Pennsylvania Natural Heritage Program

information for the conservation of biodiversity

WILD HERITAGE NEWS

Spring 2021

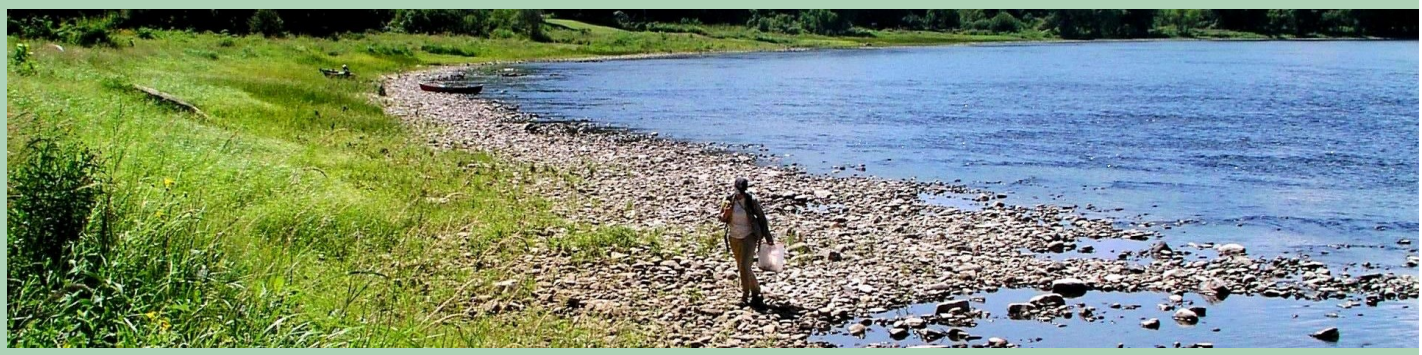

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Photo Banner:
The banks of the Allegheny River, as it flows through Armstrong County, provides habitat for a variety of rare plant species.

Steve Grund

Update Reveals 643 New Natural Heritage Areas

by

Anna Johnson

Southwestern Pennsylvania is rich in natural resources. This landscape showcases the tension between the region's diverse natural resources and the intensive and ongoing extraction of those resources. Big rivers define the area, with the most prominent confluence occurring in Allegheny County, in downtown Pittsburgh. Here, the Monongahela, Allegheny, and Ohio rivers join together, eventually flowing to the Mississippi River and the Gulf of Mexico. Huge barges full of coal still navigate the locks and dams of these working rivers. At the same time globally-rare freshwater mussel and fish species tenaciously inhabit the waterways, and even seem to be expanding their populations in some areas, a hopeful ecological sign.

One of Pittsburgh's most famous residents, Rachel Carson, typifies the environmental tensions in the region. Carson grew up in the shadow of coal and steel plants, but also became one of the founders of the modern American conservation movement. Her work to advocate for the regulation of pesticides was pivotal for the return of sustainable populations of bald eagles (*Haliaeetus leucocephalus*), peregrine falcons (*Falco peregrinus*), and osprey (*Pandion haliaetus*).

In 2018, PNHP began work in partnership with the Southwest Pennsylvania Commission and with funding from DCNR on a comprehensive update of the County Natural Heritage Inventories (CNHIs) for ten southwestern counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland. This is the largest and most ambitious CNHI update project that

David Yeany II

Peregrine falcons have become much more common in Pennsylvania as pesticides are better regulated and water quality continues to improve throughout the region.

Betsy Leppo

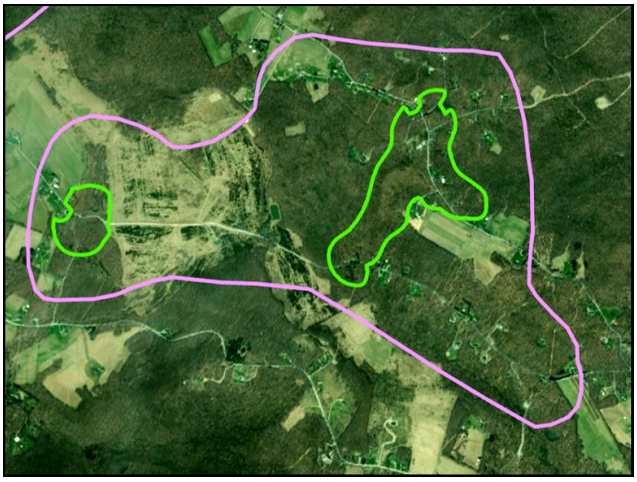
The rich, diverse forests in Ohiopyle State Park in Fayette County remain an important habitat for a wide variety of rare species.

our program has attempted to date. While several of these counties had CNHIs published in the last few years, southwestern Pennsylvania is also home to two of the oldest remaining CNHIs completed by PNHP, last updated over 25 years ago in Allegheny and Washington counties. Much has changed in that time, both across the landscape and within PNHP. For example, in 1994 there were no dedicated conservation areas in all of Allegheny and Washington counties. Today, conservation organizations such as the Allegheny Land Trust and Hollow Oak Land Trust have preserved many natural areas, and state parks and game lands in the region have shifted their management efforts to increasingly focus on conserving habitats and managing for biodiversity.

The results of this recently released ten-county update showcase a region where natural areas are recovering in many places as environmental regulations and changes in industrial practices have slowly led to improved water quality and regenerating forests. Rare freshwater mussels have returned to the Ohio River. Natural communities, such as the yellow oak – redbud woodlands, where dry, calcareous soils allow a host of uncommon plants to thrive, occur in small pockets near industrial river towns. Unfortunately, these updated inventories also reveal the impact of continued rural and suburban development. Many of our forests have again become fragmented by energy infrastructure, especially in the southwest corner of the region, in Greene County. As a consequence, previously documented Natural Heritage Areas (NHAs) have become smaller and rare species populations have likely been lost.

Pete Woods

The dry, rocky yellow oak – redbud woodlands of southwestern Pennsylvania host a variety of uncommon species. These communities are often found on steep slopes, where they avoid disturbance or development, such as this community along Pumpkin Run in Greene County.



Development of the natural landscape in the southwest has led to changes in the extent of Natural Heritage Areas (NHA). For example, here a historically large NHA, outlined in purple, has been redrawn as two smaller NHAs, outlined in green, to account for the loss of forest to development.

