Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

WILD HERITAGE NEWS

Summer 2019

Big Hopes for Tiny Butterflies

by

Betsy Leppo

Inside This Issue

Photo Banner:
Appalachian grizzled skipper (*Pyrgus wyandot*)

John Peplinski

In the spring of 2019, the Pennsylvania Natural Heritage Program (PNHP) began conducting surveys for frosted elfin (*Callophrys irus*) and Appalachian grizzled skipper (*Pyrgus wyandot*) butterflies at sites throughout Pennsylvania, supported by grants from the Pennsylvania Department of Agriculture and the North Atlantic Landscape Conservation Cooperative. The frosted elfin and Appalachian grizzled skipper are globally rare butterflies, identified as Species of Greatest Conservation Need in the 2015 Pennsylvania Wildlife Action Plan (PGC-PFBC 2015), and Regional Species of Greatest Conservation Need (RSGCN) according to the Northeast Association of Fish and Wildlife Agencies (2017).

Additionally, the U.S. Fish and Wildlife Service is assessing the conservation status of frosted elfin to determine if federal protection under the Endangered Species Act may be warranted. We are investigating the distribution and extent of the butterflies and their caterpillar food plants in Pennsylvania, evaluating the condition of their habitats, and identifying potential population stressors such as habitat succession, development, invasive plants, deer herbivory, and incompatible vegetation management. This survey information will aid in evaluating the current status of these butterflies in Pennsylvania, and help us protect and manage their remaining populations.

John Peplinski

Appalachian grizzled skipper (*Pyrgus wyandot*)

The Appalachian grizzled skipper is a small dark butterfly with white spots that form a checkerboard pattern on the wings. This species (or some argue, subspecies) is known from New York south to North Carolina, and west to Michigan, Ohio, and Kentucky.

Betsy Leppo

Dwarf cinquefoil (*Potentilla canadensis*)

In Pennsylvania, the caterpillars feed on dwarf cinquefoil (*Potentilla canadensis*), a low-growing trailing plant with five-lobed palmate leaves and flowers with five bright yellow petals. Dwarf cinquefoil is much more wide-spread and common than the grizzled skipper that feeds on it.

The frosted elfin is a small brownish-gray butterfly with tiny tails and silvery scales on the hindwings that gives it a frosted appearance. Frosted elfin populations are also restricted to the eastern United States, but have a broader range that extends along the coast from New Hampshire south to Florida, and along the western edge from Alabama to Wisconsin. In Pennsylvania, the caterpillars feed on wild indigo (*Baptisia tinctoria*), a tall bushy plant in the legume family with irregular-shaped yellow flowers in mid-summer. In other parts of the range, the frosted elfin also uses wild lupine (*Lupinus perennis*).

John Peplinski

Adult female frosted elfin ovipositing on wild indigo leaves.

There are many similarities between these two butterflies. Adults appear for a brief time in the spring, with one flight per year. Grizzled skippers start their flight in April and frosted elfins in May. The exact timing of their flight depends on local climate and weather conditions over the winter and spring. The caterpillars are specialists that feed on a single kind of plant, and the adults nectar on a variety of spring wildflowers.

Ben Coulter

Frosted elfin caterpillar feeding on a wild indigo flower bud.

Decades ago there were dozens of active (extant) sites for these butterflies around the state, but they gradually disappeared from those places. When we began these surveys there was only one active colony known in the state for each butterfly. The status of the butterflies at some historical sites is unknown because no one has looked for them in recent years. Both butterflies were historically associated with natural prairie and barrens habitats, though their particular habitat needs differed and they did not typically occur together. In recent decades both species have become more dependent upon right-of-ways and other manmade early successional habitats.

Betsy Leppo

Wild indigo can be found growing in right-of-ways, especially those that are mowed late enough in the season to allow the wild indigo to set seed.

Betsy Leppo

Grizzled skippers begin flying in early spring when the first spring wildflowers are blooming, and before most vegetation has flushed new green growth.

