Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

WILD HERITAGE NEWS

Summer 2021

Inside This Issue

Photo Banner:
Zoologist Ryan Miller surveys a talus slope in Huntingdon County for Species of Greatest Conservation Need.

Amy Miller

Life on a Boulderfield

by

Jeff Wagner

Travel on the many roads running through the Appalachian Mountains that make up the Ridge and Valley Province of Pennsylvania and you will notice that a number of variously shaped, unvegetated rocky patches run down the mountain slopes. These boulder strewn patches are known by a few names, including boulderfields, scree slopes, rock runs, and talus slopes. Although prominent, they have until recently been given little attention, at least from a biological perspective.

The first time I set foot on a scree slope, I sat down on a large rock and contemplated its origin and tried to explain the pattern of vegetation. I noted that the substrate didn't change very much when transitioning from the open rock to the adjacent matrix of forest. Was this open slope an odd successional stage? A place of more active erosion? The transition from forest to unvegetated rock, even though narrow, showed that under the branches and drip line of trees some vascular plants were establishing. Also, an occasional shrub or tree growing away from the forest edge would feature a little refugia of its own, supporting a few ferns or perennial herbs. Would these rock fields eventually become like the adjacent forests and woodlands? If these areas are transitioning, they are doing so slowly. One area in eastern Pennsylvania, the Hickory Run State Park boulderfield which is a bit different from typical scree slopes of the Ridge and Valley in being relatively flat, is documented as shrinking due to succession. Without the steep downhill movement, perhaps organic material can accumulate more quickly and accommodate early successional plants.

DCR-DNH, Gary P. Fleming

A typical boulderfield in the Virginia portion of the Appalachian Mountains.

It is widely recognized that these scree slopes are periglacial features that formed south of the terminal moraines of the glaciers where permafrost had given way to freeze thaw cycles that began breaking apart the less resistant material underpinning the mountain slopes. Resistant sandstone and quartzite that make up the majority of these slopes, collapsed, broke apart, and progressed downslope at a geologic pace. The conditions that this erosion and movement created was a difficult environment for vegetation to either remain or colonize. Soil that once may have occupied these slopes was lost with increasingly forceful erosion.

Scott Schuette

Lasallia papulose, a large, umbilicate lichen that looks like toad skin, is common on relatively undisturbed acidic rocks, especially cliff faces and boulders.

Scott Schuette

Grimmia laevigata, like other species of *Grimmia*, is a moss adapted to extremely harsh environments of exposed, acidic sandstones and granitic rocks. This is a characteristic species of early successional boulderfields and rocky riparian corridors.

Although they appear barren, these boulderfields do support native plants and animals but are difficult to classify. Even with the multiple names and slightly different concepts, Natural Heritage programs reference NatureServe and the National Vegetation Classification (NVC) to define these rock slopes as communities largely dominated by lichens and bryophytes. Their ability to withstand very dry conditions, grow with little substrate and adhere to the surfaces of rock makes them the quintessential early colonizers - the first level of primary succession. Although limited research has been done, quantitative or otherwise, the non-vascular flora of scree slopes is being described. In 2009, James Lendemer from the New York Botanical Garden, a long-time collaborator with PNHP, along with Harry Edenborn and Richard Harris, characterized the lichen flora of a talus slope in Huntingdon County, adding a number of rare and disjunct species to the Pennsylvania checklist. The Virginia Natural Heritage Program has also conducted extensive qualitative surveys of their boulderfields.

These harsh communities furnish habitat for a number of Pennsylvania's rarer animals. Forested talus provides habitat for snakes, both common and rare, as well as two of Pennsylvania's native lizards, the common five-lined skink (*Plestiodon fasciatus*) and eastern fence lizard (*Sceloporus undulates*). Open canopied talus can serve as critical basking and gestation habitat for the timber rattlesnake (*Crotalis horridus*) and northern copperhead (*Agkistrodon contortrix mokasen*), with the rock providing a warm surface to maintain their body temperatures which is especially critical to females with developing embryos. The rocks also serve as a safe retreat from predators and maintain a relatively stable temperature as these mountaintop sites quickly cool overnight.

Pete Woods

Eastern fence lizard

DCR-DNH, Gary P. Fleming

Timber rattlesnakes engaged in a combat dance. Open boulderfields are favored by timber rattlesnakes, which often locate their hibernacula in the rocky substrates.

Rare mammals also call open talus home, including the Allegheny woodrat (*Neotoma magister*) and eastern small-footed bat (*Myotis leibii*). The cold tolerant eastern small-footed bat can even hibernate deep within the rock slopes and recent research using acoustic detectors and radio telemetry suggests that the federally-threatened northern long-eared bat (*Myotis septentrionalis*) may also use talus slopes for hibernation. The rock vole (*Microtus chrotorrhinus)* and long-tailed shrew (*Sorex dispar*) rely on talus habitat, but unlike the previously mentioned species which depend on the sun exposed rock, the rock vole and long-tailed shrew favor damp cool rock fields with underground water flow more typical of north facing slopes. The Allegheny woodrat is a Pennsylvania mammal adapted to living in and among these rocky slopes. Even with the abundant habitat these slopes provide, the woodrat is in decline likely due to habitat fragmentation and the spread of parasites through other animals like raccoons.