The 643 new NHAs contained within these ten CNHI reports are intended to serve as a basis for conservation planning for the region. The individualized site reports can be used as a guide to the diversity of our landscape for local stakeholders and landowners, and suggest conservation actions which can be taken to protect these areas into the future. Each NHA is ranked in significance from locally to globally important, allowing municipalities to more easily prioritize conservation areas. The introductions to each county's inventory report also provides an overview of the landscape and the unique challenges and ecological resources each county possesses.

Just as the landscape has changed dramatically over the last 25 years, many changes have also occurred within PNHP. Our mapping abilities have advanced and allowed for much more spatially precise delineations of

NHAs. While the maps in the original 1994 reports were hand-drawn, today we rely on Geographic Information System (GIS) tools to digitally record, map, and manage our biodiversity records. This means that the NHAs we now depict are more focused around the core habitat areas used by the focal species and communities of concern, and can be more easily adjusted and updated as we gather additional data or the landscape changes. Internally, updates to our NHA reporting processes, completed as part of this project, have allowed us to much more rapidly synthesize and analyze inventory data. These data infrastructure adjustments help us better achieve our program mission of being "the most trusted, accurate, up to date, comprehensive source of natural heritage information for Pennsylvania."

This project created the opportunity for two years of fieldwork across the region, which PNHP used to inventory natural areas and work with museums and citizen scientists in the community to identify and incorporate regional observations of rare species into our updates. PNHP's taxonomic expertise has expanded over the years, and our field biologists are now able to track and monitor a broader range of taxa. In addition to our comprehensive tracking of rare plants, mammals, herptiles, and birds, relatively newly tracked species groups include odonates (dragonflies and damselflies) and land snails. Both of these groups are fascinating by their very nature, but also serve as indicators of rare and sensitive natural habitats.

Pete Woods

Land snails are a group of species which PNHP has only recently begun to include in inventory reports. Shown here is a shell of the flamed tiger snail (*Anguispira alternata*).

Land snails, for example, are most often found on calcareous soils over limestone-influenced bedrock. These types of soils often support other uncommon species, such as the pockets of rich woodland flora that we love to visit to see spring wildflowers. The addition of land snails to our inventories highlights the importance of collaborations for PNHP; a substantial portion of PNHP's new land snail records are the result of the hard work of Tim Pearce, the curator of mollusks at the Carnegie Museum of Natural History, and his ongoing efforts to monitor the diversity of land snails in Pennsylvania. In fact, the single site hosting the highest diversity of snail species in all of Pennsylvania is found in the southwest. Simpson Hill NHA, in Fayette County, supports at least 37 species of land snails, many of them rare.

Melissa McMasters

This image of the elusive clubtail (*Stylurus notatus)* was captured on August 2, 2014 and posted to iNaturalist. The globally vulnerable dragonfly is perched on the Roberto Clemente Bridge along the Allegheny River.

Odonates (dragonflies and damselflies) breed in freshwater wetlands, one of the habitats most threatened by development and disturbances. The presence of rare odonates is often an indicator of the presence of higher quality freshwater ecosystems. PNHP often receives documentation of these species from citizen scientists, through platforms such as iNaturalist. For example, an iNaturalist user captured and shared a photograph of a dragonfly resting on the Clemente Bridge in downtown Pittsburgh; this species was identified as the elusive clubtail (*Stylurus notatus*), a globally vulnerable and state imperiled species in Pennsylvania. This species record is now incorporated into the new NHA that encompasses the stretch of the Allegheny River that flows through downtown Pittsburgh. It is a sign of the improving water quality and riparian habitat along the region's large rivers. Another iNaturalist contribution to the southwest inventory is the rediscovery of the six-banded longhorn beetle (*Dryobius sexnotatus*), a species that was previously considered extirpated from the state of Pennsylvania, and which is likely globally threatened. This rare bark

beetle relies on very large, mature maple, elm, or beech trees for habitat. It was observed boring into old majestic street and yard trees that remain in some neighborhoods. Platforms like iNaturalist allow a distributed network of naturalists to share these kind of backyard observations, sometimes changing our understanding of the range and abundance of species.

PNHP

The steep forested hillsides above the Youghiogheny River are home to many rare species.

PNHP field inventory update efforts for this project focused on some of the most important areas for biodiversity in the region. Further south and west of Pittsburgh, the fast-flowing Youghiogheny River has carved a deep gorge through the hills of Fayette and Westmoreland counties. The minimally developed riverbanks here provide habitat for many rare plants, as the intense and frequent floods maintain open, natural grassland conditions. Some of the rare plants in these habitats only occur along the Youghiogheny River in Pennsylvania. Examples include beautiful Barbara's buttons (*Marshallia pulchra)* and riverbank grape (*Vitis rupestris*). The majority of blue monkshood (*Aconitum uncinatum*) in the state also occurs along the Youghiogheny, with a few scattered occurrences along other southwestern rivers as well. The updated inventory of these habitats forms the basis for continued research, and PNHP scientists are studying how changing flood patterns related to climate change may impact river scour communities.

Steve Grund

Blue monkshood (*Aconitum uncinatum*) is a rare wildflower, primarily growing along the floodplains of the Youghiogheny River.

Further upslope from the Youghiogheny River, large swaths of mostly undeveloped forest provide ample retreat for the Allegheny woodrat (*Neotoma magister*), which makes its homes in cracks and crevices of rocky outcrops surrounded by forest. Another species found here is the West Virginia white (*Pieris virginiana*), a globally imperiled butterfly species which rarely ventures out of the forest, even to cross roadways. This butterfly lays its eggs on toothworts (*Cardamine spp.*), but also will choose garlic mustard (*Alliaria petiolata*), an invasive plant closely related to toothworts. Unfortunately, garlic mustard is an evolutionary trap for the butterfly, and its larvae will not survive when feeding on this plant. Thus, this species not only requires large blocks of unfragmented forest, but also needs habitat that is relatively uninvaded by the ubiquitous garlic mustard. Luckily, both of these conditions exist in the forests of Ohiopyle State Park, along the Youghiogheny. Further north in Butler County, this rare butterfly also can be found near Moraine State Park and along Wolf Creek.

