanded them for our purposes to create Seven Steps for Great Pollinator Photos:

1. *Image resolution.* Set your camera to its highest resolution. While this may seem like overkill for some purposes, if someone else is identifying or confirming the identity of the insect in your photograph, they might need to zoom in on the photo considerably to see a certain anatomical feature. Zooming way in to photos is only possible when they are taken, *and uploaded*, at high resolution.
2. *Telephoto and zoom.* A telephoto lens for an SLR camera, or a superzoom compact camera, can be great for getting closer to the insect without spooking it. Telephoto attachments are available for many smartphones as well. Often it may be best to take photographs from a distance with a telephoto lens first before attempting to go in for closer photos. With zoom lenses and superzoom cameras, use “optical” zoom (where the lens actually adjusts), rather than “digital zoom,” which is functionally the same as enlarging the image and therefore reducing its resolution. Smartphones without added lenses can only zoom digitally (e.g., by “pinching out”).
3. *Close encounters.* Get as close as you can, especially after trying longer distance shots (see #2). Bees will not sting you while they are foraging, although they might fly away.
4. *Macro.* Most compact cameras and smartphones have a macro (close-up) feature and you can purchase macro lenses for SLRs. These can be fantastic for close-up images of cooperative insects, but keep in mind that it takes practice to get the desired parts of the insect in focus, as the depth of field (the area of the subject that is in focus) is narrower by default. A tripod can help stabilize the camera so that the area in focus can be larger.
5. *Focus!* On most phone cameras, simply tap on the part of the screen you want to be in focus before taking the photograph. Photographs of blurry insects are of little value.
6. *Is this my best side?* Take photos from multiple angles to make sure you capture important features. For bees, close-up photos of the front of the face, the side of the face, the side of the body including the legs, and the entire top of the abdomen are ideal. For beetles and moths, most key features are in the dorsal view—from above—and many species can be identified with a single photo of the dorsal surface (see <https://www.flickr.com/photos/usgsbiml/> for good example photos).
7. *Cooling.* Consider capturing insects in a vial or plastic bag, chilling them in a cooler or refrigerator for a few minutes with ice packs, and then photographing them. Chilling slows them down and you may find them more cooperative. This method could be very

helpful in getting photos for iNaturalist, although it may not yield the most realistic or aesthetically pleasing images.

Tips for photographing nest sites for the Survey

While it may be rare that you will stumble upon a native pollinator nest, we are very interested in documenting nest locations through the iNaturalist portal. Approximately 30% of native bees nest in wood tunnels and 70% are solitary ground nesters. Bumble bees utilize brush piles, rock piles, bunchgrass, and old rodent burrows for nesting. For examples of nest sites for pollinators visit the Xerces Society ‘providing nest sites for pollinators’ resource page to get ideas of what to look for (found at: <https://xerces.org/providing-nest-sites-for-pollinators/>). For images of bumble bee nest sites taken by fellow citizen scientists visit the Nest Sighting Gallery on Bumble Bee Watch (<https://www.bumblebeewatch.org/app/#/nests/lists>).

Data submission

Setting up an iNaturalist profile is easy! Go to <https://www.inaturalist.org/signup> and start a new profile or link an existing social media or Google account.

The iNaturalist app is available for iPhone and Android devices. Links to download these to your mobile device are on the www.iNaturalist.org home page.

Join the Project. To access our Project page on iNaturalist, search under Projects, or go straight to <https://www.inaturalist.org/projects/empire-state-native-pollinator-survey> and click “Join this project” on the upper right.

Using the smartphone app, click the menu (three stacked bars) at the upper left, and select Projects. Then search for Empire State Native Pollinator Survey (just a couple of those words will pop it up), and join.

Instructions for adding observations on a smartphone

If you have a smartphone or GPS-enabled tablet that you are willing to use in the field, this is the more efficient, and likely the more accurate, method of contributing to our iNaturalist project. And it has most of the functionality that the website has. But not all smartphones take

good close-up images of moving targets, so make sure you can get in-focus photographs this way before using this method exclusively.

Note: These instructions pertain to the Android app. We hope to include a section in future versions of this handbook that note any differences from the iOS app.

From the screen showing “My Observations,” tap the menu icon (three stacked lines) on the upper left, where you can see your projects, among other things. To **add an observation** of one of our focal taxa, use the green bar at the bottom of this menu. The first step is to take a new photo or add an existing photo from your device. We are requiring observations to be accompanied by photographs for this project, so if you select the “No photo” option your observation will be rejected at a later step. Make sure your device’s GPS is enabled!

In the species search box, you can type something as vague as “Insect” and the order Insecta will pop up, “Fly” and the order Diptera will pop up, or “hover fly” and the family Syrphidae will pop up. iNaturalist is giving you some of its best guesses for the taxon you wish to enter. Enter the lowest taxonomic level you’re sure of—while we discourage outright guessing, feel free to put in your best attempt at identification. The project curators and the iNaturalist community will review photographs and confirm identifications or suggest new ones.

Date, time, and **location** are automatically populated based on where you and your device are when you begin recording the observation. If you’re documenting the observation later these fields will need to be altered. Using iNaturalist in the field, right when your observations are made, will result in fewer errors resulting from these “default” values.

Make sure you click on **Projects** at the bottom, and check Empire State Native Pollinator Survey. Remember that you have to have joined the project previously for our project to appear in the list. You’ll lose your observation (little bit of work that it is) if you have to go back to join the project in the middle of data recording.

Instructions for adding observations on a computer

Add an observation. To add an observation of one of our focal taxa, click on the large, red banner that says “ADD OBSERVATIONS” and start typing the name of the observed taxon in the search box at the upper left. In the search box, you can type something as vague as “Insect” and the order Insecta will pop up, “Fly” and the order Diptera will pop up, or “hover

fly” and the family Syrphidae will pop up. Enter the lowest taxonomic level you’re sure of— while we discourage outright guessing, feel free to put in your best attempt at identification. The project curators and the iNaturalist community will review photographs and confirm identifications or suggest new ones. Enter the date and time of your observation, and any description of the insect you’d like to include.

Location. It’s critical that you record the location of your observation as accurately as possible. If you have x-y coordinates, also called GPS points, in latitude/longitude decimal degrees format (e.g., 42.541267, -73.872991), you may type them into the box. If you have coordinates in another format, like Universal Transverse Mercator (UTM) (e.g., 592541E 4710491N, zone 18T) or degrees-minutes-seconds (e.g., 42°32'28.6"N 73°52'22.8"W), several websites can convert them to decimal degrees, including <https://www.latlong.net/>. *Double-check all entered coordinates!* This is a common error in scientific data entry and one of the reasons we prefer the mobile app, because location is determined by the GPS within the mobile device. Double-check by re-reading what you’ve typed, but also by viewing the map to see that your observation plots where you expect it to.

If you want to use the map to record the location of your observation, you may type a place name (e.g., “Jones Beach State Park”) in the “Where were you?” box, which may zoom in on the map if iNaturalist recognizes the name, but you’ll need to adjust the map to reflect the actual location of your observation.

Locational uncertainty. If you know the approximate location where your observation took place, click on the map at that point, and either adjust the size of the circle or change the value of the “Acc” field in the box to reflect uncertainty in your location (i.e., “it was somewhere within this circle”). Make the circle as small as you can, while being 100% confident that your observation happened within it.

Uploading photographs. We are requiring observations to be accompanied by photographs (1-5 images can be uploaded). There are two main methods of linking photos to observations: from your computer’s hard drive (or any drive connected to the computer) or from an existing image-hosting platform. We strongly prefer that you upload photos directly into iNaturalist and have iNaturalist host your images. Check the box next to “Sync obs. w/ photo metadata?” as this will allow us to access the image’s date, time, exposure properties, and even

x-y coordinates (if that feature is enabled on your camera). Whichever method you choose, please attach images of the highest quality you can.

Please check to make sure you are uploading your most in-focus photos. And don't forget to upload multiple views of the same insect, if you have them, to an observation.

Help with iNaturalist

iNaturalist's help page is here: <https://www.inaturalist.org/pages/help>, and the iNaturalist team moderates a Google Group (<https://groups.google.com/forum/#!forum/inaturalist>) in which users can ask (and answer!) questions not covered on the help page.

Other online data repositories

We recognize that you may already be contributing observations to other websites. If you are already a contributor to Bumble Bee Watch (www.bumblebeewatch.org), please feel free to continue to upload your bumble bee photographs there. We will work with that project's coordinator to share data on New York's bumble bees. Note, however, that to upload photographs of our other focal taxa, you'll need an iNaturalist account.

BugGuide is a great resource (www.bugguide.net) for identification, and we are exploring ways of maximizing the potential of obtaining observation data from there. However, iNaturalist has some advantageous features, such as availability for mobile devices and geolocation of observations, that make it preferable for our purposes.

Considerations in the Lethal Collection of Specimens

Volunteers submitting data to the Survey as Bowlers, Netters, and Surveyors will be lethally collecting insects for this project. This can present challenges different from many other entomological settings because: 1) unlike many other insects (i.e., dragonflies, butterflies), the great majority of our focal taxa simply must be collected because they can't be reliably identified to species while on the wing (even by experts); 2) as a result of this, many non-target insects will be collected, resulting in significant “bycatch”, which we want to reduce; 3) there is a sense that pollinators are already in decline; 4) many of them sting or else mimic a species that stings; and 5) the valuable ecosystem service (pollination) that each individual is performing is lost when it is removed from the environment. Therefore, general Entomological codes of ethics (see Amateur Entomologists' Society 1997, Abbott 2007, Pohl 2009, Trietsch and Deans 2017), might not readily apply to already stressed pollinator populations.



