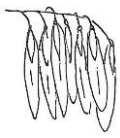
bank, waiting to be examined and have its genetic secrets unlocked.

This year, ash seed production was scarce and spotty. Instead of sitting idle, we set out to collect some of the species common to ash dominant forests. Presumably, once EAB decimates our ash forests here in New York, we can expect understory species to suffer too, particularly in areas swarming with other invasives like Japanese barberry and stiltgrass. We taught identification of 10 different native plants to our volunteer collectors and took in seeds from *Mimulus ringens*, *Schizachyrium scoparium*, *Rhus copallinum*, and others. These collections will live in Colorado at the National Seeds of Success seed bank. This program is part of a larger plan to develop a network of seed collectors: people who care about our native plants and want to do their part to help conserve them. We will provide all the training and information necessary to take part, so if you're interested, please reach out! Just as our flora provides the backbone of the landscapes and ecosystems we enjoy here in New York state, so we hope our volunteers will do the same for our programs, and provide the strength in numbers and resourcefulness we need to really make a difference. For more information contact mmarquand@marsb.org



Botanizing in New York: Bittersweet Findings

by Scott Ward, SUNY Brockport

Hello to fellow botanists and NYFA members! I've written a quick summary of my research interests and how NYFA's research award has helped me through my endeavor. In addition, I have added the observations and pictures I've collected so far in the hope that they may help some of you who struggle from time to time with distinguishing American bittersweet from Oriental bittersweet (especially without the tell-all fruit).

For my first field season, I primarily used the research award provided to me by NYFA for traveling to my various research sites; from Akron and Basom in Genesee County to the Finger Lakes National Forest and additional Ithaca-based sites in Schuyler and Tompkins County. So far, I have analyzed four communities that support American bittersweet populations, and hope to document plant communities at four more sites next summer. With this information, I am hoping to determine a disturbance threshold for the species, and compare it with sites inundated with Oriental bittersweet.

American bittersweet (*Celastrus scandens*) has a NYS CoC (Coefficient of Conservatism) rating of 6 (see Rich Ring's article in the Spring 2016 newsletter for an explanation on CoC values). This means the species generally has a narrow range of ecological tolerances and persists in stable communities. In part of my analyses so far: some of the sites register a 4 or less when accounting for all other species present. This provides interesting initial findings, showing that this state-rare species can actually withstand a moderate level of disturbance (if we associate low rated species and exotics with a level of disturbance). This may not be surprising to some that have encountered the species across numerous sites, given its seeming predilection for mildly disturbed hedgerows and thickets. Hopefully next year's data will help to shed more light on this year's findings.

Another aspect of my research deals with the closely related Oriental bittersweet (*Celastrus orbiculatus*). NYFA research funds aided my purchase of the tree coring equipment that will help me to answer questions regarding the tree-girdling nature of *Celastrus orbiculatus*. I hope to collect cores from trees across known restoration sites in which the invasive vines have been cut or removed in past years. From these cores, I want to determine if tree growth rebounds after the girdling pressure of *C. orbiculatus* has been released. Additionally, I have taken transpiration and photosynthesis measurements on saplings infested with *C. orbiculatus* this year and will use my leftover funds to collect leaf samples from canopy-dominant trees next summer. This will include either ascending the

trees with harness equipment, or clipping samples using pole pruners and ladders. Although from casual observations many botanists can see that trees have been pulled down and in some cases killed by Oriental bittersweet, it is still important to quantitatively measure specific parameters of tree health in order to understand the specific mechanisms of this species' invasion. Furthermore, data from this year may show if the combination of drought conditions and girdling by vines has caused synergistic stresses to infested forest trees.

Both aspects of my research this summer have involved the close and careful consideration of morphological characteristics that help to separate the two bittersweet species in the field, as many of my sites had them co-occurring. Below are descriptions that have helped me to distinguish the congeners from each other, as well as corresponding pictures I've gathered this research season.

Flowers/Fruit:

This is perhaps the easiest method to tell the species apart. *Celastrus scandens* has white-colored flowers borne in terminal panicles whereas *Celastrus orbiculatus* has green flowers borne in axillary cymes. If you are trying to determine if the species you are looking at is native or not, always look closely throughout all vine individuals for the presence of terminal fruit clusters (or stalks, if fruit are no longer persisting on the stem).