David Yeany II

The globally imperiled West Virginia white butterfly (*Pieris virginiensis*) relies on unfragmented forests with a rich spring wildflower flora uninvaded by garlic mustard.

Another regional highlight of the updated inventories are the fen communities of Lawrence County, the southern edge of the northwestern glaciated portion of Pennsylvania. Fens were likely once much more extensive in this region, but many of them have been drained and converted to agriculture. Small remnant pockets remain, however, such as the Mitchell Fen

B.L. Isaac

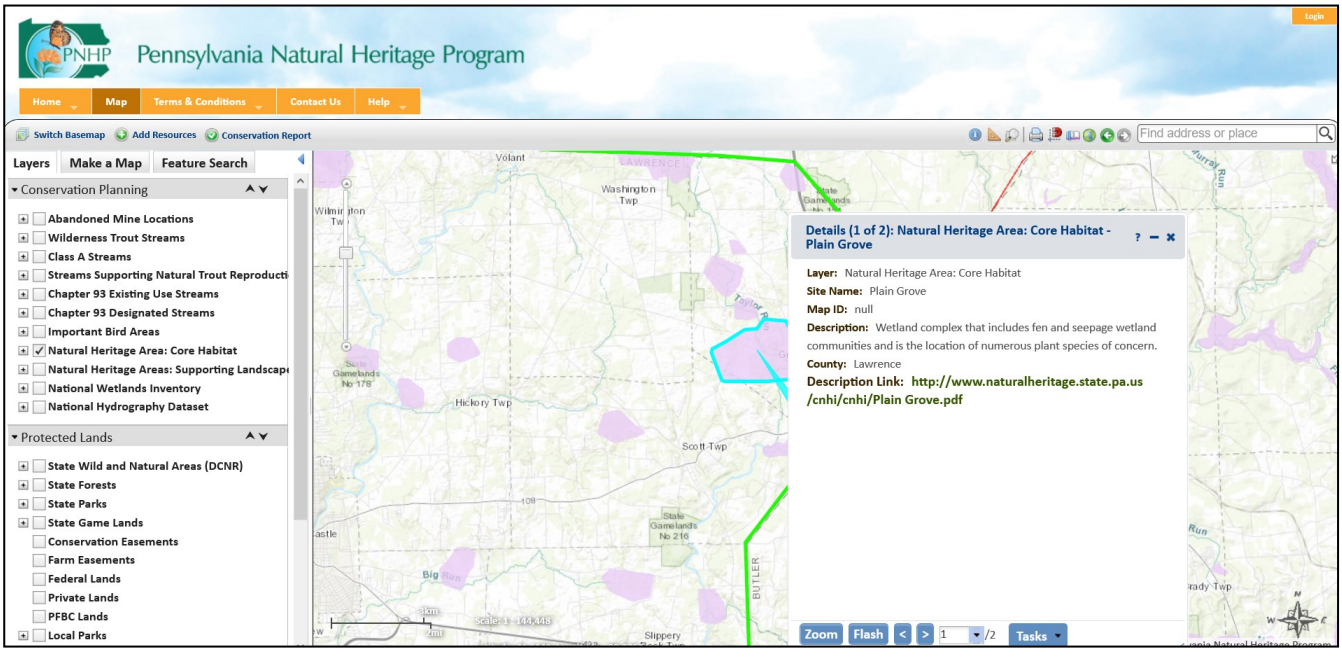
Spreading globeflower (*Trollius laxus*) is a rare wildflower that specializes on fen habitats, including the small remnant fens found in Lawrence County.

NHA and Plain Grove Fens NHA, hosting populations of rare species such as the spreading globeflower (*Trollius laxus*). PNHP continues to collaborate with state partners on strategies for monitoring and managing these unique wetland habitats. Also, within this region is one of the easternmost prairie remnants, Jennings Prairie, a tiny pocket of extremely rare natural grassland in Butler County. Featuring the showy dense blazing star (*Liatris spicata*) in the summer, this site supports many rare species found in very few places in Pennsylvania.

Our updated southwestern CNHI reports and spatial data are currently available on our website. If you live in Pennsylvania, there is likely an NHA not far from your home. Our NHAs are meant to introduce Pennsylvanians to the rare species and natural communities found all around us, and showcase the best examples of living ecological resources in each county. By documenting the location of environmentally sensitive areas, we hope that these reports will continue to help us sustainably balance economic development with the conservation of our natural resources and the preservation of our natural heritage.

About the Author

Anna Johnson began working for PNHP in 2018 as a conservation planning communication specialist. While a plant and pollination ecologist by training, since joining PNHP she has been mostly in the office, developing conservation tools. She loves finding ways to make complex ecological issues, stories, and data more accessible to more people. She received a BA in liberal arts from St. John's College and a PhD in Geography and Environmental Systems from the University of Maryland, Baltimore County.



All of the newly updated NHAs are mapped and linked to descriptions on the Pennsylvania Conservation Explorer and PNHP websites.

Tracking Boreal Nomads: Winter Movements of Evening Grosbeaks

by
David Yeany

Pennsylvania is a nexus of range limits for a number of northern and southern species of both plants and animals. For birds in particular, our forests and wetlands support a diversity of boreal (northern) breeders near the southern edge of their ranges - birds like Canada warbler (*Cardellina canadensis*), white-throated sparrow (*Zonotrichia albicollis*), northern waterthrush (*Parkesia noveboracensis*), and yellow-bellied flycatcher (*Empidonax flaviventris*). However, Pennsylvania also hosts winter populations of some boreal songbirds, specifically boreal finches. This family of birds has eight species in eastern North America which mostly breed in northern forests. They have strong ties to their boreal winter food availability and respond with a specialized type of movement in fall and winter known as irruptive migration.

David Yeany II

Evening grosbeaks are gregarious birds and gather in flocks, sometimes large, at feeders during winter irruptions.

David Yeany II

Evening grosbeak female

David Yeany II

Evening grosbeak male

Better known as winter finch irruptions, colorful finches like crossbills (*Loxia* spp.), redpolls (*Acanthis* spp.), pine siskins (*Spinus pinus*), and evening grosbeaks (*Coccothraustes vespertinus*) will invade regions south of their boreal or arctic ranges in Canada and the northern United States in search of winter food. Primary drivers of these mass movements are a number of often cyclical conifer (e.g., spruces, pines, and hemlocks) and deciduous (e.g., maples and birches) tree seeds and some tree fruits (e.g., mountain ash). Outbreaks of spruce budworm (*Choristoneura fumiferana*), a native moth that defoliates spruce and fir forests, can also help drive nesting success and subsequent irruptions, especially for evening grosbeak, purple finch (*Haemorhous purpureus*), and to some extent pine siskin.