Certainly collecting insects for this project will in no way approach the billions killed by other means including bug zappers (Frick and Tallamy 1996), but we nevertheless want to be careful to lighten our impact on the resource and remember that it is unjustifiable over-collecting (on top of all the other stresses these populations are exposed to) that can be problematic—not obtaining a limited number of specimens for legitimate scientific purposes (Pohl 2009). If you find that you're asking yourself—do I really need to take that XXth bee that is most likely the very same species as the others I've already gathered here—then the answer should probably be no! (but do record this observation in your field notes). For hand netting, volunteers should have the proper field guides in hand allowing them to double-check their identification and then let the bug go unharmed. In almost all cases, it is preferable to have a data entry form for a survey that says something like 10 individuals of species X were observed, 1 was collected. Remember, ESNPS aims to understand the distribution, not abundance, of the insects. So, once you know that a particular species occurs at a particular place at a particular time, it is not necessary to keep on documenting that fact with more dead individuals. This is the kind of over-collecting that we

want to try to avoid, especially if we think it could be a vulnerable species *at that location* for some reason. Consider collecting photographic observations in the spring to avoid collecting bumble bee queens or if you come across more than one queen, only collect one specimen of the same type to minimize impact. Later in the season (e.g., June and July) consider lethal collection when workers will be out foraging and queens will be in the nest, further minimizing any impact on populations of concern.

So far only one study has looked at the effects of long-term repeated lethal sampling on pollinator populations. Gezon et al. (2015) found that in the Rocky Mountains, relatively simple bee communities at high elevations were robust to intensive collecting even with repeated removals over a number of years. While not directly comparable to our much richer insect communities here in the northeast, this should give us some comfort that our lighter-footprint inventory approach, designed to sample the state extensively, won't significantly alter pollinator population dynamics (or the flowers that rely on them!); especially when compared to the much more intensive long-term monitoring scheme designed to detect population trends (Lebuhn *et al.* 2013) which sparked a heated debate about lethal pollinator sampling in the journal *Conservation Biology* a few years ago. What it will do however, is provide a treasure trove of invaluable museum quality voucher specimens (data) that researchers will be able to draw upon for years and years to further conservation efforts of these vital animals.

Hand-netting: Instructions for Participants

Hand-netting is a way of describing the use of an aerial insect net to catch and collect insects. In addition to hand-netting, "beating" is another capture technique that can be employed, especially for beetles. Beating involves the use of a flat beating pad by tapping plants down onto the pad to see if insects fall off, after which they may be collected from the pad. Beating can be more effective for species that don't readily fly away after being tapped. Please see our "Resources" section for tips on where to purchase nets and other supplies. We will demonstrate and practice this survey method at project training workshops, as weather permits. If you sign up to stay in the loop on the project (<http://signup.com/go/yxaxrgQ>), you will be notified of dates and locations of workshops near you (2018-2020). You may want to make, or attempt to make, your own species identifications on vouchers you collect. We will not focus our initial

workshops on pollinator taxonomy as this would be a multiple-day course with taxonomic experts. Our focus at the workshop will be on basics in pollinator biology, survey and vouchering techniques, and data submission procedure. We will be confirming species identifications on records submitted to the project (photos and specimens will be reviewed by experts for final species determination and/or verification).

Field survey types: Planned survey (30-minute timed search or otherwise) and incidental observations

You will decide where to do hand-netting surveys. Please see “Where should I survey?” and “When should I survey?” sections above and follow the field techniques and data submission procedure described below. In addition, you may decide to hand-net pollinators incidentally, as opportunities present themselves, outside of a planned survey. If you are interested in performing timed searches during your hand-netting surveys, we have the following recommendation:

Conduct a timed search in each of four habitat categories (forest, meadow, wetland, and roadside) at each sample site. In a timed search, observers will spend 30 minutes walking throughout the sampling location, targeting flowering plants and looking for target species.

That said, if you do not have 30 minutes to spend at 4 habitat types at a site, you can still participate by doing hand-netting surveys among as many habitat types as you can get to at a site, and for the duration that works for your schedule. Even one individual pollinator collected at one site could benefit the project if it ends up being a target species. Please refer to the Resources section for suggestions on references to get familiar with our target species in Table 2. This will allow you to perform targeted netting for these species and avoid capturing a lot of bycatch (see the Considerations in the Lethal Collection of Specimens section above).

How to hand-net and make a collection

Whether conducting a timed search or collecting pollinators as incidental captures, hand-netters will find the following information relevant, and will find they will improve their netting skills and have more successful captures with more practice.

While we are targeting more taxonomic groups than bees in our study, we reference this several times and recommend you read “The Very Handy Manual: How to Catch and Identify Bees and Manage a Collection” available here:

<https://www.pwrc.usgs.gov/nativebees/Handy%20Bee%20Manual/The%20Very%20Handy%20Manual%20-%202015.pdf>. Please see the “Resources” section for instructional videos available as well.

Participants should purchase an aerial insect net that is right for them. They come in various sizes (ring diameters) and colors and we recommend a lighter color for the netting, such as white, as it will be easier to distinguish insects from the netting after capture (see Field Equipment list section for more).

Here are some tips to remember for greater success with netting (adapted from Droege 2015):

- While surveying, hold your net at the ready: grip the net handle/pole near the net with one hand and place the other hand near the back or middle of the pole. Hold the tip of the net flat against the net handle with the hand closest to the head. When you begin your swing, as with a “side-swipe”, release the net. As you complete your swing and determine that an insect is in the net, quickly twist your wrist. This motion closes the net bag against the net frame, trapping the insect in the back portion of the net.
- If your target flies close to the ground, use the “pancake” technique, coming down with the net over the target from above until your net frame touches the ground. Then slowly raise the tip of the net upwards and the insect should fly up into the tip allowing you to pinch off the end of the net and collect the insect.
- Be careful of vegetation with thorns or burrs. These can damage your net.
- These insects have good eyesight and they are quick movers, so approach them slowly and stand back a bit (but within reach of the insect with your net), being careful not to let your shadow fall over them.



Transverse flower fly (*Eristalis transversa*)
(Stephen Diehl and Vici Zaremba)

Removing insects from the net, especially those that can potentially sting, can be intimidating at first. Only a few groups you might capture using this technique could have significant stings. These include *Apis* (honeybees), *Bombus* (bumble bees), Pompilidae (spider wasps), Polistinae (paper wasps), Vespinae (hornets and yellowjackets), and some other wasps (Droege 2015). However, these are large, showy, and easily identified, so their stings

can be avoided. With most bees and even these species, unless you physically grab a bee or trap

it against your hand, you are not going to get stung (Droege 2015, Maine Bumble Bee Atlas 2015).

To remove an insect from the net, begin by moving it to the bottom of the net (tip or smaller, pointy end). You can accomplish this by giving the net a strong shake or snap. Also, most insects have this helpful behavior of always crawling up towards the sky, so you can hold the tip higher than the rest of the net. If the insect is on the move, it will crawl toward the tip (or whatever part of the net you have higher). Then, you can grab and clamp down on the net just below the insect. The bunching of the net above your hand will keep it protected. Then you can bring a collection container inside the net with your other hand, through the bunched area, keeping a tight seal around it. Trap the insect inside and shake it to the bottom of the container before slipping on the lid. Please see the “Resources” section for instructional videos available from one of our Advisors Sam Droege of USGS and also the Maine Bumble Bee Atlas.

The **collection container** you use will depend on your preferred method for euthanizing your voucher. For participants who are not NYNHP staff or the student field crew, we recommend two humane methods that will be easily accessible. Collected insects can be euthanized by freezing or through use of a kill jar charged with ethyl acetate. Freezing can be the simplest method and is preferred if you are collecting single specimens in vials, as opposed to longer searches in which you need to place several individuals in a container without others escaping. If your voucher is not going in the freezer right away, the container should have a cap with air holes to prevent suffocation before freezing. Keep vouchers in the shade or in a cooler with an ice pack on hot days to prevent overheating.

To use a traditional kill jar, you will need to purchase the jar and ethyl acetate from a supplier (see “Field Equipment list” and “MSDS” below in the Resources section). Please read the MSDS on ethyl acetate before using, as it is a toxic chemical and should be used with gloves in a ventilated area. To charge your kill jar, pour enough ethyl acetate into the jar to soak into the plaster, without leaving any liquid still in the jar. You should charge the jar before the survey and if you are using it a lot, it may need to be re-charged (every couple of hours) as the liquid evaporates. You may need to wait a few minutes between collecting multiple vouchers in a single jar from a site before opening the lid again. Alternatively, charging multiple kill jars to bring with you during your survey will make collecting multiple specimens in a short period of

time easier (e.g., you won't miss a specimen visiting a flower because the specimen in the kill jar is still active).

For those of you who want to do a timed search but will not use a kill jar, you may place insects into a sealable container with soapy water. The soap in the water will cause the insect to drown on impact. We prefer participants **not** use soapy water to capture insects, as there is more processing involved to preserve the specimens; however, some folks may find the ease and time savings in the field worth it to have more processing steps later on. **If you choose this method, you must dry your specimens according to the procedure below (and pin them, then ship to us).** Please see the Field Equipment list in the Resources section below for information on supplies needed for processing. If you cannot process your specimens within 48 hours, you must transfer them into Whirl-Pak bags containing ethyl alcohol (with a floating paper label written in pencil). Denatured ethyl alcohol can be purchased at most hardware stores. Please read the MSDS (Resources section) on ethyl alcohol before using, as it is a toxic chemical and should be used with gloves in a ventilated area. Isopropyl alcohol may be used if ethyl alcohol cannot be found. Specimens will be better looking (and thus, easier to identify) if processed within 24 hours of capture.

