NYFA
New York Flora Association

Quarterly Newsletter

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New York Flora Association Newsletter Spring 2019

Editor's Note: Happy Spring! Our lead story is about one of the spring wildflowers we all look forward to seeing – trout lily (also part of the NYFA logo, see above banner). And along with the advent of spring comes our list of field trips and workshops, see page 12. Hope to see you in the field this year!

Articles Inside:

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Trout Lily, *Erythronium americanum*

by Dr. Tom Yancey

Spring is on its way and with it comes an opportunity to observe a fascinating botanical transformation that occurs with trout lily, *Erythronium americanum*. Follow in my footsteps in discovering part of the life cycle of this common early spring flowering plant and see for yourself how trout lily's remarkable pattern of growth has helped ensure its reproduction. Trout lily is one of the most common and widely distributed of the early showy spring flowering plants, and it has multiple growth stages that involve some unexpected transformations.

Erythronium americanum occurs most commonly in deciduous hardwood forests, where early spring flowers emerge to utilize the sunlight pouring through the leafless canopy of the forest. It often occurs in large patches within these forests, and is especially common in wood lots and sugar bush stands, where its yellow flowers are easy to see. The flowers last a couple of weeks, making it possible to mark an area to return to and monitor growth transformations over time.

My own observations began with finding some mysterious plant growths that appeared to have nothing to do with trout lily. In patches of bare dirt produced by late winter scraping away of the leaf litter within a maple-beech-cherry-hemlock forest, I noticed white cord-like growths with small bulbous ends. They were emerging, growing along, and poking into the dirt, but were seemingly unconnected to anything else (photo 1). They seemed more like a fungus growth than part of a vascular plant. The tissue was completely and uniformly white and had no internal differentiation visible with a hand lens.

Photo 1. Fleshy bud shoot root with bulblet having a penetration tip.

The problem of identifying this growth persisted until last spring, when continued curiosity led to my finding several areas with these growths and finally to a find where the growths were attached to a vascular plant that had been washed out of the dirt by spring runoff (photos 2 and 3). This plant, with attached growths emanating from the base, was recognized to be *Erythronium americanum*. The odd growth is a bulblet at the end of a fleshy root generated from the base of a leafed plant. Reporting on experiments to determine the vertical penetration potential of *Erythronium*, Tessier (2013) called these growths “droppers”, following the terminology of Robertson (1966). Galil (1981), who categorized bud shoot growth in bulbous plants producing bulblets, called them “remoters”. My preference is to call them expanders, because they primarily grow along the leaf litter-soil interface. Galil noted that *Allium* and *Oxalis* are plants that can produce expanders that grow to considerable distance from a central bulb. Add *Erythronium* to that list, but with a difference: with *Erythronium* the central bulb disappears when the expanders grow.

Photo 2. *Erythronium americanum* plant with 3 bud shoots, withered leaf and main bulb.

Photo 3. *Erythronium americanum* plant with green leaf and 2 bud shoots growing from base of bulb among root mass. Note that the bulb is shriveled and becoming a husk.

The next step involves discovery. Go to a patch of trout lily that still has the typical strap-like leaves showing and carefully dig around the base of a leaf. Choose a place with un-compacted soil and carefully excavate. You will find bulblets growing from the base of the plant, like the one shown in the photos. A further step is to wait another week or so and excavate some others. By now the leaf has withered and cannot be seen, so marking with a utility wire-stemmed flag is necessary to find the plant bases. Clearing the leaf litter around the original early growth will reveal the presence of bulblets several centimeters away from the former base of the plant (photos 4 and 5). Most will have two expander bulblets, a few will have three, and some may have only one. A complete survey would be required to determine the average number of expander bulblets, but two well grown bulblets seem to be common.

Photo 4. Flagging the position of an *Erythronium americanum* plant with all aboveground growth withered and crumbled.

Photo 5. Excavation of bulblets in ground at the leaf litter-soil boundary that have grown from the previous generation bulb, now consumed by the growth. The pen is 13 cm long and the bulblets have grown 5-10 cm laterally from original bulb.