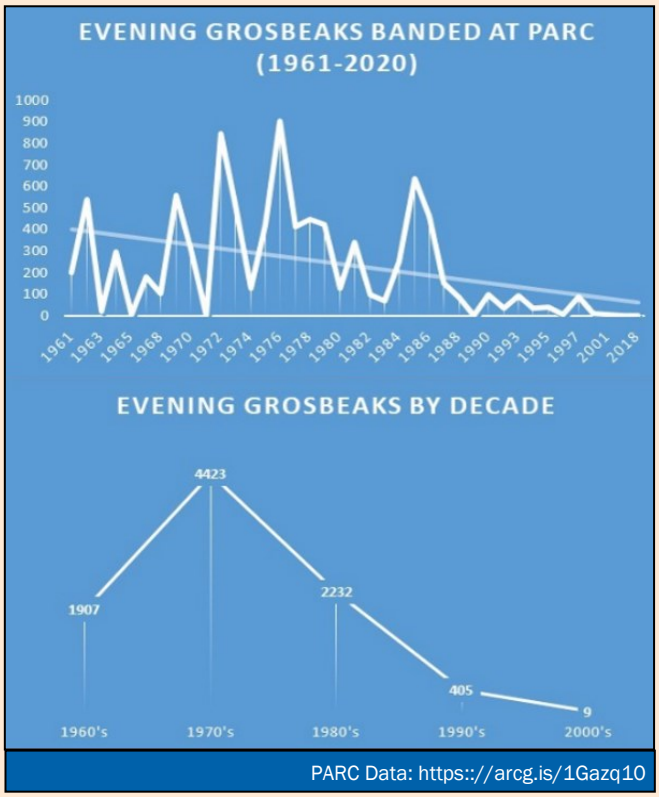
When winter food sources wane, depending on the tree species, the corresponding finches head south in big numbers – often to Pennsylvania. When poor food availability occurs for all eight eastern finches, a finch irruption becomes a "finch superflight." It is a rare phenomenon, with only five or six finch superflights recorded in the last 50 years in eastern North America. With all finches on-the-move, the winter of 2020-21 shaped up to be a finch superflight with some historic implications. Beginning in October, flocks of thousands of pine siskins were recorded heading south throughout the northeast. Redpolls irrupted south in the largest numbers in over a decade. Finally, evening grosbeaks had their biggest irruption in more than 25 years with some reaching as far south as Florida. All of these birds can and will visit feeders, and perhaps some of you had them in your own backyard this past winter.

With such huge numbers of these finches being seen over the winter, it is hard to fathom that any of them would have declining populations. However, that could not be further from the truth with evening grosbeaks. Historically, a boreal and montane species found in western North America, evening grosbeaks were first seen in the eastern United States in the 1890s, during

winter irruptions, and later confirmed breeding in the northeast by the 1920s. Ornithologists hypothesize the grosbeaks may have expanded eastward due to box elder plantings, a favorite winter food, or in response to spruce budworm outbreaks. Either way, the species had regular winter irruptions in the northeastern United States through the 1990s. But in 2016, evening grosbeak population trend assessments revealed a continent-wide decline of 92% since 1970 and led to the national listing of the species as Special Concern in Canada, the species' breeding range. At the same time, Partners in Flight called for the need to better understand evening grosbeak breeding ecology, irruptive movements, and population drivers to enable the creation of conservation strategies. Evening grosbeaks are notoriously secretive when nesting and while their irruptive movements are visible on the landscape, still very little is known about linkages between breeding and wintering populations.

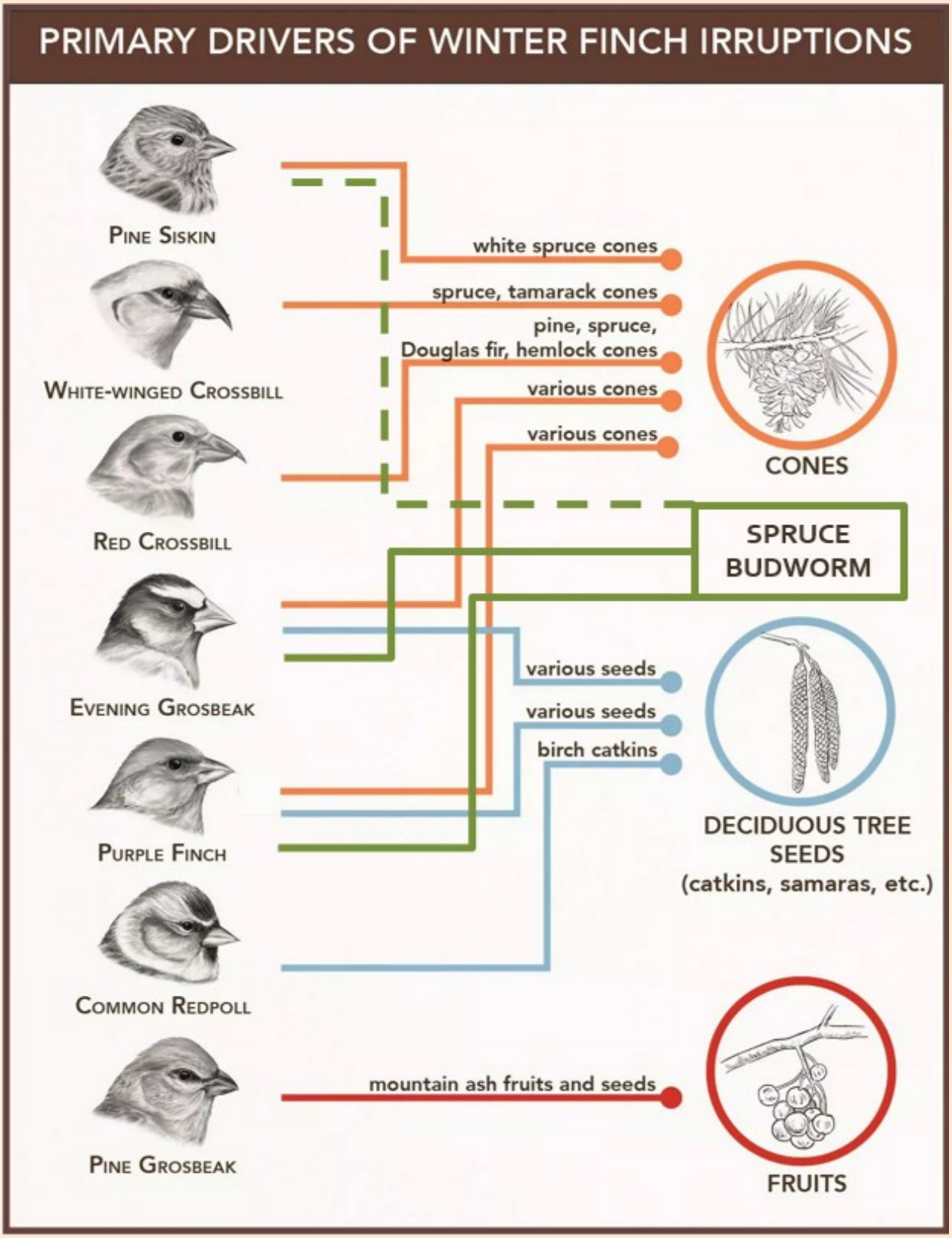
Evening grosbeak decline is evident in Pennsylvania winter populations as well. They were regular winter visitors, especially in northern counties, until about 1990 and even were confirmed breeding at locations in Wyoming County in 1994. Powdermill Avian Research Center (PARC) banded 4,423 grosbeaks during the 1970s but that number was cut in half by the 1980s, and by the 2000's only 9 grosbeaks were banded at the station – nearly a 100% decline. Factors in this decline cited by the Canadian listing include loss of mature spruce-fir forest, collision mortalities, climate change, and fluctuations in spruce budworm populations.