Pictures 1 and 2. Dull green flowers of *C. orbiculatus* (left); close up of white-colored flowers of *C. scandens* (right). Both species are primarily dioecious.

Pictures 3-6: Flowers (top left) and fruit (bottom left) of *Celastrus scandens*, note the terminal clusters of fruit. The pictures on the right show the contrasting fruit arrangement between *C. scandens* (top right) and *C. orbiculatus* (bottom right). Fruits on *C. scandens* consist of darker orange capsules surrounding fleshy red arils with 1 seed per aril. *C. orbiculatus* has more than one seed per aril.

Leaves:

When fruit are not present on vines, leaves become the most useful way to distinguish between congeners (see Pictures 7-10). Be certain to look for mature or hardened leaves, as newly produced leaves of both can often look quite similar. Mature leaves on *C. scandens* typically have slightly involute, more elliptic leaves with mildly serrate to crenulate margins. *C. orbiculatus* has sub-orbiculate to orbiculate-shaped leaves with more distinctly crenulate or even crenate margins. Leaf coloration can be slightly diagnostic as well, as *C. scandens* generally has a more blue-green to dark-green color while *C. orbiculatus* seems often to have bright-green leaves, especially in moderate to full sun. Also, the leaves on our native bittersweet tend to feel a bit thicker. When looking at mature leaves, look for acuminate points on *C. scandens*, as these leaf tips can often be significantly longer than *C. orbiculatus* (see Leicht-Young et al., 2007) for measurement information and a more formal key). Something else I have observed is that the terminal shoots of *C. scandens* often seem to grow in a circular form or "tangle" - growing in on itself (Fig. 11). While care must be taken to distinguish these species when only vegetative characteristics are present, it seems that if clearly acuminate tips and more elliptic leaves are present, then you may be looking at *C. scandens*. Both species produce bright yellow foliage prior to complete senescence, so be on the lookout during the fall season.

Pictures 7-10: Mature leaves of *C. scandens* (top left), note slightly involute curvature and long acuminate point; smaller leaf of *C. orbiculatus* (top right), note that even on immature leaf the apex is a bit shorter and margins are more crenulate; immature leaves and shoot of *C. scandens* (bottom left), often the acuminate point is more apparent than in *C. orbiculatus*; immature leaves of *C. orbiculatus* (bottom right), note similar appearance to immature *C. scandens*, hence why mature leaves are more definitive in telling the two apart.

Picture 11. Don't get "tangled up" trying to tell your bittersweets apart. Terminal shoots of *C. scandens* can often be seen twining in on themselves (also note long, slender leaf-apex).

Stems/bark:

Generally speaking, the younger stems of *C. scandens* have a light grey (nearly glaucous) and sometimes reddish-brown coloration. The stems of young woody seedlings from *C. orbiculatus* tend to have a more brownish-orange coloration and often have multiple stems arising laterally from the main stem. Also, fresh stems on *C. orbiculatus* usually appear bright green. Both species can have prickly buds later in the growing season. As for bark on *larger* vines, *C. orbiculatus* usually has a pale grey, "flaky" nature, growing tight to its host and girdling close to the ground while *C. scandens* tends to keep the reddish-brown coloration (Pictures 12-13) and smooth texture it had when smaller, and it often grows more free from its host. Note: larger, greyer vines are likely to be *C. orbiculatus*; however, *C. scandens* can also reach substantial stem widths and appear slightly grey.

Pictures 12-13: Bark from one of the larger individuals of *C. scandens* seen at Finger Lakes National Forest. It is not uncommon to see smooth bark on larger individuals.

Growth form and girdling:

While both species, by nature, are stem-girdling vines, *C. orbiculatus* almost always causes more damage to its tree hosts through its aggressive strangulation on the lower stems and trunks. I have witnessed moderate damage on tree hosts caused by small to medium sized stems of *C. scandens*, but they are not nearly as detrimental as its oriental congener. Looking up into the canopy of a tree infested with *C.*

scandens- the native vine seems to appear more "clumpy" in nature, often finding a particular portion of the canopy to grow and spread in. This contrasts with, in some ways, *C. orbiculatus*, which generally shows a more uniform twining and smothering nature once in canopies. I have yet to see any native bittersweet reach such a substantial size as one I saw at Mendon Ponds County Park in Honeoye Falls, NY. This stem from *C. orbiculatus* was approximately 13 cm in diameter (see Picture 14; note the quarter in the picture for size comparison). Many lateral brownish-orange stems can often be seen protruding from the main stem of *C. orbiculatus*, much like those on poison ivy. Lastly, I have never personally witnessed older, wider stems of *C. scandens* girdling its host close to the ground, while *C. orbiculatus* seems to almost always begin to girdle its host starting at a lower height. This can happen even when stems are quite small (note Pictures 15-16). While there are exceptions to how these infestations twine from the ground, it is something I noticed throughout the summer, and felt it was appropriate to note.