Photo 6. New generation of bulblets excavated from ground. Direction of new root growth shows bulblets may have varied orientation in ground.

This is the pre-flowering growth stage of *Erythronium americanum*. The plant has grown from a bulb and produces a single leaf early in the spring that will produce and store food for reproduction. It has ordinary roots and photosynthesizes, just as a typical plant. However, the leaf soon withers and disappears and the plant produces expander growths that extend along the leaf litter-soil interface, sometimes pushing down or up, to position bulblets that will grow into separate plants. The expander growths are produced from the base of the bulb, at the attachment point of the roots. The bulb at the leaf base is consumed by expander growth and withers to a dry husk that crumbles and disappears. The plant has split into two or more entities and has asexually reproduced itself with clones, using the food and tissue of the parent generation. A patch of *Erythronium americanum* could possibly be completely populated by clones of one individual, although they are not physically connected and are now independent of each other. The bulblet soon grows into a bulb having a network of roots (photo 6). The expander bulblet has a pointed tip and one could repeat the experiment to see how deep into the soil the plant uses this excavation adaptation to embed itself. In places with well-established leaf litter, it may not need to penetrate into the soil at all.

If you just want to observe without the trouble of marking and returning, look for the white expander growths in places where leaf litter has been scraped or washed away. Woods roads that consist of two tracks and are not graded are good places to see the pale white expanders. If it is still middle spring, look for the strap-like leaf of the plant.

All this agrees with nursery instructions for trout lily: *Erythronium americanum* seeds will not flower for a few years after planting. It is the later generations of the plants that flower, having reproduced asexually and generated a group of individuals from a single sexually-produced seed. What is most unusual is the fact that the parent bulb disappears entirely and that the growths expand laterally to different sites to become embedded. Spring-flowering plants that reproduce by new bulb growths beside the parent bulb are common, and often grow into dense patches of plants. Trout lily has the ability to disperse the later generations of growth, perhaps as an adaptation to lower light levels when leaves appear in the forest canopy. While out scouting for trout lily, also be on the lookout for Dutchman's beeches (*Dicentra cucullaria*), another plant with bulb-like growths underground. It occurs in the same deciduous hardwood forest habitat, often close to the base of tree trunks, and appears and withers away by the disintegration of the above-ground component within a couple weeks. Happy hunting and observing!

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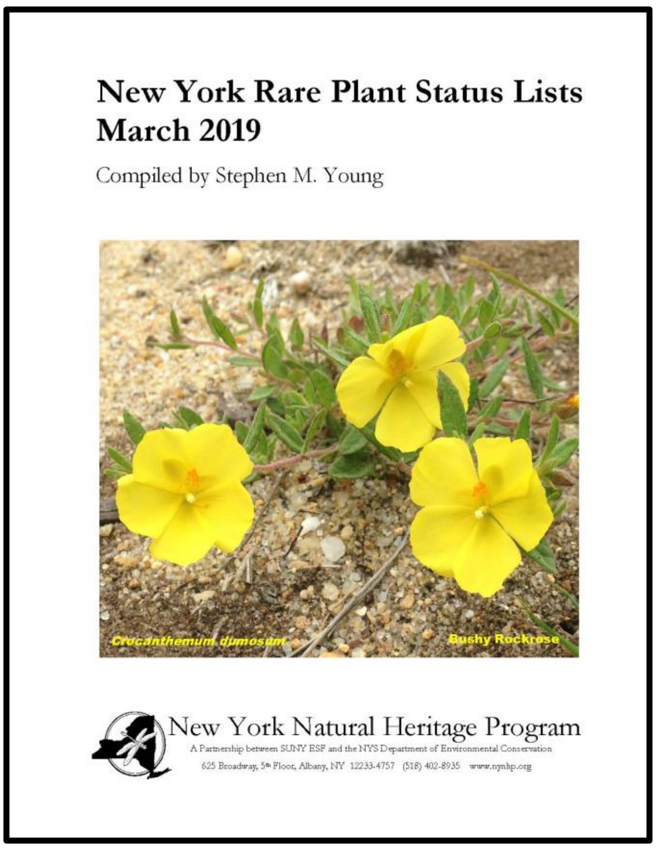
Botanical Note:



The 2019 Rare Plant List is now available from the New York Natural Heritage Program. Compiled by chief botanist Steve Young, the list contains the scientific and common names, Heritage ranks, protected status, counties of occurrences and phenology of the rare plants in New York State. The review list contains taxa that may be rare within New York but more herbarium and/or field work is needed to determine their true rarity status.