We started looking for grizzled skippers during the first golden, warm days of April. We revisited sites with records twenty or thirty years old on shale barrens and right-of-ways in south central Pennsylvania. We did not find grizzled skippers during visits to ten sites, including the most recently active colony which was seen reliably in the decade after its discovery in 2000, but has not been seen again since 2012. We did encounter other butterflies that the grizzled skipper often flies with, including the eastern pine elfin (*Callophrys niphon*) and falcate orangetip (*Anthocharis midea*). Most sites still appeared to have suitable habitat supporting dwarf cinquefoil and a variety of early blooming flowers for the adults such as wild strawberry, pussytoes, violets, fringed polygala, and spring beauty.

John Peplinski

Falcate orangetip (*Anthocharis midea*)

We started frosted elfin surveys a few weeks later at historical locations in barrens and right-of-ways in southeastern, northeastern, and central Pennsylvania. Frosted elfin adults will nectar on a variety of spring blooming plants including huckleberries (*Gaylussacia* spp.), blackberries (*Rubus* sp.), blueberries (*Vaccinium* spp.), and violets (*Viola* spp.). Like the grizzled skipper, the frosted elfin was formerly known from dozens of locales in the state, but in the past five decades dwindled to just one active site located in central Pennsylvania. We made forty visits to ten sites in 2019 but did not see frosted elfins at any except the known active site.

Ben Coulter

Eastern pine elfin (*Callophrys niphon*)

It is difficult to determine if a species has truly disappeared from a place when the habitat is still present. Spring butterflies can be hard to find when their populations are very small and localized. The brief flight period may shift several weeks earlier or later based on climate conditions over the winter and spring months. Finding a few sunny, warm days in spring to conduct surveys can be its own challenge. But we did not have to rely on our efforts alone, thanks to local partners and volunteers who monitored certain sites to track development of the host plant and search for butterflies.

A chance meeting with two local naturalists proved especially serendipitous. John and Becky Peplinski are two youthful retirees who have been exploring the forests and wetlands of central Pennsylvania for many years. We ran into them during a survey of the last known grizzled skipper site and learned that they had visited the site 34 times between 2014 and 2018! Unfortunately they had not encountered this butterfly in Pennsylvania. Combining their surveys with additional reports from other collaborators, we have now

assembled a substantial body of evidence that the grizzled skipper has disappeared from this site. This sobering realization was buoyed by news from John and Becky that they had discovered a new site for frosted elfins in the state. Thanks to their efforts, we were able to show the site to the property managers and discuss ways to manage the vegetation of the site while minimizing negative impacts to the butterfly and its wild indigo food plant.

As for all the other historical sites we visited, the grizzled skippers and frosted elfins appear to be gone. Sometimes the reason is clear, for example, the habitat was altered so much that the caterpillar food plant no longer exists. Habitat loss can be sudden and dramatic, such as conversion to development or agriculture, or gradual, such as succession from grassland to forest. Over time many habitats for these butterflies have disappeared as forests reclaim former openings. These changes are reversible, but it takes a lot of effort to restore and maintain early successional habitats.

Betsy Leppo

Grizzled skipper and frosted elfins on right-of-ways are vulnerable to management activities that remove nectar and caterpillar food plants when adults and caterpillars are actively using them. However, habitats in natural openings are often lost over time due to benign neglect which allows them to become overgrown with woody plants.

Many colonies persisted for a while on right-of-ways because routine maintenance is required to suppress the woody vegetation. Unlike a farm field, golf course, or residential lawn, a right-of-way is more likely to simulate the natural habitats these butterflies need by encouraging the growth of native, low growing plants mixed with patches of bare soil. However, the same management that creates and maintains habitat for the butterflies can also harm small and isolated populations of butterflies. The timing and application of management tools such as mowing, broadcast of herbicide, and prescribed fire can be devastating if not considered in light of the life cycle of the butterfly and its food plant. Right-of-ways are also prone to invasive plants, which can overtake the native plants needed by the butterflies. Gypsy moth spray is another potent threat, as it typically takes place at the same time that young grizzled skipper and frosted elfin caterpillars are feeding. They are particularly exposed because they feed on plants in open habitats and are vulnerable to the effects of the spray.

Ben Coulter

Many butterflies that belong to the same family as the frosted elfin (Lycaenidae) are tended by ants, such as this Formica species. Ants may be a critical component to survivorship of frosted elfin caterpillars by protecting them from attacks by predators and parasites. Caterpillars secrete 'honeydew' as a reward. Research is needed to identify the species of ants that tend frosted elfin caterpillars in Pennsylvania and whether there are habitat characteristics that favor the ants. This relationship is another piece of the puzzle when trying to understand the survival needs of these butterflies.