Charlie Eichelberger

Allegheny woodrat

"Every mountain talus slope and block area examined by us held wood rats. We also found them in hills, where there was suitable habitat several miles from the main ridges. Since rocky areas are so widespread here, the wood rat is a common and characteristic mammal of this sector. It is usually more abundant near the shrubby and wooded edges of talus slopes, but if a few black birches have managed to establish themselves well out among the rocks, the wood rat can exist there. It appears little limited by the nature of the vegetation or by the kind of stone in this area. The only limiting factor observed was the availability of rocky habitats."
- Mammal Survey of South Central Pennsylvania, Gifford & Whitebread 1951

Charles J. Sharp, CC BY-SA 4.0 Wikimedia Commons

Turkey vulture

In addition to nesting on cobble rooftops, common nighthawk (*Chordeiles minor*) nest in more natural settings composed of small open rock substrate including along the edges of talus fields and rock outcroppings. If you're ever in a talus field with large, cave-like spaces and catch a putrid whiff and an eerie hissing crescendo, you're undoubtably near the nest of a turkey (*Cathartes aura*) or black vulture (*C. atratus*). The nests of these scavenging birds are nothing more than a level spot protected from the weather. As you'd expect, a species which feeds on carrion (often ripe carrion!) does not have the best smelling quarters.

PNHP along with other Heritage programs in the northeast and other researchers have plenty to do to better understand, describe, and assess the quality of these bare rock dominated communities. We need to know more about the distribution of the non-vascular plants, how much and exactly which of these communities are utilized by animals, especially our rarer animals, and determine which we consider exemplary or exceptional.

About the Author

Jeff Wagner directs the Natural Heritage Program at WPC and works with the PNHP partners to administer and manage the overall program for the state. Jeff previously served as a Community Ecologist and County Natural Heritage Coordinator for the program. He is delighted to work with an expert staff of curious, experienced and all around great people.

Green Isn't Always Good

by

Amy Jewitt

Note: As part of the WPC webinar series, Green Isn't Always Good was a featured presentation. It was oriented to the general public and WPC members. This article provides some of the ideas that were presented, hoping to raise awareness of the threat from invasive species and promote interest in native plants.

Gardening and landscaping are favorite pastimes of many nature lovers, including me. Ever since I was a young child, I've enjoyed getting my hands in the dirt and ending the day with a feeling of satisfaction, knowing that I made my little patch of earth just a little bit greener.

My time working at the Western Pennsylvania Conservancy and the Pennsylvania Natural Heritage Program as the Invasive Species Coordinator has connected me to many people involved in protecting the native species that call our region home. A big part of their role, as well as mine, is recognizing a simple, yet often overlooked fact: green isn't always good. Let me explain.

In the natural world, plant life abounds in a variety of shapes, colors, sizes, and of course, species. Places like state and national parks, protected nature preserves, and local community green spaces are all special, given the unique plant life that can be found there. Nature lovers rejoice in seeing these locations awash with a variety of vegetation, enjoying the feeling of contentment it provides to a person's mind, body, and soul. However, not all plant life found in the natural world is beneficial. Depending on the native range of a species, a plant may actually be "out of place" or exotic, and possibly invasive, meaning the presence of that plant causes harm to the environment, economy, and/or to the health and well-being of people living nearby.

Prior to European settlement, the natural world in North America consisted only of native species – plants, animals, and insects which are indigenous in their origins to the continent. This is crucial to understand because native insects and wildlife are adapted to use the plants native to North America for food. For example, the monarch butterfly caterpillar is adapted to eat only the leaves of milkweed; nothing else. Without native plants, insects like the monarch caterpillar would have no food to eat, and over time, would eventually die off. In addition, wildlife that depend on insects as part of their diet would also suffer as a consequence if native plants were not present or in limited supply.

Daniel Fenstermacher, USDA Forest Service

This spray of greenery is actually an invasive species, multiflora rose, which causes harm to the ecological functioning of an area by outcompeting native species and providing little nourishment or habitat to wildlife

Native plants also provide shelter and habitat. In some cases, wildlife adapted to use native plants for shelter, and if little or no native vegetation is available, they are forced to use alternatives that may have negative outcomes. For example, some birds prefer to build their nests in native shrub species, but when unavailable may use invasive shrubs, such as bush honeysuckle (*Lonicera* spp.). Studies have shown that nests in non-native shrubs are typically built lower to the ground making hatchlings more susceptible to predation.

F. D. Richards, "Lonicera tartaria, 2015", CC BY-SA

Birds nesting in Tartarian honeysuckle, along with other species of bush honeysuckle, are known to have lower brood survival rates attributed to higher predation levels.

Liz West, "purple loosestrife", CC BY 2.0

Purple loosestrife (*Lythrum salicaria*)

Given the importance of a plant's native range, it's helpful to have the ability to recognize whether the plant species we see around us are native, or "out of place" (i.e., exotic or possibly invasive). To many people, the landscape in the photo above is gorgeous, decorated with purple blooms of a striking flower that is obviously doing quite well in this wet meadow habitat. However, to someone with a trained "ecological eye," this site holds no beauty. This plant, purple loosestrife (*Lythrum salicaria*), is a known invasive species found in much of North America, and is actually considered a noxious weed in many states, Pennsylvania included. The "green" this plant provides to a landscape has little to no value and actually taints the land's ability to properly function, hindering the growth of desirable native plants, and in turn, limiting the food and habitat resources that native insects and wildlife depend upon.

Amy Jewitt

The landscaping in the front of this home primarily consists of non-native exotic species. The plants on the far left are Japanese barberry (*Berberis thunbergii*), a known invasive species in Pennsylvania and much of North America. Over time, this plant may escape into natural areas where it will wreak havoc on the ecological functioning of the local ecosystem. Viewed from the perspective of an insect, bird, or pollinator, this landscape is a desert, offering little food, shelter, or habitat.

The "green isn't always good" view requires one to consider the ecological role of a plant in addition to its beauty and aesthetics. Learn to identify "good" plants (native plants OR exotic non-invasive plants in the state or region) from "bad" plants (invasive plants in our state or region). For clarity, I will note that plants are not inherently good or bad, as all plants are native to a particular place in the world and serve a purpose in the ecological functioning and health of the region where they are indigenous.