The list can be downloaded at http://www.dec.ny.gov/docs/wildlife_pdf/2019rareplantlists.pdf. A sortable table of the list can also be viewed at http://www.dec.ny.gov/animals/66348.html. In this table you can sort the list by family, name, and rank. We hope you have the opportunity to see some rare plants in the field this year or make some new discoveries!

Harlem Valley Fens and Knolls Trip, July 21, 2018

by Chris Graham

A dozen people braved red cedar thickets, hot white sands, and a fen on July 21st on a trip to Dover Plains, NY. The group had a good time exploring the Nellie Hill and Roger Perry preserves. At Nellie Hill, we hiked through hardwood forest (including an unplanned bushwack through a Japanese barberry thicket!) to a red cedar barren where New England blazing star (*Liatris scariosa* var. *novae-angliae*), grooved yellow flax (*Linum sulcatum*), and green milkweed (*Asclepias viridiflora*) thrived (see following photo by Doug McGrady).

We then explored a large side oats grama (*Bouteloua curtipendula*) meadow, where we discovered the striking green blooms of several green milkweed plants. Lunch was had in a beach-like setting on the "white sands of Dover," an area of beautiful white marble sands ringed by red cedars and scattered hardwoods. Finally, we spent an hour or more perambulating a long, linear fen dominated by shrubby cinquefoil (*Dasiphora fruticosa*) and various sedges (*Carex* spp.). Other highlights included purple cliffbrake (*Pellaea atropurpurea*), whorled milkweed (*Asclepias verticillata*), and harebell (*Campanula rotundifolia*).

Assessing the climate change vulnerability of two rare alpine taxa: *Nabalus boottii* and *Nabalus trifoliolatus* var. *nanus*

by Kristen Haynes

Global climate change is already driving community change and species loss worldwide, and will undoubtedly leave its signature on New York's flora. New York's alpine species may be particularly vulnerable to climate change, given their existence in small, isolated populations at the highest and coldest points of the landscape. While small in area (~0.3 km^2), New York's alpine zone represents a hotbed of biodiversity and is home to a suite of rare species, including regional endemics and arctic species at the southern limit of their range (Capers et al., 2013). Understanding the probable response of these species to climate change is critical for identifying conservation priorities.

Species can survive climate change in one of three ways: (1) range shift, (2) evolution, and (3) phenotypic plasticity (i.e. acclimation) (Jump and Peñuelas, 2005). Although the emphasis is often placed on the first two modes of response, phenotypic plasticity—or the modulation of a plant's morphology and physiology in response to environment—is likely critical (Bradshaw, 1965; Nicotra et al., 2010). For species lacking the connectivity or dispersal ability to shift their range and/or the genetic diversity to evolve (many of our alpine species probably fall into this category), phenotypic plasticity may be the primary response to climate change.

With support from NYFA, I conducted a common garden experiment to understand the ability of two rare alpine species to respond to climate change through phenotypic plasticity. The focal species included *Nabalus boottii* (Boott's rattlesnake-root), a state endangered and globally imperiled (G2) species (Young, 2017), and *Nabalus trifoliolatus* var. *nanus*, the rare alpine variety of the widespread three-leaved rattlesnake-root. Non-alpine populations of *N. trifoliolatus* were also included for comparison. I transplanted seeds and seedlings of the focal *Nabalus* species into raised beds at low, mid, and high elevation on Whiteface Mountain in Wilmington, New York, and monitored survival for two months. At the conclusion of the experiment, I removed remaining plants from the field and measured functional traits such as height, biomass, and specific leaf area. Leaf size, shape, and pigmentation were measured from scanned whole-plant images using ImageJ software. Significant differences in average functional trait values among the sites indicated phenotypic plasticity.