For specimens euthanized by freezing or kill jar, pin specimens beginning with step # 8 below. For all specimens, follow the shipping instructions in the “Shipping Vouchers” section below.

Processing procedure for soapy water specimens (adapted from Droege 2015):

1. Strain sample in brine shrimp net to remove soapy water and spoon specimens into a Whirl-Pak bag. Fill with enough denatured alcohol to cover the specimens. Insert a paper label with date, site, habitat, and collector written in PENCIL. Keep air in the top of the bag above the alcohol and roll the top down to the “fill line” printed on the bag and bend the twist ends backward and tuck in. Store upright in a cool place.
2. When ready to process, dump out specimens from a Whirl-Pak bag into a brine shrimp net and give them a quick rinse with water.
3. Remove specimens from net with a spoon onto a paper towel to absorb excess water.
4. Put a piece of loose fiberglass screen over a quart-sized mason jar lid (instead of the central metal disk used for canning).
5. Dump specimens from paper towel into the fiberglass screen within a circular area the size of the mouth of the mason jar. Screw in the jar to the lid with the screen in between so the specimens are inside the jar resting on the screen and the whole assembly is upside down (lid side down).

6. With the mason canning jar inverted, hold a hair dryer facing upward into the jar and blow-dry specimens for 1-3 minutes just until they begin to pop around the jar like popcorn. You may need to hold the dryer away from the screen a bit if it is overheating and turning itself off. You may shake the jar so specimens dislodge from the sides of the jar and fall to the bottom (lid end). Specimens that have been dried too long will become brittle and break during pinning, so best to stop drying at first sign that wings are flexed away from specimen's bodies and their hairs are no longer matted.
7. Dump specimens onto a dry piece of paper towel and begin pinning process immediately.
8. To pin, transfer a single specimen onto a styrofoam surface with forceps (a styrofoam spreading board works well for this purpose or you can pin directly in your insect storage box--see Equipment section for suggestions). Size 2 insect pins will work for 2/3 to 3/4 of the pollinators you will be collecting. For smaller insects, it will be beneficial to have some size 0 pins on hand.
9. With the top of insect facing up, hold the insect steady with a finger or forceps and insert pin through the thorax and into the styrofoam below. Museums prefer the specimen be pinned on the right side of the thorax, if possible (admittedly, for small specimens the pin may will up more area than this). It is best to pin a bee through the scutum between the tegula and the mid-line (Figure 1), as the mid-line often contains useful characters for identification. Beetles should be pinned through the right elytrum (outer wing case). It is also best to scooch the insect up on the pin (by pressing into the styrofoam further) to allow for NYNHP to put labels below the specimen for museum curation. However, you will want to leave enough room between the pin head and the insect for a finger to grip the pin.
10. Move specimen to an insect storage box. Group specimens from a sample together within the storage box and **label grouping with date, site, habitat, sample method, and collector information** (a single paper label held in place with 1-2 pins-you can even pin your specimens on top of the label). **Leave enough room (an inch or so) to clearly demarcate between samples within the box.** (Example label, right). Non-target taxa should also be pinned and kept with the rest of the sample. If you want to make species determinations, add an individual paper label to the bottom of the pin under the specimen with the scientific name. Ship pinned specimens and data sheets to us, see Shipping specimens section below.
11. If a specimen is too small to pin with a size 0, we suggest placing the insect back into the Whirl-Pak bag or sealable container and filling with enough ethyl alcohol to cover. Don't forget to add a label into the bag, written in PENCIL. These may be shipped to us following the instructions below in the Shipping specimens section. Most of these insects will likely be considered non-targets and "bycatch," but some could be targets. We will be keeping bycatch for interested researchers working on other projects.

Charleston State Forest, 7/26/2017, Z18, 555726 E, 4744987 W Meadow, bowl-trapped, Erin White and Ashley Ballou
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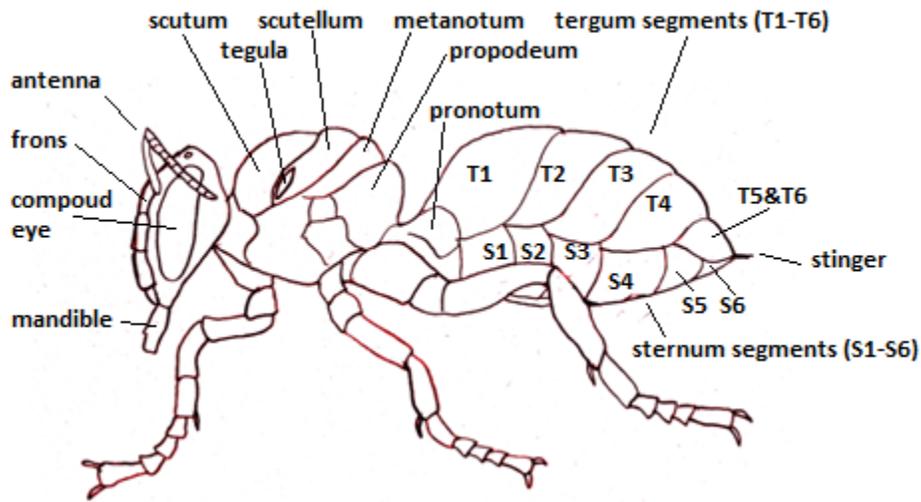


Figure 1. Terminology for body parts of a bee (Hutchings Bee Service 2018; <https://sites.google.com/site/hutchingsbeeservice/home/bee-anatomy>)

Summary for Hand-netting:

1. Capture a suspected target species in a net. Use ID guide and if not possible target, let it go and record on data sheet. Could also photograph.
2. Remove the target insect from the net into a collection container (freezer ready vial with air hole cap, kill jar, or less desirably, a vial of soapy water). Transfer insects into Whirl-Pak bag filled to fill mark with ethyl alcohol if it was in soapy water.
3. Write in PENCIL on a label and place INSIDE collection vial or bag with the insect: Date, site, habitat type, "hand-netted", collector name.
4. Place bag in cooler with ice pack if not in ethyl alcohol.
5. Transfer bag to freezer and leave in overnight if not euthanized with another method.
6. **We cannot accept specimens that have not been properly pinned and labeled, so please follow these steps carefully.** Pin specimens euthanized by freezing or ethyl acetate. Pin using size 2 (or 0 for smaller insects) into a storage box (see Field Equipment list section). Place pin through thorax with dorsal (top) view of the specimen showing. All specimens must be pinned in boxes and grouped together by site with a label for the sample. Non-target taxa should also be pinned and kept with the rest of the sample. Insects that are too small to pin should be retained in a container or Whirl-Pak bag with ethanol (with a label containing site info in PENCIL).
7. Process specimens in ethyl alcohol per the method above, by blow-drying and pinning (rinse specimens in water through brine shrimp net, blow-dry in inverted quart-sized mason jar with screen cap at bottom for 1-2 minutes, turn onto paper towel and pin immediately).
8. Follow instructions for shipping specimens with data sheets.

Data recording and submission

Please record your data from hand-netting, bowl-trapping, and any incidental specimen records on the ESNPS Data Sheet for Project Participants. For insects you are vouchering with photographs, submit them to our iNaturalist project at

<https://www.inaturalist.org/projects/empire-state-native-pollinator-survey>

The data sheet was designed to be filled out in the field, ensuring that important information is recorded as the survey is happening. The information on the data sheet is essential and includes standard information fields needed for most scientific studies of insects. Please follow the instructions below for filling out your data sheet as completely as possible. Please ensure that your data sheets accompany any specimens you submit to the project. Please follow the shipping instructions in “Shipping specimens” below.

Empire State Native Pollinator Survey: Data Sheet for Project Participants Instructions

The project data sheets are designed to allow participants to report surveys at multiple **stations** (habitat types, or distinct patches of habitat) at a survey **site** (park, preserve, or other named area) on a particular date.

Site-The survey site is the location where you conduct your survey. The site can include multiple habitat types, generally within a reasonable walking distance from each other. If you have to drive to another place or property to survey on the same day, you should consider it a separate survey site. In general, it is a good idea to use names from a map. If you are at a feature that is unnamed, such as a private property with a meadow habitat, create a name based on physical attributes of the area (i.e. Smith's meadow, or Smith Road meadow). You may survey at various "stations" (which may be different habitat types, or distinct patches of habitat) within the survey site.

Date- Enter the date of your survey. Please enter this in DD-MMM-YYYY format (i.e. 11-APR-2018). Please use a new data sheet for each date you survey, even if you are "continuing" a survey from a previous day.

Observers-Please list all names of observers who contributed to the survey. Put the data recorders name first and all other participants present. If someone is with you, but not contributing to the data collection, do not list them. An accurate count of contributing observers will help us determine survey effort.

County-Record the name of the county in which the location you are surveying is located.

Town-This can be less familiar to most people than county names. Record the name of the town if you know it. These can be found on a DeLorme Atlas.

Site Locator-This field provides more detailed directions to the specific survey site location. While the station coordinates are the most important piece of location data we require, this written description will allow us to perform quality control on our spatial data and verify the coordinates plot correctly.

Station- Refers to the habitat station you are surveying at the site

Habitat type-Please record information under a single station for each habitat you survey at a site. You can check the appropriate box or write-in the habitat you survey at the top of the station section. Common examples of habitats that will be surveyed are listed as choices and we recommend up to 4 habitats surveyed per site (forest, meadow, wetland, and roadside).