Despite the decline in Pennsylvania's winter evening grosbeak populations, there remained a consistent recurring population in Forest County and the Allegheny National Forest (ANF) region. At this site, evening grosbeaks occurred during half of the last 14 winter seasons and even during non-irruption years. During the winter of 2016-17, PNHP initiated a collaborative project with PARC to begin studying these wintering evening grosbeaks in western Pennsylvania. Our goal was to use a combination of unique marking methods and new telemetry technology to track evening grosbeak winter movements within the region and beyond. To better inform conservation for the species, we hoped to answer a few key questions: 1) why do grosbeaks consistently return to the ANF region, 2) how far does this species roam regionally during winter, 3) what is the timing of their irruptive movements, 4) what migration paths do they follow, and 5) where do Pennsylvania winter populations breed?



In Pennsylvania, winter banding records from Powdermill Avian Research Center in Westmoreland County show the same, steep continental decline of evening grosbeaks since the 1970s.

David Yeany II



Winter finch irruptions are driven by the lack of available winter food sources – tree seeds, and in the case of evening grosbeaks, can also be affected by breeding season food abundance in the form of spruce budworm caterpillars.

Now in the project's fifth year, we have marked 118 evening grosbeaks with unique color-band combinations for identification by field observers and deployed tiny radio transmitters – nanotags – on 74 evening grosbeaks. Nanotags are a new take on an "old" telemetry technology and emit unique VHF radio signals that are passively detected by the Motus Wildlife Tracking System, a network of receiver stations across North America and the world. Efforts by the Northeast Motus Collaboration, and especially PARC and the Willistown Conservation Trust, have increased detection coverage within the evening grosbeak's potential migration range. Across the ANF, partners established five receiver stations to detect regional movements and in 2021 a mini-receiver station at the study site to detect returning grosbeaks. When a bird flies within range of these stations (~15 km), the antenna will record a detection and data will be stored for upload to the Motus database.

David Yeany II

Each evening grosbeak in our study is color-banded with a unique combination of leg bands enabling observers anywhere to identify each specific bird. This bird's unique band combo is Left: Orange/ Yellow, Right: Metal.

David Yeany II

This male evening grosbeak is outfitted with a solar-powered radio transmitter, enabling it's movements to be detected by Motus receiver stations throughout the life of the bird.

Nanotags are cutting-edge technology that have reduced the size of the radio transmitter to miniscule proportions with the evening grosbeak tags weighing less than two grams or about 3% of the bird's mass. We attach the tags via a leg loop harness made from elastic or stretch thread. This is analogous to a 160-pound person wearing a small hip pack weighing less than five pounds. Our project represents the first and only tracking study of evening grosbeaks – a curious distinction for a species which is known to have irruptive migration. We are also one of the first to deploy new solar-powered nanotags by Lotek which are designed to last the life of the bird and have on-board power storage, providing the opportunity for many years of data collection – the oldest known evening grosbeak in the wild was 15 years old!

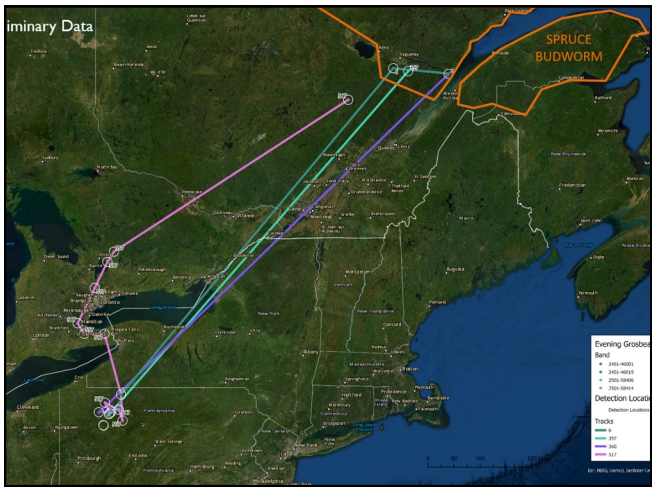
In the fall of 2020, with a finch superflight underway and our project growing, the newly formed Finch Research Network (FiRN) joined as a partner in this collaboration. During this winter's evening grosbeak irruption, we nearly tripled our tag deployments from 2018-19 with grosbeaks expected to remain in Pennsylvania until May. We are already beginning to see some early tracking results from our tagged and color-banded grosbeaks.