Wild *Nabalus boottii* flowering on Whiteface Mountain.

Overall, I found low survival following transplantation, but high and equal functional trait plasticity for survivors across all *Nabalus* taxa. Average trait values across thirteen traits were 39% different between plants grown at the highest and lowest sites. This high degree of plasticity provides a cautiously hopeful message regarding the response of these species to climate change. While abrupt changes in climate could cause mortality in young life stages of alpine *Nabalus*, strong phenotypic plasticity is likely to help populations persist in the face of a changing climate.

Young *Nabalus* plants awaiting transplantation into raised beds on Whiteface.

Example *Nabalus* plants recovered from Whiteface field sites at the end of the growing season.

Acknowledgements:

There are many individuals and organizations that made this project possible. I would like to thank my advisor, Dr. Donald Leopold, and my graduate committee for their advice throughout the project. Samouel Beguin and Russell Haynes provided field assistance, while Hannah Kowalsky and Jani Liu assisted with trait measurement. My thanks also go to the staffs of Cranberry Lake Biological Station, Whiteface Mountain Atmospheric Sciences Research Center (especially Paul Casson), Whiteface Veterans' Memorial Highway, and Whiteface Mountain Ski Resort (especially Mike LeBlanc) for their assistance with logistics and site access. Arthur Haines, Bob Popp, Dan Sperduto, Kyle Turchick, and the Mount Washington Auto Road staff (especially Howie Wemyss) provided essential assistance and advice during initial field collection. This project was supported by New York Flora Association and SUNY-ESF's Grober Graduate Research Fellowship.

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Summit location on Whiteface Mountain, ready for seedling transplant.

Third Annual Identification of Plants in Winter Workshop

by Joe McMullen (joymcmullen2@msn.com)

On January 26, 2019, I led the third annual Identification of Plants in Winter workshop sponsored by the NYFA. As in the past, it was held at the Onondaga Lake Visitors Center in Onondaga County. It included a classroom portion where a power point presentation was given and many plant specimens were available for viewing. During an afternoon field trip to a nearby county park various plants were viewed in the field.

A diverse group of 19 amateur and experienced botanists attended the workshop, which resulted in good discussions. The group included: a college professor, students, environmental consultants, agency personnel, and interested citizens. Both woody and herbaceous species identification during winter conditions were addressed. Scars left behind when various deciduous plant parts are shed and bud features are instrumental in identifying woody species. Dried remnants of herbaceous plants can be diagnostic, but the rather deep snow cover at the time of the workshop hindered our herbaceous species identification.

For the identification of woody species in winter, the first observation should always be whether the leaf arrangement and branching is opposite or alternate. In addition to arrangement, the shape and size of the leaf scars are important. Equally important are the number, arrangement, and size of the vascular bundle scars within the leaf scar. In plants, the vascular system does not consist of a hollow tube like the veins and arteries in our bodies; plant primary vascular tissue consists of many elongated cells grouped together in a bundle. The veins in leaves are vascular bundles and this vein network joins together down through the leaf stalk (petiole) and connects to the twig where the petiole attaches to the twig. When the leaf falls off, a scar is left behind, and within that leaf scar, vascular bundle scars appear where each vascular bundle had connected to the twig.

Separating Our Common Maple Species

Maples (*Acer* spp.) often form a prominent component of deciduous forests in New York. Sugar maple (*Acer saccharum)* is not only the state tree, but is a valuable timber species and the source of maple syrup, with New York being second only to Vermont in its production. So, distinguishing maple species can be important.

As most of you know, maples have an opposite leaf and branching arrangement. All maples have a crescent-shaped (like a crescent moon) leaf scar with three bundle scars, one scar at each tip and one in the middle of the leaf scar (photo 2).

Color and other features help distinguish the different maples. Sugar maple has a dark brown bud on a glossy brown twig (photo 1). Red maple (*Acer rubrum*) and silver maple (*Acer saccharinum*) buds and twigs look the same, with reddish buds and twigs. Silver maple twigs, however, have a rank odor when crushed and the inner bark is exposed. The twigs of silver maple are also usually turned up at the tip (photo 9). When red and silver maple trees are young, the bark of both species is smooth, tight, and light gray in color. One identifying feature of red maple is target canker, a fungal infection that causes the bark to crack in concentric circles (Wojtech 2011). This canker pattern is unique to red maple and persists as the tree matures and the remaining bark forms vertical cracks (photos 5 and 6).