FOREST: Deciduous dominated, Coniferous dominated, Mixed woods; OPEN: Grass/herb meadow, shrubland, cropland (active), orchard/vineyard, powerline corridor, rock outcrop, barren sand, alpine, lawn/garden/landscaping; WETLAND: wet meadow, freshwater marsh, salt marsh, bog/fen, pond, salt marsh, shrub swamp, forested swamp, lake, reservoir; ROADSIDE; Other/description (write-in).

Station Coordinates- Please provide coordinates in either decimal degrees or UTM's for your habitat surveyed. We provide space for entering your latitude and longitude in decimal degrees or your eastings, northings, and zone for UTM. You can find coordinates using a GPS device or smartphone in the field, or look these up online when you get home (do the same day).

Timed Search- If you completed a hand-netting survey please check this box and enter your start and end time within the habitat surveyed. We recommend a search of 30 minutes, but enter whatever time you spend. If you took a substantial break from surveying within this time period, please adjust your end time to reflect when you would have finished had you surveyed straight through. The total time surveyed matters more than the precise start and end times. Record the total number of specimens collected.

Bowl transect- If you completed a bowl-trapping survey please check this box and enter your start and end time within the habitat surveyed. We recommend setting up your last bowl by 10am and leaving bowls out for a period of at least 5 hours. Record the total number of specimens collected and number of bowls placed.

Incidental Collection- If you did not complete a full survey, but have a specimen collected to submit, you can check this box. Remember, if you are submitting data by photo, please use the iNaturalist project. Please enter the time of capture or of finding (if found dead), and circle or write-in the method you used to collect it. Record the total number of specimens collected.

Weather- Please write the weather conditions for the day of your survey including approximate temperature (in Fahrenheit), cloud cover, and precipitation.

Additional Focal Species observed (but not captured): Here is space to write in notes about other target species that you did not capture or photograph from a site, but that you observed and for which you are 100% confident of the species ID.

Notes- Please enter additional descriptions of the habitat including abundant plant species that are in flower, signs of human disturbance, or other notables. If you are doing surveys on someone else's property, please note in this field who you obtained permission from (and any contact info they gave you).



Empire State Native Pollinator Survey: Data sheet for project participants

Version 11-APR-2018

Site name _____ Date (DD-MMM-YYYY) _____
Name of park, preserve, backyard, or other descriptor e.g., 13-JUL-2018

Observers _____

County _____ Town _____ Site locator _____
If known e.g., westernmost point on Raquette Lake, or 2 km south of Catatonk on Rte. 96

Station 1 Habitat – FOREST: Deciduous Coniferous Mixed OPEN: Grass/herb meadow Shrubland
 Cropland Orchard/vineyard Powerline Rock outcrop Barren sand Alpine Lawn/garden/landscaping
WETLAND: Wet meadow Freshwater marsh Bog/fen Pond Salt marsh Shrub swamp Forest swamp
 Lake Reservoir ROADSIDE OTHER/DESCRIPTION _____

Station coordinates: Latitude _____ Longitude _____ Other location info _____
or
UTM easting _____ UTM northing _____ UTM Zone _____

Check applicable survey type(s)

Timed search: Start time _____ AM or PM End time _____ AM or PM # specimens _____
 Bowl transect: Start time _____ AM or PM End time _____ AM or PM # spcmns/bowls ____ / ____
 Incidental collection: Time _____ AM or PM Net Hand Other _____ # specimens _____
Collection method (circle)

Weather: _____ Additional focal species observed: _____

Notes: _____
Abundant species in flower, human disturbance, etc.

Station 2 Habitat – FOREST: Deciduous Coniferous Mixed OPEN: Grass/herb meadow Shrubland
 Cropland Orchard/vineyard Powerline Rock outcrop Barren sand Alpine Lawn/garden/landscaping
WETLAND: Wet meadow Freshwater marsh Bog/fen Pond Salt marsh Shrub swamp Forest swamp
 Lake Reservoir ROADSIDE OTHER/DESCRIPTION _____

Station coordinates: Latitude _____ Longitude _____ Other location info _____
or
UTM easting _____ UTM northing _____ UTM Zone _____

Check applicable survey type(s)

Timed search: Start time _____ AM or PM End time _____ AM or PM # specimens _____
 Bowl transect: Start time _____ AM or PM End time _____ AM or PM # spcmns/bowls ____ / ____
 Incidental collection: Time _____ AM or PM Net Hand Other _____ # specimens _____
Collection method (circle)

Weather: _____ Additional focal species observed: _____

Notes: _____
Abundant species in flower, human disturbance, etc.

Empire State Native Pollinator Survey: Data sheet for project participants (Page 2)

****Please make sure to copy site name and date to this side****

Site name _____ Date (DD-MMM-YYYY) _____



Station 3 Habitat – FOREST: Deciduous Coniferous Mixed OPEN: Grass/herb meadow Shrubland
 Cropland Orchard/vineyard Powerline Rock outcrop Barren sand Alpine Lawn/garden/landscaping
WETLAND: Wet meadow Freshwater marsh Bog/fen Pond Salt marsh Shrub swamp Forest swamp
 Lake Reservoir ROADSIDE OTHER/DESCRIPTION _____

Station coordinates: Latitude _____ Longitude _____ Other location info _____
or
UTM easting _____ UTM northing _____ UTM Zone _____

Check applicable survey type(s)

Timed search: Start time _____ AM or PM End time _____ AM or PM # specimens _____
 Bowl transect: Start time _____ AM or PM End time _____ AM or PM # spcmns/bowls ____ / ____
 Incidental collection: Time _____ AM or PM Net Hand Other _____ # specimens _____
Collection method (circle)

Weather: _____ Additional focal species observed: _____

Notes: _____
Abundant species in flower, human disturbance, etc.



Station 4 Habitat – FOREST: Deciduous Coniferous Mixed OPEN: Grass/herb meadow Shrubland
 Cropland Orchard/vineyard Powerline Rock outcrop Barren sand Alpine Lawn/garden/landscaping
WETLAND: Wet meadow Freshwater marsh Bog/fen Pond Salt marsh Shrub swamp Forest swamp
 Lake Reservoir ROADSIDE OTHER/DESCRIPTION _____

Station coordinates: Latitude _____ Longitude _____ Other location info _____
or
UTM easting _____ UTM northing _____ UTM Zone _____

Check applicable survey type(s)

Timed search: Start time _____ AM or PM End time _____ AM or PM # specimens _____
 Bowl transect: Start time _____ AM or PM End time _____ AM or PM # spcmns/bowls ____ / ____
 Incidental collection: Time _____ AM or PM Net Hand Other _____ # specimens _____
Collection method (circle)

Weather: _____ Additional focal species observed: _____

Notes: _____
Abundant species in flower, human disturbance, etc.

Bowl-trapping: Instructions for Participants

Bowl-trapping is the use of “pan traps” or “bee bowls”, which are little bowls filled with soapy water, to catch and collect pollinating insects. Simply put, they are pretend flowers that drown insects. We will use 3.25 oz. white, fluorescent blue, and fluorescent yellow plastic bowls-colors that attract pollinating insects. If you are interested in conducting bowl-trapping for the Survey, **we ask that you follow our specific protocol outlined below in “Field survey instructions” and use the proper equipment outlined in the “Field Equipment list” section.**

Bowl-trapping surveys can be completed at survey locations of your choice. Please refer to “Where should I survey?” and “When should I survey?” sections above and follow the field techniques and data submission described below. Please see the Very Handy Manual mentioned above for other suggestions on where to purchase bowl-trapping supplies. Please remember that you are responsible for obtaining permission from landowners to sample at sites you have selected. You can see our example landowner letter in the “Resources” section to assist you in making contact.



Ashley Ballou and Andrea Chaloux setting bowl traps at Moreau Lake State Park (*Erin L. White*)

Field survey instructions

You will need to be able to spend an hour setting bowls before 10 am and come back approximately 5 hours later to retrieve them (also about an hour time commitment) the same day.

To complete a survey, we recommend setting 15 bowl traps

per habitat type at a site, have them deployed for about 5 hours during the warmest part of the day, ideally between 10am and 3pm. At a given site, you can locate up to four habitat types, ideally within 250 m of each other for ease of access: forest, meadow, wetland, and roadside. See the section “Where should I survey?” for suggestions on habitat selection within a site. For each habitat type you can sample, we recommend setting out 15 bowl traps (3.25 oz plastic bowls-see Field Equipment list section), alternating white, fluorescent blue, and fluorescent yellow, filled about $\frac{3}{4}$ full with soapy water. (We recommend five bowls of each color in the transect.) To make the soapy water, simply fill a gallon container with water and add a large squeeze of dish soap (not one containing citrus or ammonia; regular Dawn works well), cap and slosh to mix. The bowls should be placed on the ground, spaced 3m apart along a linear transect (which will be 42m long). If vegetation in the area is very tall (flowers up very high and difficult to see the bowls), press down the vegetation directly around the bowls to make them more visible. Record the time of bowl deployment (when you lay your last bowl) at each habitat type. Record coordinates at the transect and record other required site information on the data sheet.

Come back 5 hours later and retrieve the bowls (beginning with the same habitat type first), recording the time of pick-up from each habitat type. To retrieve the bowls, simply dump contents of all bowls from a given habitat through a brine shrimp net, and use a spoon to scoop up the insects from the net into a Whirl-Pak bag filled with 70% denatured alcohol (ethyl alcohol is best). Place a piece of paper labeled in PENCIL with date, site, habitat type, “bowl-trapped”, and collector inside the bag. Keep air in the top of the bag above the alcohol and roll the top down to the “fill line” printed on the bag and bend the twist ends backward and tuck in. Store



Colgate Lake Wild Forest (*Matthew D. Schlesinger*)

upright in a cool place until you can process the samples. You should have 4 bags for the site if you sample all habitat types—one for forest, meadow, wetland, and roadside. We suggest processing your specimens on rainy days throughout the season to avoid a bottleneck of processing in the fall. We hope to receive specimens by end of September, except for late season samples you may do.