There are many other threats that are less understood but may play a role in the decline of these species. The habitat may change in subtle ways we can't easily detect visually. We lack data on important habitat measures such as how much host plant is needed to sustain a population of butterflies. Changes in climate are bringing new patterns of temperature and rainfall, which are important factors that affect the health and reproductive success of insects and the plants they need. Climatic conditions affect outbreaks of diseases and parasites that can depress or wipe out local populations. Climate change also alters physical conditions of a habitat. Grizzled skippers and frosted elfins spend much of the year as pupae, which cannot relocate if they get too hot or too wet. As population numbers drop, minor fluctuations could cause colonies to completely collapse. Low numbers and fragmentation of populations greatly increase this threat. These rare butterflies no longer have the safety net that is provided when many populations exist near each other. In a healthy population network (or metapopulation), multiple colonies are located close enough to each other that females can easily colonize new or vacant

habitats. When older colonies are lost to succession or other causes, these newer sites can carry the regional population into the future.

This project provides a valuable opportunity for dedicated conservation efforts for these two globally rare butterflies that are in decline rangewide. Remaining populations will benefit from careful monitoring and management. Habitats may be expanded and enhanced by planting additional food plants, selectively removing trees to increase vigor of food plants, controlling invasive species, and fencing food plants where there is evidence of significant deer browse. Prescribed fire and ground scarification can be used to create new habitats near occupied areas. Working with land owners and managers to implement conservation actions is an effective way to protect species and the environment. Voluntary interventions can prevent the need for more costly regulatory actions to bring species back from the brink of extinction.

We wish to acknowledge the outstanding contributions of volunteers to this project, including Terry Christopher, Jay Drasher, Karl Gardner, Christopher Hoess, John and Becky Peplinski, Matt and Vicky Sanderson, and Mike Slater. We also thank the managers of the PGC State Game Lands, DCNR State Forests and State Parks, and utility right-of-ways who are working with us to adapt management activities to protect remaining locations of these butterflies.

About the Author

Betsy Leppo has worked with the Pennsylvania Natural Heritage Program for over 20 years and since 2005 as an Invertebrate Zoologist. Betsy conducts surveys for terrestrial and aquatic invertebrates, maintains in-house specimen collections and databases, and develops conservation recommendations for species and habitats.

Have you Seen These Plants?

The Pennsylvania Natural Heritage Program is seeking information on locations of wild indigo and lupine in Pennsylvania. If you know of locations that contain dozens of either plant, please send a map or coordinates to bleppo@paconserve.org.

Betsy Leppo

Wild indigo (*Baptisia tinctoria*) has leaves consisting of three leaflets like many clovers, and develops long loose flower clusters that bloom over several weeks in mid-summer. Wild indigo is in the pea family, and the yellow flowers attract a variety of pollinating insects.

Christopher Tracey

Wild lupine (*Lupinus* perennis) has blue pea-like flowers and leaflets radiating from the center.

Notes from the Field

High Conservation Value Forest Bat Surveys

Joe Wisgo

Given the recent and massive declines in hibernating bats due to White-Nose Syndrome (WNS), PNHP has been working with agency partners to document resilient survivors throughout the state. Part of this survey effort is focused on tracts of DCNR Bureau of Forestry Lands selected as High Conservation Value Forest (HCVF). These tracts of land are designated as such because they contain globally, regionally, or nationally significant concentrations of biodiversity and/or rare, threatened, or endangered species.

Recently while conducting bat surveys on an HCVF forest tract in Pike County, PNHP zoologists captured both a federally threatened northern long-eared bat (*Myotis septentrionalis*) and a state endangered little brown bat (*Myotis lucifugus*). Northern long-eared bats have never been a common species on Pennsylvania's landscape; however before the introduction of WNS, little brown bats were extremely common. Unfortunately WNS has caused a near 99% loss to Pennsylvania's little brown bat population, and although both of these captures are of notable importance, the little brown capture was very significant given the dramatic decline of the species over the past decade.

Charlie Eichelberger

The northern long-eared bat, a federally threatened species, is a denizen of Pennsylvania's expansive forests.