The introduced Norway maple (*Acer platanoides*) has large terminal buds that are usually purplish in color. But the most distinguishing feature of Norway maple buds are the keeled bud scales (photo 3). The keels are most obvious when the bud is viewed head-on from the tip. Sap, if present, will be milky in Norway maple, which is a good summer diagnostic trait as well.

The last common maple is box elder (*Acer negundo*), or to make it sound more like a maple, ash-leaved maple. Like most woody species with compound leaves, it has a rather stout twig, which is usually green in color and may be covered by a glaucous (whitened) bloom that can be evident at some distance (photo 4). Buds of box elder are covered with gray/white hairs, and the fruit of female trees (box elder is dioecious) can persist on the tree for much of the winter.

Photo 1. Top, sugar maple with brown buds on brown twigs, versus reddish buds and twigs of red maple, bottom.

Photo 2. All maples have crescent-shaped leaf scars and three bundle scars

Photo 3. Norway maple has purplish buds with keeled bud scales.

Photo 4. Box elder has buds covered with white hairs, and usually a glaucous green stem and persistent fruit.

Photos 5 and 6. Concentric rings of target canker is unique to red maple. The pattern persists as the tree matures.

Thorns, Prickles, and Spines (Oh My!)

One of the things I covered in the field portion of the workshop was the difference between thorns and prickles. Thorns are modified branches, or more specifically, they are branches that end in a sharp point. As branches, they originate from inside the outer layer or bark of a stem. Our hawthorns (*Crataegus* spp.) and European buckthorn (*Rhamnus cathartica*) have good examples of thorns.

Prickles, on the other hand, develop from the superficial tissue of the stem, which is usually the epidermis. Rose (*Rosa* spp.) "thorns" are actually prickles, and because they develop from the epidermis, they can be easily broken off at the base (photo 7). Our raspberries and blackberries (*Rubus* spp.), which are members of the rose family, also have prickles.

A question that arose during the workshop field review was whether the "thorns" of black locust (*Robinia pseudoacacia*) are thorns or prickles. I wasn't sure, but after some research I discovered that they are actually an entirely different structure called a spine. Although some field guides do not distinguish between thorns and spines, spines are technically sharp pointed structures developed from the apex, margins, stipules, or other parts of a leaf. In black locust, the spines are modified stipules (photo 8). The sharp-pointed ends of the leaves of American holly *(Ilex opaca*) are spines. Some plants, certain gooseberries (*Ribes* spp.) for example, have both spines and prickles.

Photo 7. Rose prickles develop from the epidermis and are easily broken off.

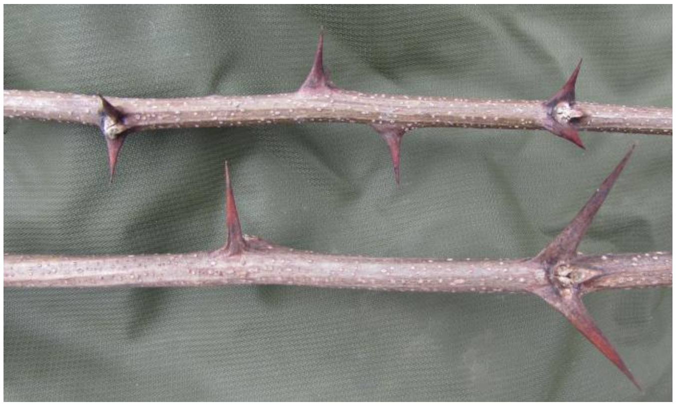

Photo 8. Black locust has spines that are modified stipules.

Overview

Winter plant identification can be fun and interesting, and sometimes it can test your forensic skills. It is also a great time to observe characteristics of plant species and plant communities that may be obscured by leaves during the growing season. If you are interested in expanding your knowledge in this area, stay tuned for next year's workshop.