Do not set out bowl traps in a site known to have listed species which may be attracted to the bowls. Records should be documented with hand-netting and photographs at such sites, and those sites where you anticipate rare species to occur (i.e. historical locations). This way, any listed species captured, may be released.

If you choose this method, you must process your specimens according to the procedure (dry and pin them, then ship to us). Follow the processing procedure for soapy water specimens beginning at step 2 above. Then, follow the shipping instructions in the “Shipping specimens” section below.

Summary:

1. Set 15 bowl traps in up to four habitat types at a site (forest, wetland, meadow, roadside) with soapy water, laid out 3m apart and alternating white, blue, and yellow bowls. Finish placing last bowl by 10am. Record time of bowl deployment at each habitat type. Collect other required site information for survey site visit form.
2. Retrieve bowls 5 hours later, recording time of bowl retrieval at each habitat type.
3. Dump contents of bowls through small mesh net and place all insects from that habitat into one Whirl-Pak bag filled with 70% ethyl alcohol. There will be up to four bags (one for each habitat) per site.
4. Make sure your bags have paper labels **INSIDE** them, for each habitat type. Date, site, habitat, “bowl-trapped”, and collector is in **PENCIL**. Pen will disappear once it hits the alcohol.
5. Store bags upright until they can be processed.
6. Process (dry and pin) specimens following processing procedure for soapy water specimens above beginning with step 2 (rinse specimens in water through brine shrimp net, blow-dry in inverted quart-sized mason jar with screen cap at bottom for 1-2 minutes, turn onto paper towel and pin immediately).
7. Ship specimens in storage box with data sheets. We anticipate having an electronic database entry option for participants. Please use the paper form until this is available.

Data recording and submission

Please follow the data recording and submission instructions in the hand-netting section above for filling out the ESNPS Data Sheet for Project Participants. Make sure any specimens submitted (following the shipping instructions below) are accompanied by data sheets.

Storing and Shipping Specimens

Storing specimens

Insects euthanized by freezing should be kept frozen until the specimens will be pinned. Generally, very little thawing time is needed before pinning. Specimens euthanized by ethyl acetate or another chemical in a killing jar should also be kept frozen until pinning if not pinned right away when you return from the field. Do not thaw the specimens until you can pin them right away, as ice can melt within the container and can soak the specimen, causing hair matting and possible molding later on. Specimen labels containing date, site, habitat, method, and collector should be kept with specimens at all times. Always place a label on the inside of a container, even if also labeling the outside.

Specimens euthanized in soapy water while hand-netted will need to be pinned within 48 hours, or the specimens will need to be transferred into containers or Whirl-Pak bags containing denatured ethyl alcohol (see above hand-netting and bowl-trapping procedures). Once placed in alcohol, labels will need to be written in PENCIL, as pen will disappear when it hits the alcohol. Always place a label on the inside of a container, even if also labeling the outside. Whirl-Pak bags will need to be stored upright and in a cool place until processing.

After pinning specimens (regardless of euthanization method or previous storage), if you are able to, leave the box open (no pets, house mice, or other animals who might disturb the specimens) for a few days to help them dry out. Then store them in a dry place in cardboard



Tricolored bumble bee (*Bombus ternarius*)
(Larry Master)

folding insect storage boxes with the lids closed. Do not keep them in a basement, refrigerator, or otherwise humid environment, as mold can grow on your specimens, which is difficult and cumbersome to remove and may ruin specimens. Also, store the boxes in an air-conditioned space. The boxes are also not pest proof and dermestid beetles can eat the specimens (mice can also be a problem). Check your specimens frequently for signs of infestations of beetles (small black powder and shed skins in the boxes). Tips for getting rid of dermestids and mold are in the Very Handy Manual.

Shipping specimens

You are welcome to drop off your specimens and data forms to NYNHP at the address below. Please contact Erin White, erin.white@dec.ny.gov, first to ensure someone will be in the office to receive them. We anticipate that many of you will need to ship your specimens to us. Please follow the procedure below for this. If you have many boxes to get to us and are not close to Albany, feel free to contact us to see if we may be in your area and could arrange for an exchange close to you rather than shipping. We prefer to receive data and specimens throughout the season and certainly by end of September, with the exception of Sept/Oct samples you may do.

Shipping Procedure for Pinned Specimens (adapted from the Very Handy Manual):

1. Ensure specimens are firmly pinned in the bottom of your box (but pins are not poking through to the back of the box) so that they do not come loose during shipping. Place empty pins in all four corners and center of the box, if specimens are not in these locations, to support the cardboard.
2. Cut a piece of cardboard that fits snugly inside the box, resting on top of the heads of the pins. Do not use foam, which will engulf the pin heads.
3. If there is space between the top of the cardboard and the lid of the box, place a filler material such as bubble wrap or packing peanuts to keep the cardboard in place snugly against the pin-heads during shipping.
4. Tape or rubber-band the box shut.
5. Place the specimen box within a larger box for shipping. There should be at least 2 inches of free space on all sides. Fill space with a filler such as packing peanuts, crumpled newspaper, or bubble wrap. Include data sheets with specimens.
6. Ship to Erin White, NY Natural Heritage Program, 625 Broadway, 5th Floor, Albany, NY 12233-4757. Please include the floor number and all zip-code digits to ensure it gets to the proper location in the building.

Shipping Procedure for Bycatch retained in Whirl-Pak bags (adapted from the Very Handy Manual):

1. Remove as much alcohol from the bags as possible, while maintaining enough in the bottom to ensure specimens' preservation. Make sure your specimens and label remains inside. Remove air from the bag with your fingers and roll the top down to the level of the alcohol, bend the twist ties forward and twist the wires together. Tuck wire ends into center.
2. Put your Whirl-Pak bags into a Ziploc bag.
3. Put the Ziploc bag into another larger Ziploc bag with some paper towels around it. This will help prevent leaking into the shipping box if any leaking occurs.
4. Place the bags in a larger shipping box with padding around them.
5. Ship to Erin White, NY Natural Heritage Program, 625 Broadway, 5th Floor, Albany, NY 12233-4757. Do include the floor number and all zip-code digits to ensure it gets to the proper location in the building.

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- Maine Bumble Bee Atlas. 2015. Maine bumble bee atlas participant handbook. 36 pages.
- Pohl, G. R. 2009. Why we kill bugs—the case for collecting insects. *Ontario Lepidoptera* 2008:7.
- Trietsch, C., and A. Deans. 2017. The insect collector's code. Frost Entomological Museum, Department of Entomology, Pennsylvania State University, University Park, PA.

Resources

Project related:

Empire State Native Pollinator Survey project website: <http://www.nynhp.org/pollinators>

Empire State Native Pollinator Survey iNaturalist site:

<https://www.inaturalist.org/projects/empire-state-native-pollinator-survey>

Empire State Native Pollinator Survey participation sign-up page (registration, workshops):

<http://signup.com/go/yxaxrgQ>

Capture, Process, Pinning, and Shipping method reference:

The Very Handy Manual: How to Catch and Identify Bees and Manage a Collection:

<https://www.pwrc.usgs.gov/nativebees/Handy%20Bee%20Manual/The%20Very%20Handy%20Manual%20-%202015.pdf>

Conservation:

Animal conservation guides by NYNHP (selected target species):

<http://www.acris.nynhp.org/animals.php>

Xerces Society for Invertebrate Conservation: <https://xerces.org/>

Wildlife Preservation Canada training for Bumble Bee Watchers:

<https://xerces.org/2018/01/19/wildlife-preservation-canada-continues-training-bumble-bee-watchers/>

Other online data repositories:

Bug Guide

<https://bugguide.net/node/view/15740>

Bumble Bee Watch

<https://www.bumblebeewatch.org/>

Coursework:

The Bee Course: Southwestern Research Station, Portal AZ: <https://www.thebeecourse.org/>

Bee references:

A Guide to Identifying Bees Using the Discoverlife Bee Keys:

http://www.discoverlife.org/ed/tg/How_to_use_the_discoverlife_guides.html

Bumble Bees of the Eastern United States:

<https://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuideEast2011.pdf>

Bumble bee pocket identification guides (<https://xerces.org/identification-guides/bumble-bee-pocket-id/>)

Discover Life: <http://www.discoverlife.org>

Mitchell, Theodore. 1962. The Bees of the Eastern United States online keys:

<https://projects.ncsu.edu/cals/entomology/museum/easternBees.php>

Williams, Paul, Robbin Thorp, Leif Richardson, and Sheila Colla. 2014. An Identification Guide: Bumble Bees of North America. Princeton University Press: Princeton and Oxford.

Wilson, J., & Carril, O. 2016. The Bees in Your Backyard: A Guide to North America's Bees. Princeton University Press.

Fly references:

Kits, Joel H., Stephen A. Marshall, and Neal L. Evenhuis. "The bee flies (Diptera: Bombyliidae) of Ontario, with a key to the species of eastern Canada." *Canadian Journal of Arthropod Identification* 6 (2008): 1-52.

Miranda, G.F.G. et al. 2013. Key to the genera of Nearctic Syrphidae. *Canadian Journal of Arthropod Identification* No. 23.

Rotheray, G.E., and F. Gilbert. 2011. *The Natural History of Hoverflies*. Forrest Text, Cardigan, UK.