David Yeany

Processing an evening grosbeak at our study site in Forest County.

With the help of seven citizen-scientist observers reporting color-banded evening grosbeaks, we have detected birds from the project across more than 20 locations, including 10 locations in Canada. At least 45 grosbeaks have been detected across these locations, including 34 birds detected via Motus stations. Tracks from 2018-19 show a high level of intra-regional movement within the ANF and indicate a high flock turnover at feeding stations. This means there are likely many more evening grosbeaks within the region than other count data (e.g., eBird) might show. We also recorded tracks for four evening grosbeaks tagged from three separate flocks during their return flights in 2019 – all leading to the same region just south of Saguenay, Quebec. This region correlates with current spruce budworm outbreaks (T. Hoar pers comm.). As mentioned above, evening grosbeak populations can be strongly tied to spruce budworm fluctuations and pesticide treatment of those outbreaks. In fact, the historic irruption seen this winter due to winter food shortages was likely bolstered by high evening grosbeak breeding success

fueled by spruce budworm outbreaks not treated due to pandemic-limited travel. One evening grosbeak track in particular shows a more detailed route of lake avoidance, traveling around and between lakes Erie and Ontario as a risk aversion migration strategy. Our preliminary tracking data also show evening grosbeaks timing their return flights to northern breeding grounds from late March to mid-May. With this tracking information, we are beginning to link winter populations of evening grosbeaks in Pennsylvania to potential breeding areas with active spruce budworm outbreaks in southcentral Quebec. We only stand to gain more information about how these birds use the landscape and time their movements with new Motus detections this spring and hopefully in the coming years – all to better inform full annual cycle conservation strategies for evening grosbeaks.



Map showing spring migration routes detected via Motus automated radio telemetry stations for four evening grosbeaks outfitted with nanotag radio transmitters in Forest County, PA during the winter of 2018-19. Despite being from three different flocks and leaving Pennsylvania on different dates between late-March and mid-May, all four birds migrated to a Canadian region in Quebec that has a current spruce budworm outbreak.

This effort to investigate the mysterious movement ecology of wintering evening grosbeak populations in Pennsylvania falls under the work of the Allegheny Bird Conservation Alliance and is a collaboration among the PNHP at the Western Pennsylvania Conservancy, the Powdermill Avian Research Center at the Carnegie Museum of Natural History, and the Finch Research Network. The project has also been made possible, in-part, through the support of the Nuttall Ornithological Club.

About the Author

David Yeany joined the PNHP in 2011 and currently serves as Avian Ecologist. His work focuses on conserving rare and declining bird species – including field surveys, monitoring, habitat relationships studies, spatial analysis, and tracking with Motus. David is passionate about birds and their conservation, gladly sharing his enthusiasm with anyone willing to listen.

Notes from the Field

Wood Turtle Conservation

Kathy Gipe

Kathy Gipe

The wood turtle is a medium-sized turtle that favors both terrestrial and aquatic habitats.

The Pennsylvania Fish and Boat Commission will receive Competitive State Wildlife Grant funds in the amount of $135,000 for the project titled "Regional Conservation for Wood Turtles and Related Emydine Turtles." The PNHP will help to implement key components of the Wood Turtle Conservation Plan, which was created with the support of a 2014 Competitive State Wildlife Grant. The 2020 grant will be used to address important wood turtle conservation needs. Actions include the restoration of key nesting areas, standardized population assessments in data-deficient areas, long-term studies of survivorship and population dynamics, centralized data analysis, intensive studies of animal movements and resource use at key sites, expanded range-wide genetics studies and genetic assignment capability, long-term housing and support for confiscated turtles, and expanded/standardized Passive Integrated Transponder (PIT) usage.

Due to its designation as a State Wildlife Action Plan priority species, and because our data from the first grant suggests that there may be declining populations in some areas, the wood turtle needs continued attention even though it is considered somewhat common in parts of the state. The PNHP data collection efforts will be an important contribution to an upcoming revised wood turtle federal status review, and our local management efforts will help to keep a unique part of Pennsylvania's wild heritage alive and well. We expect that this project will contribute to the long-term viability of representative and priority wood turtle populations.

Survey123 Improves iMapInvasives Data Collection

Amy Jewitt

Since 2013, the iMapInvasives program in Pennsylvania (www.paimapinvasives.org) has been a valuable tool for natural resource professionals and citizen scientists interested in tracking where invasive plants, animals, and insects are found. Downloading the iMapInvasives mobile app onto a phone or tablet simplifies collection of presence and not-detected data when outside and away from a computer. Data can also be entered using the online version of iMapInvasives which provides options to capture more detailed information. For those conducting land management activities, iMapInvasives can document treatment locations along with other pertinent details. Once documented, all information in iMapInvasives is easily shareable with others.

Recently, iMapInvasives began providing a new data collection tool within Esri's Survey123 mobile application that allows registered users to document survey and treatment data while in the field. Made primarily for land managers and natural resource professionals, the Survey123 app goes beyond the capabilities of the iMapInvasives mobile app (which collects only point data) by allowing individuals to record polygon delineated data on-the-go. After downloading the Survey123 app onto a smartphone or tablet, an iMapInvasives set-up guide (available on the Mobile Tools page at www.imapinvasives.org) shows users how to access a form for collecting iMapInvasives data. Once data collection is complete, users can easily upload their data from Survey123 into iMapInvasives with a Wi-Fi connection. The Survey123 app is free to download and does not require an Esri license to use.

The following scenarios demonstrate how the Survey123 app might be used by a natural resource

professional:

- A land manager conducts and simultaneously documents treatment efforts for multiple terrestrial invasive species found within a park by drawing polygons and/or lines representing the areas treated.
- A botanist surveys for aquatic invasive weeds in a large waterbody and draws lines and/or polygons to indicate presence or absence of species detections.

Whether you work with invasive species as part of your job, or if you map invasive species as a hobby, the Pennsylvania iMapInvasives program encourages you to get started using the Survey123 app today. Learn more by contacting Amy Jewitt, Invasive Species Coordinator, at ajewitt@paconserve.org, or by visiting the Mobile Tools webpage at www.imapinvasives.org.