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Photo 9. Upturned twig ends characterize silver maple.

The Winter Plant Identification group dressed for the field.

NYFA Field Trips and Workshops for 2019

For more detail see: http://www.nyflora.org, Field Trips and Workshops page. Note: We are still in the planning stage for a sedge workshop with Tony Reznicek in June. Please check our website for an update.

May 12: Spring Wildflowers of a Rich Shale Talus | Brooktondale, Tompkins County - Shindagin Hollow State Forest

May 18: Flora of Rich Woods and Rocky Tops | Lonesome Bay State Forest | Hammond, St. Lawrence County. - Lonesome Bay State Forest

June 2: Learn 10 . . . Graminoids (grasses, sedges and rushes) | Allegany Nature Pilgrimage | Cattaraugus County - Allegany State Park

June 8: Flora of Point Gratiot | Dunkirk, Chautauqua County - Point Gratiot State Park

June 8: Flora of Ice Pond | Patterson, Putnam County - Ice Pond Conservation Area

June 15: Botany, Birds, and Butterflies of Mount Loretto | Staten Island, Richmond County - Mount Loretto Unique Area

June 20: Mount Skylight Alpine Plants - Mount Skylight

June 22: Bog and Fen Peatlands Across the Border | Ottawa Valley, Eastern Ontario - Burnt Lands Provincial Park

June 23: Learn 10 . . . Trees | Otsego County – Clark Sports Center Community Room, Cooperstown

June 29: Tongue Mountain Uplands and Wetlands | Lake George, Warren County - Tongue Mountain

July 6: Hudson River Tidal Wetlands and Shores | Esopus, Ulster County - Black Creek Preserve, Esopus

July 10: Valcour Island Wetland Flora | Plattsburgh, Clinton County - Valcour Island

July 13: Chestnuts and Bog Plants of Riddell State Park, Otsego County – Riddell State Park

July 14: Flora of Jaycox Run | Geneseo, Livingston County – Jaycox Run

July 27: Learn 10 . . . Shrubs | The Wild Center | Tupper Lake, Franklin County - The Wild Center

August 3: Whiteface Mountain Flora | Wilmington, Essex County - Whiteface Mountain

August 3: Flora of Harriett Hollister Spencer Park | Springwater, Ontario County - Harriett Hollister Spencer Park

August 9: Aquatic Plants Workshop | Bailey Hortorium, Cornell University | Ithaca, Tompkins County - Cornell University Bailey Hortorium

August 18: Delaware and Hudson Canal Flora | Phillipsport, Sullivan County - Delaware and Hudson Canal Museum

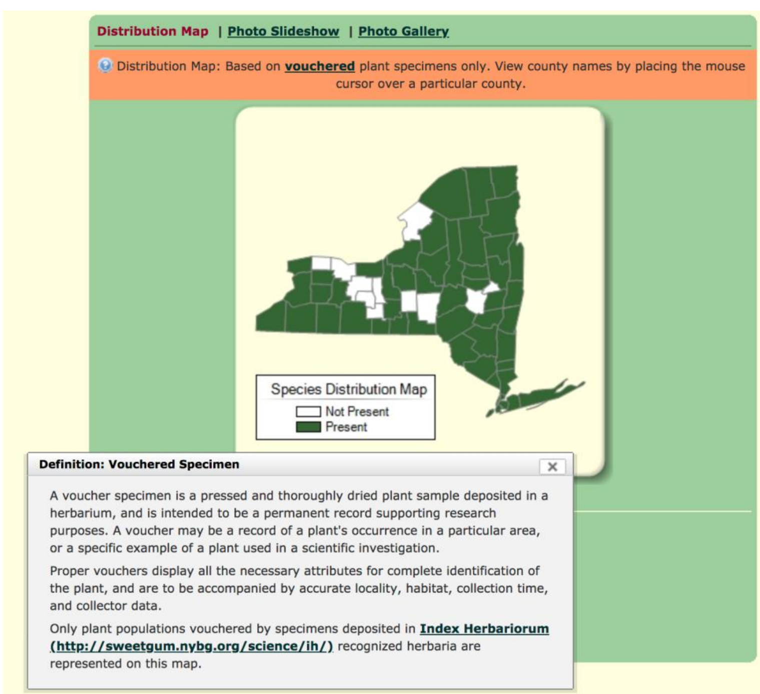
September 13: Learn 10 . . . Graminoids (grasses, sedges and rushes) | Woodlawn Preserve | Schenectady, Schenectady County - Woodlawn Preserve