The following are a few suggestions on how to get started:

1. Learn plant identification.

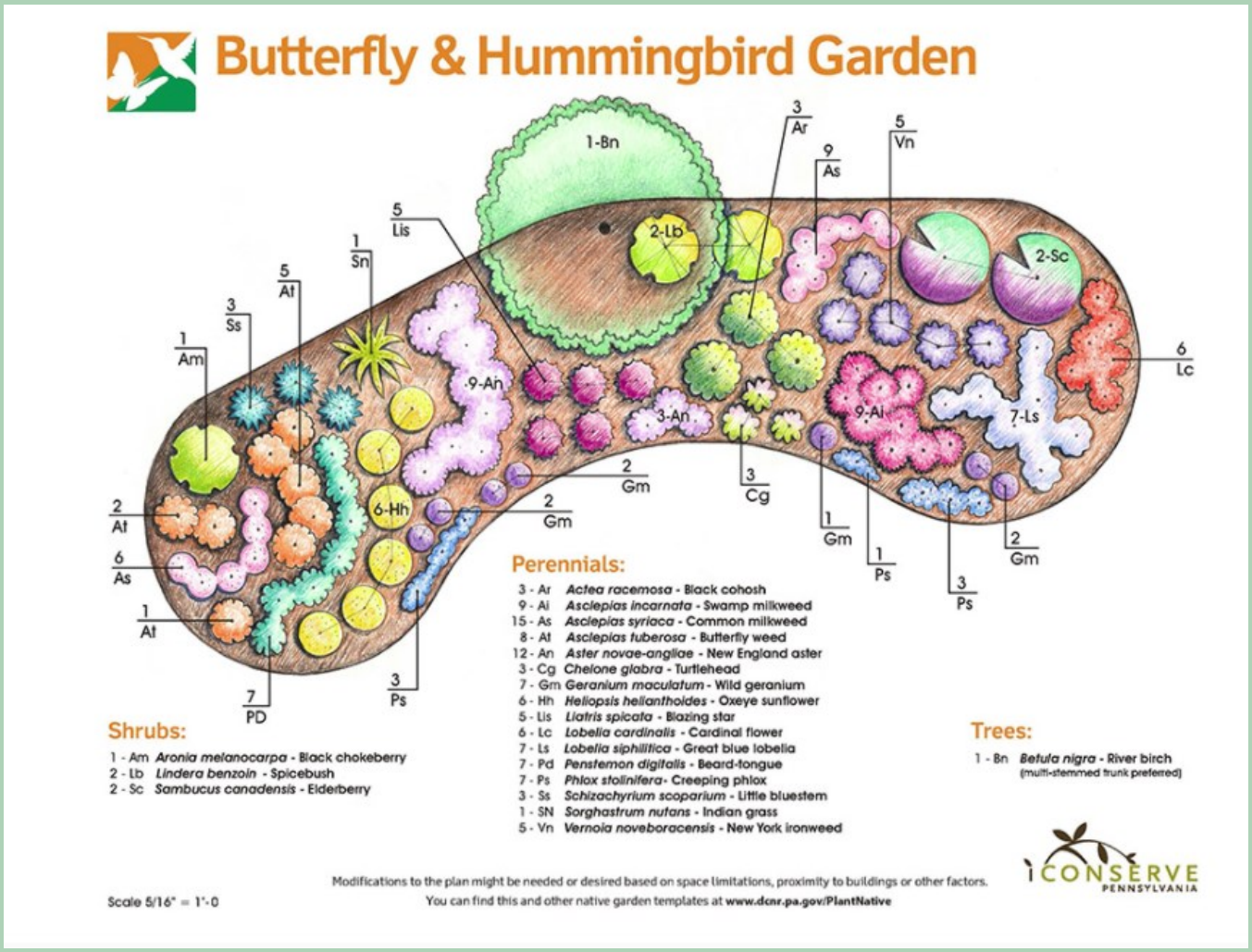
To recognize the "good" from the "bad" plants requires having some level of skill to identify plants in your local region as well as practice in the field to find and accurately identify these species. A good place to start is to contact your local Penn State Extension office or a local land trust and inquire about the native and invasive species found in your area. From there, take some time to study these plants by reviewing information in online field guides. Finally, apply your knowledge by looking around your home landscape or a nearby natural area and begin to identify a few of the species you see. Better yet, team up with a friend or group of people and learn together.

Recommended field guides on invasive plant species known from western Pennsylvania and/or the Mid-Atlantic region:

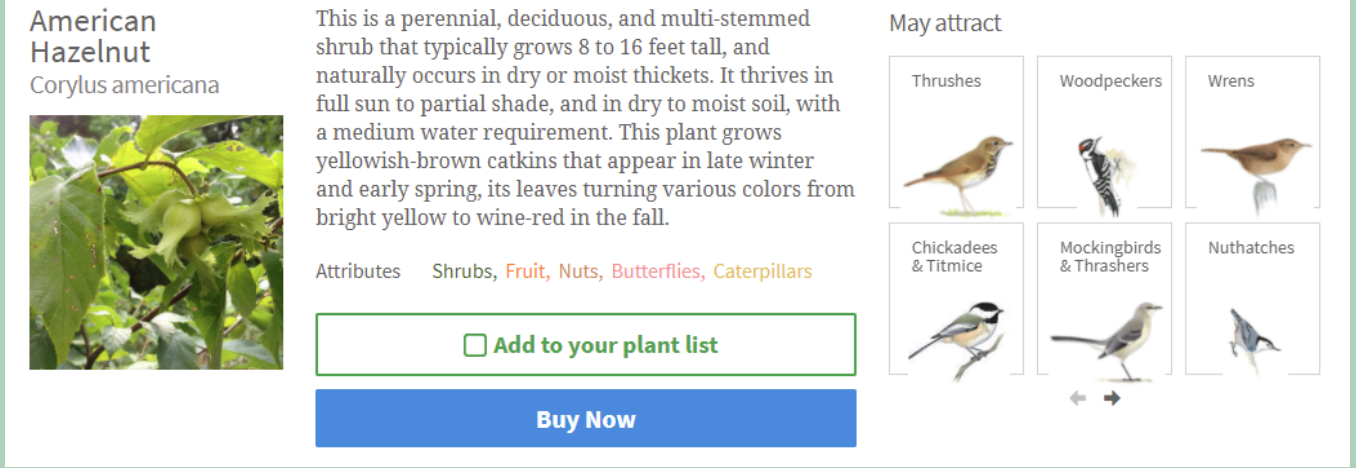
- Invasive Plants of Pittsburgh, Pittsburgh Parks Conservancy, https://pittsburghparks.org
- Plant Invaders of Mid-Atlantic Natural Areas, https://www.invasive.org/alien/pubs/midatlantic/midatlantic.pdf