WNS was first documented in Pennsylvania during the winter of 2008-2009 and is caused by the cold-loving fungus *Pseudogymnoascus destructans* (referred to as Pd). Pd produces lesions on the patagia (wing membranes) and frequent bouts of awakening during hibernation.

Charlie Eichelberger

Once the most common bat in the state, the little brown bat struggles to persist due to WNS

Since stored energy is burned in excess during these aroused states, hibernating bats deplete their fat stores and essentially starve to death during winter months when insects are unavailable. Before WNS, little brown bats could be found hibernating in congregations numbering into the thousands. Most hibernacula now only contain numbers in the single digits and others are no longer even occupied.

While it's apparent that the damage caused by WNS isn't likely to be reversed anytime soon, it is encouraging to see some bats are showing signs of resiliency to the disease. PNHP along with agency partners will continue surveillance for bat species of concern, and will identify and attempt to conserve important habitats.

Searching for Three Noxious Weeds in Pennsylvania

Amy Jewitt

The Pennsylvania iMapInvasives program recently hosted a special event called the "Three-Part Species Search Challenge." During the month of July, registered users of iMapInvasives and the general public were invited to search for three invasive, noxious weed species: water chestnut (*Trapa natans*), hydrilla (*Hydrilla verticillata*), and wavyleaf basketgrass (*Oplismenus hirtellus*). Each of these invasive plants is a high priority to find and document in Pennsylvania, not only because of their status as noxious weeds, but because of the environmental harm they exhibit in areas where their

populations outcompete native species. The ability of the two aquatic species (water chestnut and hydrilla) to hinder recreational activities such as boating, fishing, and swimming makes finding and reporting them especially important for natural resource professionals who manage places such as state parks which serve as recreational hotspots in Pennsylvania.

Nick Macelko

Water chestnut

The first species, water chestnut, is an aquatic invasive plant native to Europe, Asia, and Africa. It was originally brought to the United States by water gardeners in the 1800s, and over time, was quickly able to establish and spread. Water chestnut can grow in any freshwater setting, but prefers nutrient rich waters less than 16 feet deep including ponds, lakes, slow moving streams, and rivers. According to data from iMapInvasives and the PA Flora Project, current impacted areas in Pennsylvania include nine counties, most of which are located in the eastern part of the state, but a few places in western Pennsylvania have also been identified. Recognizing water chestnut is fairly simple to do, even for those who don't consider themselves botanical experts, because no other species are known to resemble it.

Penn State Master Watershed Stewards

Hydrilla

Hydrilla is a problematic aquatic invader thought to be native to Asia, Africa, and Australia, although its origin is not certain. It has been documented in 26 counties in Pennsylvania (according to data from iMapInvasives) and is known to cause environmental damage to impacted waterbodies. As mats of hydrilla die and decay, bacteria deplete oxygen from the waterbody, negatively affecting fish and other aquatic organisms. Additionally, large infestations of hydrilla prevent sunlight from reaching other plant species growing beneath it, thus outcompeting beneficial native species that support aquatic life and the waterbody's overall ecosystem. Hydrilla does have a few look-alike species that closely resemble it, including the exotic invasive Brazilian elodea (*Egeria densa*) as well as the native North American elodea (*Elodea canadensis*). To tell these three species apart, a close look at the number of leaf whorls, the presence or absence of tubers, and whether the leaf margins are smooth or serrated will help both professional and amateur botanists alike make an accurate species identification.

Andrew Rohrbaugh, DCNR

Wavyleaf basketgrass

The final species is a terrestrial plant known as wavyleaf basketgrass (WLBG). This invader is relatively new to Pennsylvania with the first documented discovery recorded in 2016 in the iMapInvasives database. The only known locations currently in Pennsylvania reside in York County in Gifford Pinchot and Codorus state parks. WLBG is a shade tolerant species, and as such, can completely cover a forest floor. In doing so, it competes against native forest species and hinders natural regeneration of young tree seedlings. With a decrease in plant diversity where WLBG infestations exist, native plants high in nutritional value are in limited quantity and thus various wildlife species are negatively impacted. WLBG's similarity in appearance to Japanese stiltgrass (*Microstegium vimineum*) and small carpetgrass (*Arthraxon hispidus*) can make identification tricky, but