Picture 14. Woody cross section of *C. orbiculatus* taken from Mendon Ponds County Park. Note the quarter for size comparison. This vine had a diameter of 13 cm, individuals with a diameter of 18 cm have been recorded.

Pictures 15-16: (Left): a cut and treated vine of *C. orbiculatus* on *Acer saccharum* about 10-18 cm diameter depending on where you measure. Will this tree ever fully recover now that the vine has been cut? (Right): A smaller vine of *C. orbiculatus* on a *Prunus serotina* sapling (note the much lighter grey coloration of the vine compared to the typical reddish-brown color of *C. scandens*).

Separating these species using morphological characteristics can be tricky unless I use all available parts of the plant. The hierarchy of identification for me goes: fruit/flower arrangement, mature leaf width and apex length, stem size and coloration, and infestation size and form on host. I know this article was in some ways excessive, but isn't it fascinating how congeneric plant species can appear so vastly similar in certain situations, yet have the potential to cause such vastly different ecological consequences?

I hope these descriptions and pictures have helped some of you, and maybe further solidified many of the characteristics that more experienced botanists were always aware of but never put down into layman's terms. Collection of *C. scandens* vouchers should be limited considering the species' continued rarity in our state; however, I encourage botanists to collect and catalogue vouchers of *C. orbiculatus* so that we can create a solid foundation in understanding where this species is and isn't growing (especially for Biota of North America Program (BONAP) records). Looking ahead, these vouchers may help us to further understand the fundamentals of both species invasions, and congeneric co-occurrence amidst our state's diverse floral assemblages.

If you have any locations or sightings of *C. scandens* in the Western and Finger Lakes portion of New York, please contact me at sward5@u.brockport.edu. I would like to thank NYFA for their research award; botanists James Battaglia, David Werier, and Marybeth Deller for their assistance in helping me find various populations of *C. scandens* throughout the state, and Anne Johnson for her assistance in plant identification. And lastly, I would like to thank my advisor, Dr. Kathryn Amatangelo here at SUNY Brockport, for guiding me through the process of ecological research.

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NYFA Trip: Mill Brook First Growth Forest and Mill Brook Fen, 7/9/16

by Dan Spada

A weather forecast for scattered showers and thunderstorms did not deter an intrepid group of 16 from trekking a short distance in from Mill Brook Road south of Arkville, NY. Dr. Michael Kudish led the trip and provided an interesting narration on the forest history of the site. This small area on the northerly slope of Balsam Lake Mtn. was acquired by NYS in the early 1900's and is part of the Forest Preserve. Indications are that this site was never logged and would be considered "first growth" forest, that is, forest that has never had human disturbance such as logging, burning, barking, etc. This piece of land happens to be located just beyond the limit to which tanbark mills hauled bark. In addition, the area was colonized in the mid- to late 1800's and so had less chance of human disturbance from logging or pasture clearing before state acquisition. There were three distinct vegetational communities that we explored. Immediately upslope of and adjacent to the Mill Brook Road is an old growth eastern hemlock community mainly occupying the nearly-flat top of a moraine; only a small portion of the grove descends down the short, relatively steep slope to the road. On the far side of the slope is a depressional wetland that is perhaps two acres in size. Beyond the wetland the slope rises again and continues steeply all the way to the summit of Balsam Lake Mtn. This slope contains a first growth northern hardwood forest. We noted many large yellow birch (*Betula alleghaniensis*) (43" dbh), sugar maple (*Acer saccharum*) (36" dbh), red maple (*A. rubrum*) (27" dbh), black cherry (*Prunus serotina*) (36" dbh), white ash (*Fraxinus americana*) (30" dbh), and eastern hemlock (*Tsuga canadensis*) (45" dbh) as well as typical ground cover species found under