2. Plant native species in your yard or garden.

When incorporating native plants into your home landscape consider species with varying heights, textures, and bloom periods to provide color throughout the growing season as well as nectar and pollen for insects, butterflies, and birds. DCNR provides a list of locations where native plants can be purchased in Pennsylvania as well as some excellent garden templates on their website in the Conservation section. Additionally, online tools like Audubon's Native Plant Database (https://www.audubon.org/native-plants) or the National Wildlife Federation's Native Plant Finder (https://www.nwf.org/nativeplantfinder/) are fantastic and easy-to-use, generating custom lists of



Example of a garden template available from the DCNR website (https://www.dcnr.pa.gov/Conservation/WildPlants/LandscapingwithNativePlants).



Audubon's Native Plant Database (https://www.audubon.org/native-plants) provides information on plant species native to your region based on zip code, and gives tips on the types of birds each species may attract.

species native to your area based on zip codes. Finally, if you're curious about the native range of any species, I would recommend using the Biota of North America Program's Taxonomic Data Center Query Page (*bonap.net/tdc*). As long as you know the scientific name of a species, you can easily find out if it's native or exotic in your state or region.

Note: In some cases, native species are unfortunately not well-suited to grow in certain environments, such as urban areas with poor soil conditions, heat island effect, or pollution by road salts or other harsh chemicals. However, with proper care and maintenance, native plants can flourish even in urban spaces.

Eric Kobal, photos and garden design

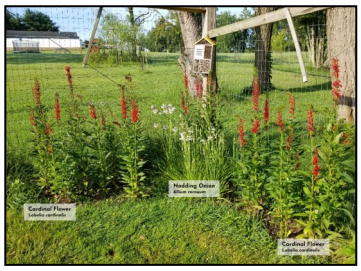
Before and after images showcase a small backyard transformed into a space with native plants. A close look reveals the variety of blooms that decorate this new garden design.

3. Strike a balance.

Adding "good" greenery into your home landscape can also mean the inclusion of exotic non-invasive species, many of which, like native species, also provide ecological services beneficial to the environment such as carbon sequestration, air and water purification, stormwater control, and the prevention of soil erosion. Additionally, exotic non-invasive species can provide shelter and habitat for wildlife, shade for your home (lowering your utility bill), and beauty to your landscape. A few examples of exotic non-invasive species include dawn redwood (*Metasequoia glyptostroboides*), weeping willow (*Salix babylonica),* and concolor fir (*Abies concolor*).

4. Start small and expand as your space allows.

Don't feel like you have to plant your whole yard at once, though if that is your goal, work at it over time and expand into new areas as your space (and time) allows. In my own yard, I have a small corner of my vegetable garden that is dedicated to native perennials



Amy Jewitt

The small corner of my home garden dedicated to native perennials.

including cardinal flower (*Lobelia cardinalis)* and nodding onion (*Allium cernuum*). It's a small space, however, it can have a big impact for the pollinators and native insects that can (and do!) use these species for food. Additionally, the red and pink blooms produced by these attractive flowers are breathtaking to behold during the summertime, providing natural beauty to my home landscape.

5. Document invasive species in iMapInvasives.

Understanding invasive species distributions is important for natural resource professionals, educators, and individuals with environmental interests. By documenting the presence of invasive species in local natural areas, you can help professionals identify and prioritize invasive species control efforts.

The Pennsylvania iMapInvasives program provides distribution data on invasive species found in our state. The general public is encouraged to submit their findings to the platform.

From one nature lover to another, I wish you the best of luck in your pursuits to help make the natural world a more beautiful and ecologically healthy place.

About the Author

Amy Jewitt joined PNHP in 2013 and administers the Pennsylvania iMapInvasives program. She learned the importance of finding and reporting invasive species from her time spent working for the Plum Pox Virus Eradication program in Carlisle, PA and the Asian Longhorned Beetle Cooperative Eradication program in Worcester, MA. Amy enjoys educating the public about the harm caused by invasive species as well as the benefits of including native plant species in our home landscapes.

When Life Gives You Rhus, Make Rhusade! Sumacs in Pennsylvania

by

Steve Grund

We have five species in Pennsylvania that are correctly called sumacs, and one that is often erroneously referred to as sumac. Let's get the error out of the way; tree-of-heaven (*Ailanthus altissima*), especially when young, resembles the staghorn sumacs superficially and is often (sometimes insistently!) referred to as sumac. Tree-of-heaven has only one tooth at the base of each leaflet, and can thus be distinguished from all of our sumacs, which have leaflets toothed throughout. The bark is distinctive and very different than the bark of sumacs. Unlike the sumac, tree-of-heaven (or wherever it is from), is an introduced and troublesome invasive species in Pennsylvania.