Wavyleaf basketgrass look-alikes. Left to right in photo above, Japanese stiltgrass , wavyleaf basketgrass, and small carpetgrass.

not impossible. To tell these three species apart, look for pleated ripples across the width of WLBG's leaves, as well as an elongated sharp tip. The leaves of small carpetgrass grass typically appear ruffled or wavy, but not pleated, and its leaves are much smaller in size compared to WLBG. Japanese stiltgrass leaves contain a silvery row of hairs running down the midvein, a very distinct characteristic of this species, and its leaf ends in a blunt gradual point compared to the sharp elongated tip of WLBG.

Check future issues of Wild Heritage News for results of the challenge or email Amy Jewitt at ajewitt@paconserve.org for a copy of the report.

Stewardship Effort Taken to Protect Globally Rare Plant Species

Rocky Gleason

First of all, let me admit to you one thing, I am an invasive species, and so are you. At least we humans fit all the criteria for an invasive species. So it is with this knowledge in mind that I cast aspersions at other species.

A recent revisit to a long-appreciated creek-side limestone outcrop revealed a sad sight. Like a critical health diagnosis, the grim discovery of a particularly aggressive invasive plant species left our inventory crew shaking our heads in despair.

There are many invasive species of plants at the site, most of them the result of accidental introductions centuries ago, perhaps from ship ballast or as hay brought in as animal feed to the new continent. Over time, they have spread far and wide, often displacing native species and forever changing the original habitat conditions. Invasive plant species are like litter that has the ability to multiply on its own. As if the casually tossed candy wrapper could increase in size and number, replicating until the single wrapper becomes a small roadside drift of litter, which in time becomes a town dump, and eventually a landfill covering acres.

The most exasperating invasive species are those that are the result of intentional planting, escapes from landscape settings. Landscape plants that stay where they are planted, and don't spread by seed or vegetatively, have little impact on their surroundings. Invasive species are those plants that expand beyond their intended setting and spread into adjacent habitats. These plants present the greatest risk to the regional ecology. Winged euonymus, or burning-bush, (*Euonymus alatus*), is one of these, an introduced plant used frequently in the landscape trade that has begun to colonize large swaths of natural habitat. Its thicket-forming character casts dense shade and crowds out most other native species.

Winged euonymus or burning bush can form a dense thicket, casting deep shade over the habitat.

Many people experience what could be called "plant blindness" where the natural world is seen as a general green blur, where greenery represents the rich exuberance of the flourishing natural world. But to a trained naturalist, the various plants are distinct and are categorized into groupings, such as Family, Genus, Species, but also native and non-native. A walk in the woods to someone with "plant blindness" could seem entirely refreshing, reveling in the vast emerald swaths of plant life. While the same walk to a trained naturalist could be (in the words of PNHP Botanist John Kunsman) like walking through a museum of precious artifacts, many of which have been defaced by vandalism and graffiti, paintings torn, sculptures smashed, and the architecturally beautiful building itself in ruins. Yes, ignorance can be bliss.

Charlie Eichelberger

A view of some of the winged euonymus during stewardship activities

Charlie Eichelberger

The same view as above after stewardship action.

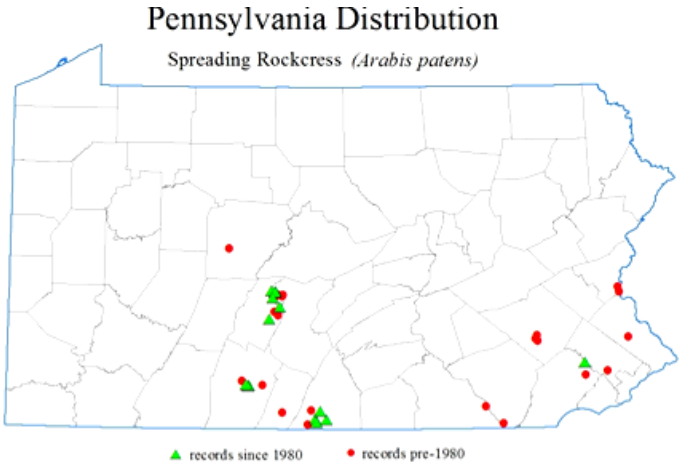
As we entered the newly discovered thicket of winged euonymus, our initial instinct was to begin snapping and pulling those on the periphery of the invasion. But we soon realized that we lacked the tools and manpower to adequately address this problem, and planned to come back at a later date. We did return this spring. Though it is not the best time of year to attack a woody shrub, as the roots store a lot of sequestered energy, we chose to cut all the stems of this plant, which covered about a half-acre, and drag them away from the best part of the habitat. Cutting at this time would at least diminish the ability of this plant to set seed for yet another generation of invasion. We left the stumps high, expecting them to re-sprout, and intend to cut again this fall and treat the cut stumps with herbicide. Late summer and early fall is a good time to chemically treat woody shrubs, as the direction of flow is back into the roots, resulting in a greater likelihood that they will not re-sprout.