Skevington, J.H., M.M. Locke, A.D. Young, K. Moran, W.J. Crins, S.A. Marshall. In press. *Field Guide to the Hoverflies of Northeastern North America*

Beetle references:

Evans, Arthur V. 2014. *Beetles of eastern North America*. Princeton University Press. Princeton, New Jersey.

Yanega, D. (1996). Field guide to northeastern longhorned beetles (*Coleoptera: Cerambycidae*). Illinois Natural History Survey.

Moth references:

Beadle, David and Seabrook Leckie. 2012. Peterson field guide to moths of northeastern North America. Houghton Mifflin Harcourt Publishing Company, New York, New York.

Moth Photographer's Group: <http://mothphotographersgroup.msstate.edu/>

Tuttle, James. 2007. The hawk moths of North America: A natural history study of the Sphingidae of the United States and Canada. Wedge Entomological Research Foundation.

Nesting references:

Xerces, types of nests and sites: <https://xerces.org/providing-nest-sites-for-pollinators/>
Bumble Bee Watch, nest sightings: <https://www.bumblebeewatch.org/app/#/nests>

Instructional Videos

Some great resources for surveying pollinators are already available on the web.

Sam Droege (Project Advisor) has instructional videos available:

How to Net Collect Wasps and Bees: <https://www.youtube.com/watch?v=n6ZF1z3uA7E>

Secret Techniques to Bee Catching: <https://www.youtube.com/watch?v=SwYbv5bySPQ>

How to Pin Specimens: <https://www.youtube.com/watch?v=V2F8LBQV5L0>

The Maine Bumble Bee Atlas also has videos available on netting, collecting, and pinning here: <https://mainebumblebeeatlas.umf.maine.edu/member-resources/instructional-videos/>

Field Equipment list

PHOTOGRAPHING

Cell phone or camera for photographing/uploading photos to iNaturalist

HAND-NETTING

Aerial Insect Net

Rose Entomology Pro Nets are light and don't snag as easily on thorns. You would need a handle, hoop, and best bag such as (11RPN3B) Rose 36" Handle Only, (Blue), Includes Wrench and 12" Grip, (11R15H) Rose 15" Diameter Hoop, (11R15BCW) 15" Best Bag, chiffon. White. This type of net is about \$117 from bioquip.com

Another option is the Collapsible Insect Net. You would need a net, handles, and grip such as (7715CP) Collapsible Net, White, 15" Dial., 5" Handle, (12" handle extensions, 7312AA, or 24" handle extensions 7312AB, to make a length of 3-4 feet), and a red vinyl grip, 7357. This type of net is about \$42 from Bioquip.com

The economical "professional insect net" is available from Forestry Suppliers for about \$40. This has a 15" hoop with a white aerial insect net available in polyester or muslin.

http://www.forestry-suppliers.com/product_pages/products.php?mi=52781&itemnum=53746&redir=Y

Kill jar, ethyl acetate- (collecting jars with plaster bottom (various sizes available) and ethyl acetate from BioQuip)

Collecting vials (with air holes in lid if using freezing method, or containers with caps for soapy water method)-can reuse clean containers from household items

Cooler with ice pack

Project Data form-digital or paper

Ziploc bags and permanent marker

Forceps or tweezers-available from Bioquip

Pencil and paper for labels

GPS or smart phone for decimal degrees or zone 18 UTM Coordinates

Good field guides

Folding Insect Storage boxes, available from Bioquip (1002 F or 1009), boxes can be made from scratch (see Very Handy Manual) but will need to be hand-delivered to NYNHP Albany office.

Insect pins, size 2 and 0, various types available from Bioquip

Close focusing binoculars

BOWL-TRAPPING

60 (3.25oz) bowl-cups- 20 white, 20 fluorescent blue, 20 fluorescent yellow-see the Very Handy Manual for supplier suggestions, www.nhssi.org is one possibility. A few extras of each color are advisable as some may be lost due to unforeseen circumstances.

Whirl-Pak bags (4 oz. size) 4 per site-available from Bioquip in packs of 100

70% denatured alcohol (ethyl alcohol preferred, isopropyl OK)-hardware store

Plastic spoon-save this when you go for ice cream

Brine shrimp net or similar mesh net-pet store

Dawn dish detergent for making soapy water

Gallon sized jug or at least 3 liter capacity container

Paper towel, tweezers or forceps

Quart-size mason jar with lid- with center metal insert removed

Loose fiberglass screen- cut with scissors to cover opening of mason jar

Styrofoam Spreading Board, available from Bioquip (1024P)

Folding Insect Storage boxes, available from Bioquip (1002 F)

Insect pins, size 2 and 0, available from Bioquip

Project Data form-digital or paper

Pencil and paper for labels

Ziploc bags and permanent marker

GPS or smartphone for decimal degrees or zone 18 UTM Coordinates

Optional for each survey:

Hat

Sunscreen

Insect repellent

Water and food

Backpack to carry equipment

Field clothes and shoes appropriate for habitats

Change of shoes and socks if accessing wetlands

Recognizing symptoms of an allergic reaction to a bee sting

We have previously discussed in the hand-netting section how most of our targets do not possess the potential to sting. *Bombus* can have a significant sting and you may encounter some non-target pollinators with significant stings. However, these are easily identified and with proper handling techniques that we have outlined above, it is unlikely that you will get stung. That said, if you know you are allergic to bee stings, always carry an epi-pen with you in the field. If you are uncertain if you or your field partner is allergic, it is important to know the signs of an allergic reaction to a bee sting. Remember, pain, swelling, redness and itching or burning at the sting site can be a normal reaction. However, the symptoms below indicate an allergy, which can be life threatening. Hives and swelling can block airways. If you recognize these signs of a medical emergency, call for medical help immediately.

Signs of a severe allergic reaction include:

- Rapid swelling around the eyes, lips, tongue or throat
- Difficulty breathing
- Wheezing or hoarseness
- Severe itching, cramping or numbness
- Dizziness
- Hives or a reddish rash
- Stomach cramps
- Loss of consciousness

Material Safety Data Sheets (MSDS)

It is important to know the chemical properties and toxicity of various substances you will use so that you can take proper precautions to use them safely. We provide Material Safety Data Sheets (MSDS) sheets for ethyl alcohol and ethyl acetate below.

Disclaimer: Any brand names appearing in this handbook do not reflect sponsors of our project and are simply examples of what biologists and pollinator experts have found work well for doing pollinator surveys. ESNPS was and is not compensated by these companies to promote or endorse their brands nor does it reflect a relationship with NYS DEC or NYNHP with said companies.

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

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MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

MANUFACTURED BY: **Commercial Alcohols**
 Bruce Energy Centre 275 Bloomfield Road 2 Chelsea Lane
 4th Concession Chatham, Brampton, Ontario
 Tiverton, Ontario Ontario L6T 3Y4
 N0G 2T0 N7M 5J5

EMERGENCY PHONE NUMBER: CANUTEC (613) 996-6666

TRANSPORTATION

PRIMARY CLASS:	3	CLASS NAME:	FLAMMABLE LIQUID	UN#:	1170
SUBSIDIARY CLASS:	NONE				
SHIPPING NAME:	ETHANOL				

I. EMERGENCY AND FIRST AID PROCEDURE

<u>INGESTION</u>	<ul style="list-style-type: none"> Never give anything by mouth if victim is rapidly losing consciousness or is unconscious or convulsing. DO NOT INDUCE VOMITING. Have victim drink about 250ml (8fl. oz.) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Seek medical assistance.
<u>SKIN</u>	<ul style="list-style-type: none"> Flush contaminated area with water for at least 20 minutes. Remove contaminated clothing under running water. Completely decontaminate clothing before re-use, or discard. If irritation occurs seek medical attention.
<u>INHALATION</u>	<ul style="list-style-type: none"> Remove victim to fresh air. Artificial respiration should be given if breathing has stopped and cardiopulmonary resuscitation if heart has stopped. Oxygen may be given if necessary. Seek medical attention immediately.
<u>EYES</u>	<ul style="list-style-type: none"> Immediately flush eyes with water for at least 20 minutes, holding the eyelids open. Seek medical attention immediately.
<u>NOTES TO PHYSICIAN</u>	<ul style="list-style-type: none"> Symptoms of ethanol intoxication vary with the alcohol level of the blood. Mild alcohol intoxication occurs at blood levels between 0.05-0.15% and approximately 25% of individuals will show signs of intoxication at these levels. Above 0.15% the person is definitely under the influence of ethanol and 50-95% of individuals at this level are clinically intoxicated. Severe poisoning occurs when the blood ethanol level is 0.3-0.5%. Above 0.5% the individual will be comatose and death can occur. The unabsorbed ethanol should be removed by gastric lavage after intubating the patient to prevent aspiration. Avoid the use of depressant drugs or the excessive administration of fluids.

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

Page 2 of 6

MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

II. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT, °C • 16 (Tag closed cup, ASTM D-56)

OTHER IMPORTANT DATA

COMPONENT	% V/V	FLAMMABLE LIMITS, % V/V		VAPOUR PRESSURE KPA AT 20°C	VAPOUR DENSITY (AIR = 1)	AUTOIGNITION POINT, °C
		LOWER	UPPER			
(1) Ethyl Alcohol	95.0	3.3	19.0	5.87	1.6	422
Water	Balance					

EXTINGUISHING MEDIA

- Apply alcohol-type or all-purpose-type foams by manufacturers' recommended techniques for large fires.
- Use carbon dioxide or dry chemical media for small fires.
- Water is generally unsuitable and may help to spread the fire.