Steve Grund

Tree-of-heaven (above and left) leaflets have one or a few teeth at the base, and otherwise have a smooth margin. Staghorn sumac (below and right) has leaflets that are finely toothed throughout. The deep red fruits of staghorn sumac are very different than the winged fruits of tree-of-heaven.

Now to the native species! How do you know if it is poison sumac or one of the friendlier species? Poison sumac (*Toxicodendron vernix*, formerly known as *Rhus vernix*) is our only sumac that grows in wetlands. It is a shrub, but can reach a size that could be considered a small tree. The flowers are born in a loose raceme, ascending at first but hanging below the leaves when the white fruits are ripe (our other sumacs all have red fruit). All of our sumacs have compound leaves, but the leaflets in poison sumac have no teeth on the margins, and the others all do. When in a wetland, jumping from hummock to hummock, it's natural to reach for a trunk to stabilize yourself. Ironically, it's often poison sumac that we end up grabbing! The substance that may cause your skin to form a very itchy red rash is urushiol, the same oil that produces contact dermatitis from poison ivy.

Ephraim Zimmerman

Poison sumac

Our other sumacs grow in upland soil and produce red fruit. Not only are they not poisonous, but the fruits of at least one of them can be made into a delicious, tart, and refreshing drink! We will review the species then tell you how to make the drink.

The staghorn sumacs (*Rhus typhina* and *Rhus glabra*) are familiar because they are early-successional species that often grow at the edges of clearings, including along roads. In fruit they are readily recognizable by the large, upright, roughly conical clusters of deep red fruits. These fruits, and also the ends of the branches, are hairy in *Rhus typhina*, but not in *Rhus glabra*, which for this reason is usually called smooth sumac. Both staghorn sumacs reproduce vegetatively by root suckers, often forming neat dome-shaped clones with the mother plant at the center.

Steve Grund

The stems and fruit of smooth sumac (*Rhus glabra*) are entirely without hairs, unlike staghorn sumac.

Charles Bier

Shining sumac

Shining sumac, also called winged sumac, is *Rhus copallinum*. The leaves are shiny, and the leaflets are connected by "wings" on the rachis (midrib). It is a species of dry habitats and does not tolerate shade. It can be successional, like the staghorns, but is more a species of harsh habitats and, especially in the prairie states, is characteristic of habitats that regularly burn.


Pete Woods

Fragrant sumac

The smallest of our sumacs is fragrant sumac (*Rhus aromatica*). This species is usually associated with calcareous rock like limestone. It is a low shrub and the leaves have only three leaflets; all of our other sumacs have at least five and usually more leaflets borne along a central axis (pinnately compound). The leaves resemble those of poison ivy, but the leaflets have no stalks, whereas the terminal leaflet of poison ivy has a definite stalk.

Now that we covered the taxonomic stuff, how about a nice cold glass of rhusade, also called sumacade, sumac lemonade, sumac tea, or quallah (one of the Native American names). Rhusade can be made from any of our native species according to many sources on the internet, but *Rhus typhina* is most commonly used because it is by far the most common and it produces large infructescences (fruit clusters).


Steve Grund

Rhusade ready to filter after removing the fruit clusters

To make rhusade, first you need to collect the sumac fruits. The plants you are most likely to notice are those growing along a road, but these tend to be dusty and likely exposed to vehicle exhaust and often to herbicide. Better to find plants at the edges of openings in parks, abandoned fields, parking lots, or even at the edge of your yard. Make sure they are ripe by rubbing them with moistened fingers and tasting. If you get a nice tart flavor, they are ready. Typically, they ripen in late July or early August, and hold their flavor through September. If they are red and nutritious, why don't the birds eat them all? Well birds do eat them, but they don't seem to be a preferred food. Dumb birds. Or maybe the birds are fond of people and leave them for us. Nice birds!

Snap off entire infructescences (the whole cones with the red fruits, including the stem in the middle), making sure to leave some for birds and for the plant to reproduce! No need to remove the individual "berries" (technically drupes). Rinse and stuff into a large jar, like ones used to make sun tea. Pour hot, but not boiling, water over them and shake vigorously. If the water is boiling, tannins will be released, and your drink will be bitter. Let it cool in the fridge. Pour through cheesecloth into a fresh container. You should now have a beautifully deep red liquid, high in vitamin C, tart and very thirst quenching (think red zinger tea). Add ice (or if it is a cold fall day, maybe heat it back up!). Taste before adding any sugar; it might not need any! If making ahead of time, you can use cold water, it just takes more time.


Steve Grund

Rhusade is a very refreshing summer drink, even unsweetened, but to get my garden helpers to smile, I did add some sugar.

You can also dry the berries and grind them into a spice to add tartness to dishes. So, don't avoid sumacs unless they have white berries and grow in wetlands, otherwise allow yourself to be delighted and indulge in a tasty native beverage!

About the Author

Steve Grund has been a botanist with PNHP since 1995. He has been active with the Pennsylvania Biological Survey and the Pennsylvania Botany Symposium, and is a Research Associate at the Carnegie Museum of Natural Science. His biggest focus in recent years has been on plants that grow on high-energy scour habitat along the Youghiogheny River, especially the globally rare species *Marshallia pulchra* (beautiful Barbara's buttons) and *Vitis rupestris* (sand grape).

Notes from the Field

Fifteen Years and Counting

Jeff Wagner and Susan Klugman

This July marks the 15th anniversary of the consolidation of the western (Pittsburgh) and eastern (Harrisburg) Pennsylvania Natural Heritage programs into one program within the Western Pennsylvania Conservancy (WPC).