Stewardship of ecologically important sites has unfortunately become a necessary component of our work. We can't give this level of stewardship everywhere, so we must triage the sites, picking those that would provide the most benefit with the least effort. This limestone bedrock habitat was chosen for this level of intense stewardship because of the important suite of species it supports. The creekside hill is full of interesting spring wildflowers, some of which are uncommon, while others are quite rare.

Our primary target plant species is spreading rockcress (*Arabis patens*). Though not the showiest plant, this species is considered globally vulnerable, at moderate risk of extinction due to its restricted range and relatively few populations. It is also considered imperiled at the state level for the same reasons. The bulk of the global distribution of this plant is centered around south central Pennsylvania, Maryland, and northern Virginia. Pennsylvania has 38 documented populations, but only 14 of those have been seen in the past 40 years.

Rocky Gleason

Spreading rockcress (*Arabis patens*)



In addition to the rockcress, the site is floristically rich, and several other plant species of concern occur here including common jeweled shooting star (*Primula meadia*), green-and-gold (*Chrysogonum virginianum*), vase-vine leather-flower (*Clematis viorna*), and lance-leaved


Rocky Gleason

Jeweled shooting star (*Primula meadia*)

buckthorn (*Rhamnus lanceolata*). Other uncommon plants we found at the site include chinquapin oak (*Quercus muehlenbergii*), fragrant sumac (*Rhus aromatica*), roundleaf groundsel (*Packera obovata*), purple-stem cliffbrake (*Pellaea atropurpurea*), and two sedges (*Carex jamesii* and *Carex oligocarpa*). These are all relatively uncommon species that are typically found on rich limestone bedrock habitats in the region, many of which are unfortunately over-run with invasive species of plants.

Site importance, a willing and interested landowner, accessibility, and the likelihood of success made this site a candidate for continued action, which will be necessary to limit the effect of invasive species of plants on this habitat. Homeowners can help this effort by avoiding planting invasive species in their landscapes. Before planting, check with the Pennsylvania Department of Conservation and Natural Resources Invasive Species List for the plant's potential to invade natural ecosystems: (http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20026634.pdf). If you already have these species in your landscape, replace them with native plants or less harmful introductions.

Spring Invertebrate Highlights

Pete Woods


Pete Woods

The silvery blue (*Glaucopsyche lygdamus*) may be restricted to the southern ridge and valley province, where the host plant grows in small, isolated patches.

This spring, while PNHP biologists were doing surveys for Appalachian grizzled skipper (*Pyrgus wyandot*) in Bedford County, we saw several roadside patches of vetch (*Viccia carolinana*), the host plant of the silvery blue (*Glaucopsyche lygdamus*). We slowed to a crawl as we drove past the vetch and saw a small blue butterfly that proved to be a silvery blue. The most recent previous sighting of this species was also in Bedford County in 2009, but the population of vetch it had used disappeared in subsequent years, so no one was sure where to look for the butterfly.


Pete Woods

Mocha emerald (*Somatochlora linearis*)

We have also been doing insect surveys in overgrown scrub oak barrens in the Buchanan and Tioga state forests to gather baseline data before those barrens are restored by cutting or burning. In addition to finding new records for scrub oak specialists like buck moth (*Hemileuca maia*) and Edwards' hairstreak (*Satyrium edwardsii*), we also found an area used for foraging by the critically imperiled mocha emerald (*Somatochlora linearis*). This dragonfly breeds in small low gradient forest streams, so it was not expected on this dry ridge top far from water. We hope to do additional surveys to find the reproductive habitat for this population.