SPECIAL FIREFIGHTING PROCEDURES

- Use water spray to cool fire-exposed containers and structures.
- Use water spray to disperse vapours; reignition is possible.
- Use self-contained breathing apparatus and protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

- Vapours form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from handling point.

III. IDENTIFICATION

CHEMICAL NAME	ETHYL ALCOHOL (190 PROOF)	CHEMICAL FAMILY	ALCOHOLS
FORMULA	(1) CH ₃ - CH ₂ - OH	MOLECULAR WEIGHT	(1) 46.07
SYNONYMS	Ethanol, Alcohol, Ethyl Alcohol 95%, Ethyl Alcohol DPS (95% vol), Ethyl Alcohol DS (95% vol), Ethyl Alcohol VS (95% vol).		
USE	<ul style="list-style-type: none"> • General purpose organic solvent, aerosols, cosmetics, pharmaceuticals, alcoholic beverages, vinegar production, etc. 		

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

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MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

IV. PHYSICAL DATA

BOILING POINT, °C at 760mm Hg	78.3
FREEZING POINT, °C	Not Available
DENSITY, kg/L @ 20°C	0.8103
COEFFICIENT OF WATER/OIL DISTRIBUTION	Separates from oil
pH	Not applicable
DISTILLATION RANGE, °C	78.0 - 79.0
MISCIBILITY IN WATER	Complete
% VOLATILES BY VOLUME	100
EVAPORATION RATE (butyl acetate = 1)	1.7

**APPEARANCE
AND ODOUR**

- Colourless liquid with typical lower alcohol odour.
- Odour threshold is in the range of 0.1 to 5100 ppm, according to the Canadian Standards Association publication Z94.4-M1982 (Appendix 1).

V. INGREDIENTS AND TOXICOLOGICAL DATA

INGREDIENT	% V/V	CAS NO.	TLV, ppm	LC50, ppm/4h.	LD50, mg/kg	LD50, mg/kg
				RAT, INHAL.	RAT, ORAL	RABBIT, SKIN
(1) Ethyl Alcohol	95.0	64-17-5	1000	31,623	7,060	20,000
Water	Balance					

REFERENCES: ACGIH (1988-1989), RTECS (1983).

VI. WHMIS CLASSIFICATION AND SYNERGISTIC MATERIALS

WHMIS CLASSIFICATION

- Flammable liquid, eye irritant.

SYNERGISTIC MATERIALS

- Carbon tetrachloride, chloroform, bromotrichloromethane, dimethylnitrosamine,

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

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MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

VII. HEALTH HAZARD DATA

<u>INGESTION</u>	<ul style="list-style-type: none"> • May cause dizziness, faintness, drowsiness, decreased awareness and responsiveness, euphoria, abdominal discomfort, nausea, vomiting, staggering gait, lack of coordination and coma.
<u>SKIN ABSORPTION</u>	<ul style="list-style-type: none"> • No adverse effects with normal skin. However, potentially harmful amounts of material may be absorbed across markedly abraded skin when contact is sustained, particularly in children.
<u>INHALATION</u>	<ul style="list-style-type: none"> • High vapour concentrations may cause a burning sensation in the throat and nose, stinging and watering in the eyes. At concentrations which cause irritation, dizziness, faintness, drowsiness, nausea and vomiting may occur.
<u>SKIN CONTACT</u>	<ul style="list-style-type: none"> • No evidence of adverse effects from available information.
<u>EYE CONTACT</u>	<ul style="list-style-type: none"> • Severe eye irritant. • Vapours can irritate eyes. • Eye damage from contact with liquid is reversible and proper treatment will result in healing within a few days. • Damage is usually mild to moderate conjunctivitis, seen mainly as redness of the conjunctiva.
<u>EFFECT OF REPEATED OVEREXPOSURE</u>	<ul style="list-style-type: none"> • Long term repeated oral exposure to ethanol may result in the development of progressive liver injury with fibrosis.
<u>MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE</u>	<ul style="list-style-type: none"> • Repeated exposure to ethanol may exacerbate liver injury produced from other causes.
<u>OTHER EFFECTS OF OVEREXPOSURE</u>	<ul style="list-style-type: none"> • Repeated ingestion of ethanol by pregnant mothers has been shown to adversely affect the central nervous system of the fetus, producing a collection of effects which together constitute the fetal alcohol syndrome. These include mental and physical retardation, disturbances of learning, motor and language deficiencies, behavioral disorders, and small size head.

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

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MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

VIII. REACTIVITY DATA

<u>STABILITY</u>	<ul style="list-style-type: none"> Stable
<u>CONDITIONS TO AVOID</u>	<ul style="list-style-type: none"> Sources of ignition
<u>INCOMPATIBILITY</u>	<ul style="list-style-type: none"> Oxidizing materials
<u>HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS</u>	<ul style="list-style-type: none"> Burning can produce carbon monoxide and/or carbon dioxide and/or formaldehyde.
<u>HAZARDOUS POLYMERIZATION</u>	<ul style="list-style-type: none"> Will not occur
<u>CONDITIONS TO AVOID</u>	<ul style="list-style-type: none"> None currently known

IX. SPILL OR LEAK PROCEDURES

<u>SPILL</u>	<ul style="list-style-type: none"> Contain spilled material. Provide adequate ventilation and protective equipment. Remove sources of heat, sparks or flames. Spill should be collected in suitable containers or absorbed on a suitable absorbent material for subsequent disposal.
<u>WASTE DISPOSAL</u>	<ul style="list-style-type: none"> Waste material should be disposed of in an approved incinerator or in a designated landfill site, in compliance with all federal, provincial and local government regulations.

X. SPECIAL PROTECTION INFORMATION

<u>RESPIRATORY EQUIPMENT</u>	<ul style="list-style-type: none"> Up to 1000 ppm, an approved organic vapour cartridge respirator can be used. For concentrations above 1000 ppm, an air-supplying respirator is recommended. The user should consult a respirator guide, such as the Canadian Standards Association's guide Z94.4-M1982.
<u>VENTILATION</u>	<ul style="list-style-type: none"> The ventilation system should be non-sparking, grounded and separate from other exhaust ventilation systems. Local ventilation is recommended when handling.
<u>PROTECTIVE GLOVES</u>	<ul style="list-style-type: none"> Neoprene, butyl or natural rubber.
<u>EYE PROTECTION</u>	<ul style="list-style-type: none"> Chemical resistant monogoggles when handling
<u>OTHER PROTECTIVE EQUIPMENT</u>	<ul style="list-style-type: none"> Eye bath, safety shower and other protective equipment as required.

PRODUCT NAME: **ETHYL ALCOHOL (190 PROOF)**

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MSDS NO: **3001**

EFFECTIVE DATE: August 5, 2014

XI. SPECIAL PRECAUTIONS

**PRECAUTIONS TO BE
TAKEN IN HANDLING
AND STORING**

- Keep away from heat, sparks and flames.
- Keep container closed when not in use.
- Use with adequate ventilation.
- Avoid breathing vapours.
- Avoid contact with eyes and skin.
- Wash exposed skin thoroughly after handling.
- Take precautions to prevent static electricity build-up when transferring contents.

OTHER PRECAUTIONS

- Good personal hygiene practices are suggested, such as abstaining from eating, drinking and smoking in the workplace.

XII. MSDS PREPARATION

PREPARED BY: Alcohol QA, Technical Services, and Regulatory Affairs Department

PHONE NUMBER: (905) 790-7500

DATE: August 5, 2014

COMMERCIAL ALCOHOLS URGES EACH CUSTOMER OR RECIPIENT OF THIS MSDS TO STUDY IT CAREFULLY TO BECOME AWARE OF AND UNDERSTAND THE HAZARDS ASSOCIATED WITH THE PRODUCT. THE READER SHOULD CONSIDER CONSULTING REFERENCE WORKS OR INDIVIDUALS WHO ARE EXPERTS IN VENTILATION, TOXICOLOGY OR FIRE PREVENTION, AS NECESSARY OR APPROPRIATE TO USE AND UNDERSTAND THE DATA CONTAINED IN THIS MSDS.

TO PROMOTE SAFE USE AND HANDLING OF THIS PRODUCT, EACH CUSTOMER OR RECIPIENT SHOULD

- (1) NOTIFY EMPLOYEES, AGENTS, CONTRACTORS AND OTHERS WHO MAY USE THIS MATERIAL, OF THE INFORMATION IN THIS MSDS AND ANY OTHER INFORMATION REGARDING HAZARDS OR SAFETY,
- (2) FURNISH THIS SAME INFORMATION TO EACH CUSTOMER FOR THE PRODUCT, AND
- (3) REQUEST CUSTOMERS TO NOTIFY THEIR EMPLOYEES, CUSTOMERS, AND OTHER USERS OF THE PRODUCT OF THIS INFORMATION.

Logo, Name and Address 123 Any Street Maintown, GA 12345

MATERIAL SAFETY DATA SHEET

ETHYL ACETATE.