As Science Director at The Nature Conservancy (TNC), Bob Jenkins masterminded the whole concept of Natural Heritage programs (NHPs), establishing the first program in South Carolina in 1974. Over the next decade and a half, TNC worked with all of the states to establish programs. Here in Pennsylvania, it was TNC, WPC, and DER (the Department of Environmental Resources which subsequently split into DCNR and DEP) that began the program in 1982. Initially, the focus of work in Pennsylvania was split between staff at two different organizations, TNC in the east and WPC in the west. Although we began sharing a single database in 2003, there were administrative and logistical barriers to collaborating on statewide inventories or projects that crossed the east-west boundary.

In the mid-1990s TNC began to strategically separate from the NHPs. By the mid-2000s, TNC was only involved in two programs: Pennsylvania and New York. In 2005, TNC made the decision that it would leave the partnership. WPC then decided that it would take in the TNC Heritage staff and the Science Office of TNC would be dissolved. At that point we hired a consulting

Karl Kleiner

In July 2006, staff from the eastern office of PNHP were transferred to WPC to create a unified statewide program.

PNHP

TNC and WPC staff around the time the program was merged.

firm, held a broad level planning session, and produced a strategic and operational plan for the new Natural Heritage partnership of WPC, DCNR, PGC, and PFBC. One clear conclusion was that the program would work better as a single, unified entity. On July 1, 2006, TNC science staff became WPC employees and the operating plan went into full effect for PNHP.

Since then, we have grown and increasingly become an integrated team. Our once fragmented identity has solidified and now we all think of ourselves as PNHP and so do our many associates and contributors. Some of the original 2006 staff have left and new staff have come aboard but fifteen years later, there are still familiar albeit older faces that have carried the torch of biodiversity conservation into yet another decade.

Bog Turtle Conservation and Management

Kathy Gipe

In 2020, the Pennsylvania Fish and Boat Commission (PFBC), with cooperating participation from Connecticut, New Jersey, Maryland, and Massachusetts, was awarded another round of funding through the Competitive State Wildlife Grant program for a project working towards the conservation of the bog turtle (*Glyptemys muhlenbergii*). The project actions include performing habitat management, engaging in landowner outreach, continuing application of a multi-state database, continuing implementation of standardized population monitoring protocols, surveying potential and historic wetlands, drafting best management

practices, and expanding upon and refining the recently developed conservation plan. The overarching objective of this project is to protect and maintain the northern population of bog turtle and its habitat through planning and implementation of conservation actions that will lead to the recovery of the species. The Mid-Atlantic Center for Herpetology and Conservation (MACHAC), working with PFBC, was contracted to serve as the regional project lead and the Pennsylvania Natural Heritage Program (PNHP) was contracted to assist with the action implementation.

Charlie Eichelberger

The bog turtle (*Glyptemys muhlenbergii*), a state endangered and federal threatened species, is a victim of habitat loss and illegal collection, some of which can be improved by close population monitoring and habitat management.

After waiting out most of the 2020 field season, PNHP herpetologists had a busy spring in 2021 partnering with MACHAC and PFBC to conduct population monitoring surveys of 11 known bog turtle populations in Pennsylvania. These populations are among those prioritized by a conservation plan for the northeast range of the bog turtle in 2019. Many of them are considered the most robust bog turtle populations in the world. Surveys are repeated at intervals (roughly 5-7 years) to detect trends in the population and habitat, and teams of experienced bog turtle surveyors explore the wetland habitats with a keen eye for these elusive critters. Turtles are then measured and marked for individual identification before being returned to the habitat. The survey season ends in June when the turtles turn to nesting.

Biologists are now shifting their focus to monitoring and maintaining the habitat of the bog turtle. The open emergent wetlands that they call home are vulnerable to succession by woody species and invasive plants. The project team will develop plans to manage priority sites and start implementing that management this fall and winter. The project funding continues through 2025.

Characterizing Floodplains along the Lehigh River

Mary Ann Furedi

In fall 2018, PNHP ecologists received an EPA Wetland Program Development Grant to characterize the floodplain plant communities associated with under-sampled river systems in Pennsylvania. In the past, several projects have concentrated on floodplain studies in the Susquehanna, Allegheny, and upper Delaware rivers. But until now, less attention had been given to plant communities associated with the smaller river basins in the state. This current project highlights the floodplain communities associated with the Potomac, Genesee, and lower Delaware rivers.

The focus for the 2021 field season is on the plant communities found along the upper Lehigh River, a tributary of the lower Delaware River. The Lehigh River has an interesting history that has likely contributed to the formation and maintenance of the floodplains that exist today. It is the only river in the United States that was privately owned for almost 150 years. During this time, the river was modified and used as an important transportation corridor first for timber, then anthracite coal and other resources that helped fuel the Industrial Revolution. The banks of the waterway also provided an ideal location for the Lehigh and Susquehanna Railroad line. Now, the upper Lehigh River serves as a recreational hub for fishing, kayaking, and whitewater rafting. The Delaware & Lehigh Canal National and State Heritage Corridor (D&L Trail) is a hiking and biking destination as well.

Mary Ann Furedi

PNHP ecologists biking along the D&L Trail.

This spring, PNHP ecologists took advantage of the convenient river access from the D&L Trail to explore the upper Lehigh River floodplain between White Haven, PA and Jim Thorpe, PA. Before hitting the trail, we used GIS and aerial imagery to identify potential

floodplain points for further in-person investigation. Between biking and hiking, we covered almost 40 miles and discovered several repeating floodplain plant community types. We plan to return in August and September to further characterize the floodplains using natural heritage methodology for sampling plant communities. The plant community data from this work will then be added to the larger statewide floodplain dataset to examine classification similarities and differences. Data from this project provides us with an idea of the types and condition of floodplain communities in the state and will inform a number of activities, including restoration work.

Mary Ann Furedi

An example of a floodplain thicket that was commonly seen along the upper Lehigh River.