Pete Woods

The barrens buck moth (*Hemileuca maia*) is a scrub oak specialist. Mature caterpillars like this one leave their host plants to find a place to pupate.

PNHP botanists and Professor Chris Martine of Bucknell University have been visiting populations of alumroot (*Heuchera* spp.) this spring to understand the distribution of two native alumroot species. They also collected bees which were visiting the plants in the hope of finding the alumroot cellophane bee (*Colletes*

Pete Woods

Caterpillars of Edward's hairstreak (*Satryium edwardsii*) eat only scrub oak. Colonies are usually very small and localized, perhaps because in addition to needing scrub oak, they are associated with certain ant species with which they have a symbiotic relationship.

aestivalis), a regionally rare bee that specializes on collecting pollen from only this genus of plants. Although the identity of the bees still needs to be confirmed by an expert, we believe that we have found the alumroot cellophane bee, which would be a state record for Pennsylvania.

Kerry Givens

Last seen in Pennsylvania in 1948, the striped whitelip (*Webbhelix multilineata*) was rediscovered by an amateur naturalist.

The citizen scientists of Pennsylvania have also been making discoveries this spring. Records of 86 rare species have been posted to iNaturalist this spring, with additional records posted on Odonata Central, Butterflies and Moths of North America, and Facebook. We will be evaluating those for possible inclusion in our database. One of those records represents the rediscovery of the striped whitelip (*Webbhelix multilineata*), a snail that had not been seen in Pennsylvania in 71 years. In June, Kerry Givens photographed the snail at Hellam Hill Natural Area in York County. Tim Pearce of the Carnegie Museum confirmed the identity of the snail.

Tracking Swainson's Thrush Habitat Use with Nanotag Technology

David Yeany II

This spring the Pennsylvania Natural Heritage Program (PNHP) initiated a new project focused on better understanding the ecology and migratory movements of breeding Swainson's thrush – one of our state's rarest breeding birds and a Species of Greatest Conservation Need (SGCN). PNHP was part of a Competitive State Wildlife Grant award submitted by the organizations in the Northeast Motus Collaboration, including close partner Powdermill Avian Research Center (PARC) at the Carnegie Museum of Natural History. This group is establishing a network of radio towers that passively detect birds, bats, or large flying insects outfitted with small radio frequency transmitters, known as nanotags.

David Yeany

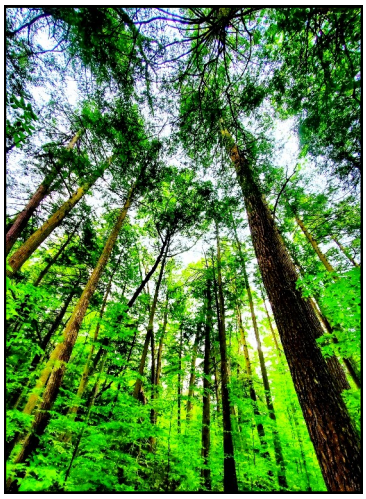
Swainson's thrush (*Catharus ustulatus*)

Ours was one of eight projects included in the grant, all using nanotag technology and the Motus Wildlife Tracking System to study SGCN in the mid-Atlantic and to close major geographic gaps in the Motus network. Nanotags weigh as little as 0.2 grams and emit a unique signal used to identify individual animals and their movements. This new, cost-effective technology enables tracking movements of small animals at a fraction of the cost of GPS tags, and utilizes an ever expanding network of Motus radio towers to discover migration routes and stopover habitat usage for many migratory species, allowing us to begin to fill knowledge gaps for many migratory bird species.

David Yeany

Nanotag transmitter #014 attached via leg loop harness to a Swainson's thrush.

With an extensive breeding range throughout Canada's boreal forest, populations of Swainson's thrush breeding in Pennsylvania are disjunct from other eastern populations in New England and near the southern edge of the species' eastern North American range. Only a small population in high elevations of West Virginia is farther south. In Pennsylvania, Swainson's thrush is found in cool, moist, typically higher elevation hemlock forest, especially those containing older, taller hemlocks. With the eastern hemlock greatly threatened by the hemlock wooly adelgid, we need to better understand how important this tree species is to this bird. The Allegheny National Forest is known for its black cherry and hemlock forests and has been a historic stronghold for the species. During 2015 surveys we documented what is likely the state's largest population in the Tionesta Natural Area, an old growth hemlock/ hemlock northern hardwoods forest with hemlock trees potentially 500 years old. Thrushes from this site along with Hearts Content and East Branch Tionesta Creek would be the focus of this study.