The Survey123 app is a product of Esri, and NatureServe makes it available to iMapInvasives users.

More Data and Tools to Protect Biodiversity

Kierstin Carlson, Molly Moore, and Susan Klugman

One of the goals of the Heritage Program is to compile a list of all plant and animal species in Pennsylvania. This forms the basis of the work that follows: assessing a species' chances for continued existence over the next decades, and documenting the locations of rare species and habitats to protect the state's biodiversity.

To that end, we are continuing to add new species to our master list. The number of species of invertebrates (moths, butterflies, beetles, etc.) outnumbers vertebrates (birds, fish, mammals, amphibians, and reptiles) by nearly two orders of magnitude. Invertebrate Zoologist Betsy Leppo is constantly researching and assessing the butterflies, skippers, and moths (Order: Lepidoptera) of Pennsylvania. Her many contacts with other zoologists passionate about these creatures turned up over 1,000 species of moths in the past two years to add to the 1,234 species of Lepidoptera already on our list. Heritage Information Management added 660 of these species onto the master list in March 2021. For more information about our work, see the Spring 2020 newsletter: https://bit.ly/33ik9IT

Pete Woods

Southern longhorn moth (*Adela caeruleella*), one of the species newly added to the Heritage database.

Ephraim Zimmerman

A Pennsylvania Dry Oak Heath Forest. NVC Type: Western Allegheny Chestnut Oak – Mixed Oak/Heath Forest

Similar work with plant communities is being done by PNHP ecologists. Plant communities are groups of plants sharing a common environment that interact with each other, animal populations, and the physical environment. We have been working with NatureServe to classify Pennsylvania plant communities according to the National Vegetation Classification System (NVC), developed by the U.S. NVC partnership of federal agencies, NatureServe, and the Ecological Society of America. Cross-referencing our data with the NVC allows us to standardize our data with other Heritage programs and natural resource agencies across the country, and provides a basis for regional data analysis and data products. In March we added over 150 NVC community types recognized as occurring in Pennsylvania to our plant community list. More information on Pennsylvania plant communities can be found on the PNHP website: http://naturalheritage.state.pa.us/Communities.aspx.

Efficiently documenting occurrences of the newly added and existing rare species and exemplary plant communities across Pennsylvania is a tall order. To increase data quality and completeness, GIS Specialist Molly Moore has been developing data entry and quality control tools in FIND, the field survey database used by

Heritage biologists. The first ever FIND Data Entry and Reporting Toolbox was unveiled in the spring of 2020 and continues to be updated with custom tools that will enable lists of species at a site to be more precisely described, improve data flow through the system to completion, and advance PNHP methods for planning surveys and tracking communication with landowners.

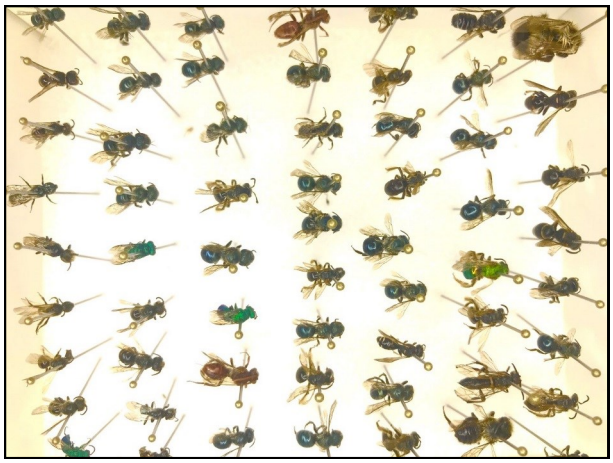
Revisiting Old Bee Collections

Pete Woods

One component of our ongoing study of bees in barrens, funded by the Pennsylvania Department of Agriculture, is to find and identify specimens of bees that were previously collected in barrens habitats. In 2011 we collected insects in malaise traps and in yellow pan traps at the Slaughtering Ground Barrens in Clinton County, in collaboration with the Carnegie Museum. Bees were among the insects captured in those traps, but were not a group we were focusing on at the time, so the bees (mixed in with many other non-target insects) were stored in jars of alcohol at the Carnegie Museum. This winter, PNHP biologists converted their home offices to home laboratories and opened up those jars. After working through the challenge of ventilating the stinky alcohol fumes, they strapped on their head magnifiers, sorted out the bees, and pinned and labeled them. We will be sending those bees to our collaborator Mike Slater for identification.

Noe Woods

PNHP biologist Pete Woods in his home laboratory.



Pete Woods

A variety of bees from one malaise trap

While we were working with the mixed specimens, we also sorted out flower flies, an important group of pollinators that we hope to start working on in the near future. This spring we will also start sorting through a similar but larger set of samples that were collected in 1997 at four barrens sites in Pennsylvania.

Digitizing a Legacy Slide Collection

Betsy Leppo

As freshwater insects, dragonflies and damselflies (order Odonata) represent one of the most imperiled groups of animals in North America (Master et al. 2000). The conservation of aquatic invertebrates can be a daunting task, since species-level identification is difficult, generally requiring specialized sampling techniques and identifications done by experts. However, dragonflies and damselflies are somewhat of an exception. With 181 species documented in Pennsylvania, it is a diverse but not overwhelming group of insects to study, and many species are identifiable in the field or from photographs. Public interest in dragonflies and damselflies has been growing in popularity in recent years, especially with the advent of comprehensive field guides and the growth of online photo and data sharing sites like BugGuide, Odonata Central, and iNaturalist.

Clark Nelson Shiffer of State College worked as an aquatic biologist and the Herpetology and Endangered Species Coordinator for the Pennsylvania Fish and Boat Commission until his retirement in 1993. His passion was photographing and documenting the natural history of damselflies and dragonflies. Mr. Shiffer traveled the country to find different kinds of odonates and was a founding member of the Dragonfly Society of the Americas. Most of his time was spent observing local species found in the streams and wetlands of Pennsylvania. He kept detailed records of his observations starting in the early 1970s. He added to record logbooks that were originally kept by George and Alice Beatty when they were professors at Penn State University. These logbooks contain an estimated 30,000 current and historical odonate records, with data gathered from museums and researchers across the state. Some of the records date back to the 1800s. Between 2003 and 2007, the Pennsylvania Natural Heritage Program digitized over 13,000 location records from the paper logbooks into an Access

Clark Shiffer

Mr. Shiffer's collection contains images of state and globally rare species such as the New England bluet (above), skillet clubtail, pygmy clubtail, and pygmy snaketail.

database called the Pennsylvania Odonate Database with funding from two Wild Resource Conservation Program grants.