Community Scientist Contributes to Invasive Species Control

Amy Jewitt

Many of us have heard the famous quote by Benjamin Franklin that says, "An ounce of prevention is worth a pound of cure." At the time, Franklin was reminding the citizens of Philadelphia to remain vigilant regarding fire awareness and prevention. This sentiment also applies to citizen/community scientists and their value in detecting and reporting high priority invasive species in our state.

Vigilant citizen/community scientists who report findings of invasive species can aid in the prevention or slowing of the damage caused by a nonnative plant, animal, or insect. We are happy to spotlight one of those individuals, Nicholas (Nick) Macelko, whose discovery of the invasive New Zealand mudsnail (*Potamopyrgus antipodarum*) in several new locations in Pennsylvania led to quick action by the Pennsylvania Fish and Boat Commission (PFBC).

Nick Macelko

Nick Macelko

As part of the 2020 Invasive Species Scavenger Hunt hosted by the Pennsylvania iMapInvasives program, Nick discovered the high priority aquatic invasive New Zealand mudsnail in Valley Creek located near Valley Forge National Historical Park in southeastern Pennsylvania. This tiny, yet pesky snail had been found in other parts of the state including Centre, Cumberland, Clinton, Erie, Northampton, Lehigh, and York counties, but had not been found in this area or this waterbody. Nick's finding was reported to iMapInvasives, confirmed by a gastropod expert, and was noticed by the PFBC in the database.

By late 2020, PFBC sent signs to national park staff who posted them along Valley Creek with the goal of educating the public on cleaning protocols for fishing gear, since New Zealand mudsnails can be transported on waders, boots, boats, or other gear used by anglers. Currently, there is no effective way to eradicate or manage populations of New Zealand mudsnail once they are established. The best way to prevent the spread is to educate the public about this species, how it is spread, and the harm it causes to native organisms and the environment.

In Nick's own words, "Chance findings of New Zealand mudsnails by community scientists such as myself demonstrate why more interested individuals are needed to help in the search for this and other high priority invasive species in Pennsylvania. Anyone can flip over a rock while fishing on their favorite trout stream, snap a picture of what they find, and upload it to iMapInvasives by downloading the mobile app, and so I would encourage more people to do so!"

Nick continues to find and report new locations of New Zealand mudsnail to PA iMapInvasives. His role in documenting his findings provides valuable data on this species' known distribution in Pennsylvania and helps stop the spread of this known invader.

Feeding a Picky Eater

Betsy Leppo

The caterpillars of the globally rare frosted elfin butterfly (*Callophrys irus*) are picky eaters. They feed only on yellow wild indigo (*Baptisia tinctoria*) at the sites where they occur in Pennsylvania. PNHP staff have been working with local land managers and the USFWS Pennsylvania Field Office to improve and expand the amount of suitable habitat around frosted elfin populations.

Ben Coulter

Frosted elfin caterpillars love to eat wild indigo leaves and flower buds, and will even chew on the stem as they get older.

One strategy is to increase the number of wild indigo plants for adult females to lay eggs on and caterpillars to feed upon. This spring we planted wild indigo seeds at a frosted elfin site to see how well they grow. USFWS is also working with students in the State College Area School District, through the Partners for Fish and Wildlife Program, to grow wild indigo seedlings in trays. These seedlings will be used to further augment the wild indigo populations at our frosted elfin sites, and will hopefully help the numbers of both plants and butterflies grow.

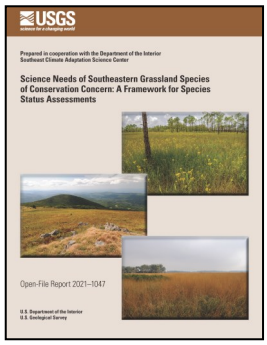
Betsy Leppo

The wild indigo planting areas were mowed over the winter. We used garden rakes to loosen the top layer of soil, scattered the seeds evenly, tamped them into the soil, lightly watered, then let nature take its course. One month later, little wild indigo plants were found sprouting vigorously in places that were still mostly bare soil and were not filling in with other plants.

Two New Publications!

Christopher Tracey

In January 2020, PNHP Conservation Planning Manager Christopher Tracey, participated in a regional Species Status Assessment (SSA) workshop in Morrison, Tennessee to identify science needs for the conservation of southeastern grassland ecosystems and species. The workshop, organized by Southeastern Grasslands Initiative (SGI) and the U.S. Geological Survey (USGS), focused on identifying specific types of scientific information and research needed to support the U.S. Fish and Wildlife Service (USFWS) and state agencies in the development of SSAs for grassland species listed under the Endangered Species Act or under current or potential consideration for listing.



Two publications resulted from this work. The first is a USGS white paper titled "Science Needs of Southeastern Grassland Species of Conservation Concern: A Framework for Species Status Assessments" (https://doi.org/10.3133/ofr20211047). This paper summarizes the workshop results including the five categories of threats discussed: (1) habitat loss, fragmentation, and disruption of functional connectivity; (2) climate change; (3) altered disturbance regimes; (4) invasive species; and (5) localized impacts. For each threat, participants focused on science and information needs, such as database availability, field survey and research priorities, modeling and mapping needs, and conservation and management priorities.

The second paper "Improving species status assessments under the U.S. Endangered Species Act and implications for multispecies conservation challenges worldwide" was recently published in Conservation Biology (https://doi.org/10.1111/cobi.13777). In this paper, we address species status assessments (SSA), a USFWS process to inform U.S. Endangered Species Act decisions from listing to recovery, within the context of multispecies and ecosystem planning. Although existing SSAs have a single-species focus, ecosystem-based research can efficiently inform multiple SSAs within a region and provide a foundation for transition to

multispecies SSAs in the future. Despite its successes, the Endangered Species Act has proven challenging to implement due to funding limitations, workload backlog, and other problems. As threats to species survival intensify and as more species come under threat, the need for the ESA to function efficiently has grown.