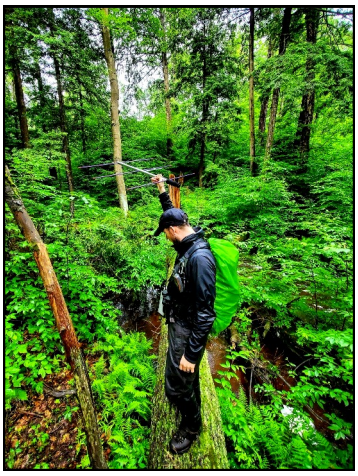
David Yeany

Old growth eastern hemlock (*Tsuga canadensis*) towers above the dense American beech (*Fagus grandifolia*) understory at Tionesta Natural Area.

We used target mist-netting to capture 23 male Swainson's thrushes in the Allegheny National Forest during June and July. With appropriate permits, we banded and color-banded (for identification of unique individuals in the field) all captured birds and deployed nanotag transmitters on 21 birds. PNHP and PARC biologists have been using handheld receivers to track and record high-resolution detection locations, mapping territories held by these Swainson's thrushes. We will use vegetation assessments and drone map imagery to measure habitat characteristics in each bird's home range. We will continue to track these birds on their breeding grounds during late July and August, and as birds disperse and begin to migrate we will look for detections from the five Motus towers in the Allegheny National Forest.

Joel Throckmorton

Luke DeGroote (PARC) and David Yeany (PNHP) work together to activate and attach a nanotag transmitter on a Swainson's Thrush at Tionesta Natural Area.



Joel Throckmorton

PNHP ornithologist David Yeany checks the radio signal from a nanotagged Swainson's thrush during tracking at Tionesta Natural Area

David Yeany

Swainson's thrush color-banded and outfitted with a nanotag transmitter just before release.

Swainson's thrush is also a long-distance migrant, wintering from southern Mexico to northern Argentina. Migration routes are assumed to vary by population, and from fall to spring. Knowing what routes our breeding birds take to their wintering grounds and the location of those wintering grounds will further aide in conservation efforts. We will await detection of our nanotagged Pennsylvania breeding Swainson's thrushes through the Motus network during fall migration and again next spring. This study will allow us to piece together a more complete picture of habitat use through the species' entire annual cycle.

Young Naturalists Study Moths with PNHP

Pete Woods

The Young Naturalist program of the Pittsburgh Parks Conservancy trains a select set of high schoolers about the ecology and management of natural areas. In June PNHP biologist Pete Woods met up with the group at the Carnegie Museum's Powdermill Reserve to teach the Young Naturalists about moths. We set up a sheet with lights to attract moths. It was a warm, humid night with little breeze and a new moon, ideal conditions for mothing. Over 100 species of moth flew in, and the students learned about the identification and ecology of moths, including their roles as pollinators and their importance in the food chain. The students also ran a black light live trap to gather moths which they looked at in the morning.

Pete Woods

Young naturalists at moth light

Pete Woods

Young naturalists taking a closer look at some moths

The day before, the students had studied stream macroinvertebrates, and had seen the larvae and nymphs of crane flies, caddisflies, mayflies, stoneflies, and other insects. The adults of all these insect groups came to the light, giving the students a better understanding of the life cycle of these insects, and of how these species connect to the ecology of the stream and the surrounding forest.

Natural Areas Conference

Jeff Wagner

Western Pennsylvania Conservancy and the Department of Conservation and Natural Resources are hosting the Natural Areas Association conference in Pittsburgh this year on October 8-10. PNHP staff have worked closely with NAA staff, solicited and sorted through proposals, and organized two days of great sessions ranging from climate change impacts on forests to managing urban natural areas. Topics will be of interest to a variety of people and professions, particularly natural resource managers and those engaged in practical, conservation-oriented research. Visit the NAA website for more information, a detailed schedule, and registration information.