September 22: Smartweed Workshop | Queens, Queens County - Alley Pond Park

Help Improve the Atlas

a note from Anna Stalter, Associate Curator, L. H. Bailey Hortorium Herbarium (BH).

If you've used the New York Flora Atlas, you may have found yourself pondering the white spaces on some of the distribution maps. Surely, *Acer rubrum* var. *rubrum* occurs in Schoharie county (see map below). Why, then, is the county polygon not green?



The text in the orange bar above the distribution map is revealing: *The distribution map is based on* ***vouchered*** *specimens only*. A click on the term **vouchered** brings up a handy definition, and an important clue: *A voucher specimen is a pressed and thoroughly dried plant sample deposited in a herbarium.*

According to the species description, *Acer rubrum* var. *rubrum* occurs in a wide variety of habitats and soil types, so it's a pretty safe bet that it grows somewhere in Schoharie county. We can conclude then, that either NO specimen of *Acer rubrum* var. *rubrum* has ever been collected in that county OR that records of those collections in Schoharie county have not yet been added to the Atlas.

NYFA volunteers continue to add data to the Atlas so that the maps will more fully represent the county level distribution of the state's flora. The Atlas committee is reaching out to herbaria in New York and beyond to access existing records. For common species like red maple, this will likely "fill in the blanks". But for less common species, the lack of data may indeed be an indication that no one has yet collected and deposited a voucher specimen. This task falls to the botanist, amateur and professional alike. If you'd like to help document species occurrence in your county, look over your county's records in the Atlas to determine where gaps exist. Where vouchers are lacking for common species, make some of your own! There are many excellent online resources describing best practices for collecting and preparing specimens.

So, your voucher is pressed. ***Do you know where your herbarium is?***

To deposit your collection in a nearby herbarium, you can search **Index Herbariorum** (IH) ((http://sweetgum.nybg.org/science/ih/) for names and contact info of herbarium staff. Many herbaria accept collections readily, but should be contacted in advance, as they may have specific guidelines for specimen or label preparation. The largest are the most likely to accept specimens; New York Botanic Garden (NY) and Bailey Hortorium (BH) are highly recommended (☺).

According to IH, there are 34 herbaria in New York State. Twenty-two of these are active collections of vascular plant specimens (some herbaria are devoted exclusively to fungi), collectively housing over 10 million specimens. The largest of these is NY, but large collections also exist in Ithaca at Cornell (BH), in Albany at the New York State Museum (NYS), and in Buffalo at the Buffalo Museum of Science (BUF). Scrolling down the *Acer rubrum* var. *rubrum* page, a quick glance through the **Source** list attests to the presence of vouchers at these larger herbaria. Several other college and university affiliated collections are located throughout the state, some of which are newly active or recently becoming more so due to the efforts of enthusiastic new faculty at these institutions. We hope to feature these collections and their curators in upcoming issues of our newsletter.

Herbarium collections play a vital role in documenting plant species occurrence, but ultimately rely on contributions from a knowledgeable and informed public. Spring is coming! Get out there and collect some voucher specimens!

The following call for action from David Werier was included in the last issue of the newsletter, and bears repeating here:

"We are looking for volunteers to help supply the Atlas with specimen data. These additional data will help make the county distribution information in the Atlas more complete. Those interested can work on counties or taxonomic groups (families, genera, or species). Objectives include making the county distribution information more accurate and providing information on what year(s) a species was found in a county. These objectives can be accomplished by either finding specimens of interest already in herbaria or making new collections and depositing them in herbaria. And thanks for your help!"

Voucher of *Acer rubrum* var. *rubrum* collected in Chemung Co., and deposited at the LH Bailey Herbarium.

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