The unglaciated southeastern United States is a biodiversity hotspot, with a disproportionate amount of this biodiversity concentrated in grasslands. Like most hotspots, the Southeast is also threatened by human activities, with the total loss of southeastern grasslands estimated at 90 percent and with many threats escalating today. We hope these publications help encourage conservation of these important ecosystems.

Update on Ecological Assessment of Allegheny County Parks

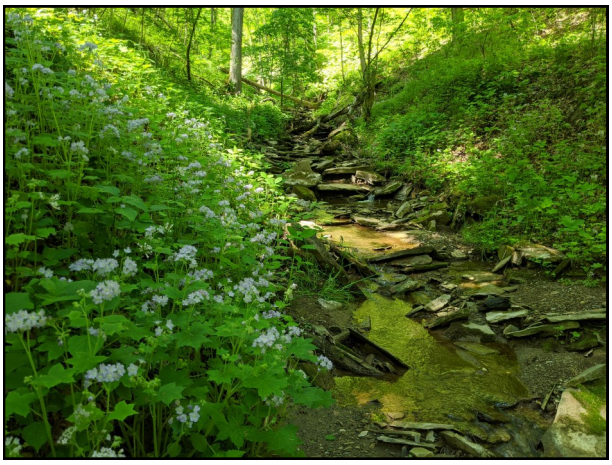
Jessica McPherson

At the behest of the Allegheny County Parks Department and the Allegheny County Parks Foundation, WPC and PNHP staff have been conducting ecological assessments of county parks. This year, we will complete studies of Round Hill and White Oak parks. These studies inventory ecological conditions within the parks, identify ecological assets and challenges, and provide management guidance to park staff. Previous studies have addressed Boyce Park, South Park, Hartwood Acres, and Settler's Cabin.

The Parks department and Parks foundation commissioned the reports to provide baseline data for moving their management efforts in a more ecologically oriented direction, and staff have been eager partners in implementing recommendations such as reducing mowing, restoring meadows to previously mowed areas, and exploring forest restoration efforts.

Jessica McPherson

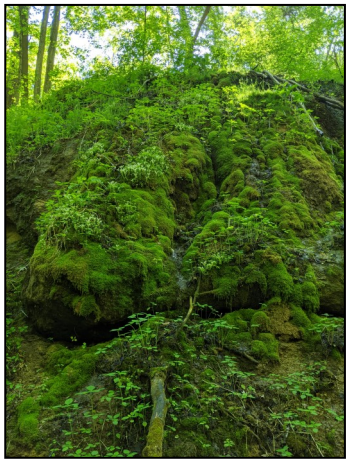
A ROW at Round Hill Park is seeded with native wildflowers



Jessica McPherson

Wildflowers such as large-flowered valerian and waterleaf bloom in a high-quality forested ravine at Round Hill Park

The parks are a microcosm of the challenges faced by the larger region. Most have a majority of their area in natural cover, but ecological function varies tremendously based on the history of how the land was used in the past. Steep slopes and stream ravines have often held fairly continuous forest cover over the last century, likely undergoing early timbering but no tilling; these areas today hold the most ecologically intact forest communities.



Jessica McPherson

Tufa formation at Round Hill

In Round Hill Park, the remnant forest ravines occur over calcareous geology, and host examples of diverse mixed mesophytic forest communities that are unusual in the county and the region. There are also several dramatic formations of tufa, a very porous calcareous rock that forms from deposition of calcium out of flowing groundwater. Six PNHP watch list species are found in these mesophytic forest ravines. The ramps populations discovered through park inventory work will also be incorporated into a study by Penn State researchers Sarah Nillson and Eric Burkhart to determine if more than one species should be recognized in our region.

In White Oak Park, a relatively high proportion of the park is remnant forest, ranging from tuliptree-beech – maple mesic types to dry oak – mixed hardwoods on the upper slopes. In some areas, there are some

spectacularly large and mature trees that might qualify as old-growth. However, the park also appears to have suffered from many decades of overbrowsing by white-tailed deer, resulting in large areas with a seriously depauperate native herbaceous layer and imperiling future forest regeneration. This is an issue that must be addressed county-wide and applied to individual parks as possible.

Jessica McPherson

This magnificent black birch is an example of the exceptionally -sized trees that can be found at White Oak Park.

The parks also include large areas outside of the above-discussed remnant forests, that today present difficult management challenges. Uplands and flat areas useful for agriculture were previously cleared and tilled. While some of these areas are today the sites of picnic groves and athletic fields, most of the previously cleared areas were allowed to reforest naturally at some point in the last fifty years. However, these forests do not have the same ecological value as the remnants; they are far lower in diversity due to the past tilling and are often filled with invasive species.

Jessica McPherson

Invasive species such as this mile-a-minute threaten ecological and recreational value at Allegheny County parks.

Managers are today responsible for large areas of forest for which restoration would be a nearly insurmountable challenge. In parks, where the public expects accommodation of a range of recreational activities, there is an opportunity to route higher-impact recreation into these lower-quality areas, protecting the more intact portions of the park. However, in some cases, the aggressive growth and thorny nature of invasive species even impede recreational use like mountain biking. Round Hill Park includes a demonstration farm; in addition to modelling ecological farming practices, the park is experimenting with management of transitional landscapes, through practices such as seeding native species in field edges and fallow areas.

As the stewards of the Allegheny County parks turn towards ecological management, they do so in a challenging time. Public awareness, interest, and support is high, and many benefits can be realized such as reduced fuel costs and improved stormwater infiltration. However, passing along the ecological heritage of our native forest communities to future generations is requiring ever-more intensive efforts to stave off invasive species, deer browse, and climate change.

Jessica McPherson

Native red mulberry (*Morus rubra*), a Pennsylvania Threatened species found at White Oak Park.