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: Ethyl acetate. Ethyl ethanoate acetoxyethane.
Chemical Family: Saturated aliphatic carboxylic acid ester
Product Use: Laboratory solvent
Manufacturers Name and Address: Caledon Laboratories Ltd. 40 Armstrong Avenue Georgetown, Ontario L7G 4R9
Telephone No: (905) 877-0101
Fax No: (905) 877-6666
Emergency Telephone No: CANUTEC (613) 996-6666

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients, % TLV Units, CAS No: Ethyl acetate, > 99, (TWA) 400 ppm, 141-78-6

PHYSICAL DATA

Physical State: Liquid
Odour and Appearance: Clear, colourless liquid with strong fruity odour
Odour Threshold (ppm): 6.4 ppm to 50 ppm (detection); 13.3 ppm to 75 ppm (recognition). Not a reliable indicator, varies widely.
Vapour Pressure (mm Hg): 73 mm Hg at 20 °C
Vapour Density (Air = 1): 3.04
Evaporation Rate (Bu ac = 1): 6.2
Boiling Point (degrees C): 76.5 °C to 77.5 °C
Freezing Point (degrees C): -83 °C
pH: Neutral if pure
Specific Gravity: 0.9019 at 20 °C
Coefficient of Water/Oil distribution: LogP(oct) = 0.66

SHIPPING DESCRIPTION

UN: 1173
T.D.G. Class: 3
Pkg. Group: II

REACTIVITY DATA

Chemical Stability: Stable. In presence of water may slowly hydrolyze to ethanol and acetic acid.
Incompatibility with other substances: May react violently or explosively with oxidizing agents (hydrogen peroxide, nitric acid, perchloric acid, chromium trioxide) or with potassium tert-butoxide or lithium aluminum hydride. Reacts vigorously with strong acids, and strong bases. Not corrosive to metals. May attack some forms of plastics, rubbers and coatings.
Reactivity: Avoid heat, all ignition sources, all incompatible materials, moisture. Avoid generating dust or vapours.
Hazardous Decomposition Products: Ethanol and acetic acid may be produced if water is present. Polymerization will not occur.

FIRE AND EXPLOSION DATA

Flammability: FLAMMABLE LIQUID AND VAPOUR. Readily ignites at room temperature. Vapors can travel to a source of ignition and flash back. Liquid can float on water and may spread fire. Can accumulate in confined spaces and cause flammability or toxicity hazard. Forms ignitable or explosive mixtures with air at room temperature or at freezing temperatures.
Extinguishing Media: Use CO₂ or dry chemicals for small fires, and alcohol or polymer foam for large fires. Water, as a spray or fog, will be ineffective for fighting fire, but may be used to absorb heat, cool containers, disperse vapours, and flush spills away from source of ignition. Fight fire from a safe distance and from upwind. Firefighters should wear self-contained breathing apparatus and protective clothing sufficient to prevent contact. Containers may explode in a fire.
Flash Point (Method Used): -4.4 °C (TCC)
Autoignition Temperature: 427 °C
Upper Flammable Limit (% by volume): 11.50 %
Lower Flammable Limit (% by volume): 2.00 %
Hazardous Combustion Products: CO_x, ethyl alcohol, acetic acid
Sensitivity to Impact: None identified.
Sensitivity to Static discharge: Liquid will probably not accumulate static charge. However, vapours in the flammable range may be ignited by static discharge.

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:
LDS₅₀: (oral, rat) 5,600 mg/kg; (oral, mouse) 4,100 mg/kg; (dermal, rabbit) >20 mL/kg
LC₅₀: (rat) 16,000 ppm/6h; (mouse) 44,000 mg/m³/3h
Effects of Acute Exposure to Product:
Inhaled: Vapours are irritating to nasal passages and throat. Exposure to 400 ppm for 3 to 5 minutes caused irritation to nose and throat in humans. High concentrations can cause CNS depression with drowsiness, headache, eventual stupor, congestion of the upper respiratory tract, spleen and kidney, and hemorrhaging in lung tissue.
In contact with skin: Not irritating to skin in tests with human volunteers and animals.
In contact with eyes: Vapour and liquid can be irritating to the eyes. Vapour has produced irritation at 400 ppm. Animal studies indicate liquid will cause moderate irritation but no permanent injury.
Ingested: Not a normal route of exposure. Does not appear to be very toxic by ingestion (animal studies). Ingestion of large amounts would probably cause nausea and vomiting, shortness of breath, headache, drowsiness, loss of coordination, possibly even coma and death.
Effects of Chronic Exposure to Product: Workers exposed to 375 ppm to 1,500 ppm for several months experienced no adverse effects. Repeated or prolonged skin contact can cause irritation, drying, and cracking of skin. Can cause sensitization and dermatitis. Prolonged exposure of workers to high concentrations (4,000 ppm to 14,000 ppm) caused only mild irritation, but more severe exposure could cause symptoms as in Inhaled.
Carcinogenicity: No human or animal information available. Group A4, not classifiable as human carcinogen
Teratogenicity: No human or animal information available.
Reproductive Effects: No human or animal information available.
Mutagenicity: No evidence of mutagenicity.
Synergistic Products: One study showed combination of ethyl acetate and formaldehyde to be more toxic than the individual chemicals.

PREVENTIVE MEASURES

Engineering Controls: Local exhaust ventilation required.
Respiratory Protection: To 2,000 ppm, NIOSH/OSHA approved chemical cartridge respirator with organic vapour cartridge, or approved supplied-air respirator operated in continuous-flow mode or full face-piece self-contained breathing apparatus; higher or unknown concentrations, as in fire or spill conditions, positive pressure, full face-piece self-contained breathing apparatus or supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus.
Eye Protection: Chemical safety goggles, face shield.

Skin Protection: 4H(polyethylene/ethylene vinyl alcohol), Barricade, CPF 3, Responder, Trellechm HPS, Tychem 10000 gloves. Impervious apron and boots and other clothing sufficient to prevent contact.

Other Personal Protective Equipment: Safety shower and eye wash fountain readily available in work area.

Leak and Spill Procedure: Eliminate all sources of ignition. Evacuate area. Do not touch spilled material. Cleanup personnel must be thoroughly trained in the handling of hazardous materials, and must wear protective equipment and clothing sufficient to prevent any contact or inhalation. Stop leak if it is safe to do so. Prevent from entering sewers and waterways. Recover product and collect contaminated soil for disposal. For small spills, contain by applying absorbent. Collect waste for disposal. Contaminated absorbent may pose the same hazards as the product. Flush area of spill thoroughly with copious amounts of running water.

Waste Disposal: Dispose of in compliance with local, provincial and federal regulations.

Handling Procedures and Equipment: FLAMMABLE LIQUID AND VAPOUR. Workers using this chemical must be properly trained in its hazards and its safe use. Wear appropriate protective clothing and equipment. Post NO SMOKING signs. Ground and bond equipment and containers to prevent a static charge buildup. Use non-sparking tools. Avoid splash filling. Keep well away from combustible and incompatible materials. Avoid contact. Avoid inhalation. Avoid generating dust or vapours. Use the smallest amount possible for the purpose in an area with adequate ventilation. Empty containers may contain hazardous residues; treat with caution.

Storage Requirements: Store in cool, dry, well-ventilated area, out of direct sunlight, and away from heat or ignition sources and incompatible materials. Post NO SMOKING signs. Keep containers tightly closed. Protect from damage. Inspect regularly for signs of leaking or damage. Keep well away from combustible and incompatible materials. Ground and bond equipment and containers to prevent a static charge buildup. Storage facilities should be made of fire-resistant materials. Provide raised sills and trenches to drain to a safe area.

Caledon Laboratories, Ltd. believes that the information contained herein is reliable and accurate. Caledon makes no warranty thereto, and expressly disclaims all liability for reliance thereon. Such information is solely for your consideration, investigation, and verification.

ds open during flushing. If irritation persists, get medical attention.
at twenty (20) minutes. If irritation persists, get medical attention.

Inhalation: Eliminate all sources of ignition. Remove to fresh air immediately. Rescuer should take precaution to limit his own exposure. Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped, give artificial respiration. Stay with casualty until medical assistance is reached.

Ingestion: Do not induce vomiting. If victim is alert and NOT convulsing, rinse mouth, give several glasses of water to drink to dilute. Get medical attention. If vomiting occurs, keep head below hips to help prevent aspiration. Rinse mouth and give more water to drink.

REFERENCES USED

CCINFO disc:

Royal Society of Chemistry: Chemical Safety Data Sheets, Vol. 1, 1992

Sax, Lewis: Hawleys Condensed Chemical Dictionary, 11th ed., 1987

Suppliers Material Safety Data Sheets:

ADDITIONAL INFORMATION

Date Issued: 01-Nov-88

Revision: Nov 2015

Proposed WHMIS Designation: B2; D2B (irritation)

Prepared by: Caledon Laboratories Ltd. (905) 877-0101



New York Natural Heritage Program

Facilitating Conservation of New York's Biodiversity

March 1, 2018

Dear Landowner:

The purpose of this letter is to help volunteer field workers for the Empire State Native Pollinator Survey gain permission to look for these insects on private lands. I have provided some background information below to encourage you to assist in the survey by allowing the volunteer field worker to visit your land.

The Empire State Native Pollinator Survey is a project of the New York Natural Heritage Program in cooperation with the New York State Department of Environmental Conservation. The survey began in 2017 and will continue through the summer of 2021.

The goal of the Empire State Native Pollinator Survey is to determine the conservation status of a wide array of native insect pollinators in nonagricultural habitats. We will focus efforts on collecting distributional information for important at-risk pollinator species that are native to the Northeastern US. We will target species in the following orders (bees, flies, beetles, and butterflies/moths).

Volunteers are an integral part of this project and contribute a significant amount of data through their survey efforts statewide. They allow us to gather much more information on these important organisms and help us cover a much larger portion of the state than we would be able to get to otherwise.

We hope that you will grant this volunteer field worker access to your land and sincerely appreciate your generosity in doing so. If you would like, the volunteer field worker can provide you with information on the types of pollinators that were found on your property.

If you have any questions, please feel free to reach me at erin.white@dec.ny.gov or 518-402-8955. Additional information on the survey can also be found at: <http://www.nynhp.org/pollinators>

Sincerely,

Erin White
Zoologist and Project Coordinator