In 2017, Mr. Shiffer's odonate specimen collection was donated to the Florida State Collection of Arthropods in Gainesville, where it will be cared for into the future. Now we have the opportunity to preserve a portion of Mr. Shiffer's 35 mm slide collection which was generously donated by his family to the Pennsylvania Natural Heritage Program. These photos represent a lifetime of work, with high quality images and one-of-a-kind observations. With the help of Sally Ray (retired PNHP biologist, now program volunteer), we will scan and catalog an estimated 3,000 slides that were selected by Mr. Shiffer as the most important out of his collection because of the quality of the photographs, the documentation for a particular locale, or because of a unique species behavior or characteristic that was captured. This will also digitize many of the voucher photographs that are recorded and georeferenced in the Pennsylvania Odonate Database. Once digitized, the images will be labeled, tagged with location and content keywords, 'cleaned' to remove dust marks and other irregularities, and posted online where they can be accessed for research and educational purposes. We believe that sharing this catalog of images online will help increase interest in odonates in Pennsylvania, and will inspire additional research and conservation of odonates and their habitats.

Clark Shiffer

The Shiffer collection also contains many lovely images of common species such as delta-spotted spiketail (*Cordulegaster diastatops*).

Understanding River Scour with Time-lapse Cameras

Christopher Tracey

River scour habitats are unique natural communities that occur along the shores of the Youghiogheny River in Fayette County. These sunny, open, riverside habitats are dominated by warm-season grasses and species more typically found in midwestern tallgrass prairie systems and are maintained by natural disturbances including high velocity floodwaters and ice-scour. River scour habitats typically form when material originating in the uplands, loosened by frost-heave and erosion during heavy rains, and carried by steep tributary streams is deposited as the water slows when it enters the larger river. This material often accumulates just below the mouth of the tributary, forming a rocky delta protruding into the river. These areas frequently flood and very few plant species are able to withstand the destructive power of the flowing water, woody debris, and blocks of ice.

Christopher Tracey

Monongahela Barbara's buttons (*Marshallia pulchra*)

Some Youghiogheny river scour plant species such as Monongahela Barbara's buttons (*Marshallia pulchra*) are showing potential declines in their population sizes. One potential reason for these declines is hydrological alteration, either by management of the dam at Confluence or through climate change alterations in the seasonal pattern of precipitation. For example, there has been an increase in the number of severe summer

storms that raise the water level in the river and may flood the *Marshallia* during the flowering and fruiting season (typically when the river is at its lowest levels).

PNHP ecologists rarely get to visit these river scour habitats when the river is flowing high, as the sites are typically underwater and accessing them would be unsafe, if not impossible. In the past, we have relied on field observations such as leaves and other woody debris stuck in trees as indicators of high water. In order to learn more about the scour process, PNHP ecologists deployed a series of trail cameras at several river scour locations within Ohiopyle State Park. These cameras took a photo at fifteen-minute increments, matching measurements taken by the river gage, allowing us to gain a firsthand view of water flowing through the river scour habitat. One of these high flow events occurred on December 25, 2020, where the Youghiogheny rapidly rose from 2.7 feet (1,590 cubic feet per second) to 9.5 feet (12,000 cfs) over the course of a day as measured at the USGS gage in Ohiopyle. The results were dramatic, as we were able to observe the river spilling over the scour, see large woody debris breaking shrubs and small trees, and witness the river slowly returning to base levels.

From these images, we have developed videos for many of our scour sites. An exciting aspect of these videos is that we were able to overlay an animated hydrograph, allowing us to better understand river levels and the impact of flowing water on these river scour habitats. An example of one of these time-lapse videos can be seen at https://vimeo.com/502443022. The results from these cameras are providing PNHP with unprecedented understanding of river scour ecosystems and the factors that impact the health and persistence of rare species found there.

Christopher Tracey

A trail camera deployed at a river scour location in Ohiopyle State Park.

Example of December 2020 time series

2020-12-14 Gage height = 2.34 ft; flow = 230 cfs
No major high water events had occurred on this site since the end of the growing season as evidenced by the standing vegetation.

2020-12-22 Gage height = 3.02 ft; flow = 1,770 cfs

2020-12-25 Gage height = 8.62 ft; flow = 9,970 cfs
A large rain event over the preceding two days significantly increased the flow in the river. The staff gage is completely submerged, indicating that at least two feet of water is covering the river scour.

2020-12-28 Gage height = 3.75 ft; flow = 2,430 cfs
The river levels have decreased

Evaluating a Novel Riparian Wetland Mitigation Strategy

Ephraim Zimmerman

For the past year, PNHP ecologists have assisted DEP, Resource Ecological Solutions (RES), and researchers from Ohio University to evaluate the success of a large riparian ecosystem restoration initiative in the Wheeling Creek watershed of Washington County, Pennsylvania. This project, called the Robinson Fork Mitigation Bank (RFMB), is a large watershed-scale mitigation bank created to restore and preserve self-sustaining functional stream, wetland, and riparian corridors. Mitgation banks, such as RES's RFMB, provide in-kind replacement for the direct loss or functional degradation of stream and wetland resources resulting from construction and development projects within the Ohio River watershed.

Ephraim Zimmerman

A vegetation monitoring plot in a restored wetland community within the McCulley Run restoration area, a tributary to Robinson Fork of Wheeling Creek, Washington County, PA.

Beginning in 2017 in Robinson Fork, RES restored or enhanced approximately 132,756 linear feet (approximately 25 miles) of streams and 58.32 acres of wetlands which had been degraded by agricultural activities, timbering practices, and natural resource extraction. The restoration efforts within the RFMB have focused on the creation of an integrated and dynamic stream and floodplain system, which reconnected floodplains to the water table and streams.

Researchers from Ohio University are currently monitoring changes in hydrology, water temperature, and nutrient flux at six study sites within the RFMB following restoration. PNHP is helping to determine success of the restoration activity, focusing on vegetation and amphibian communities at the sites.

Ephraim Zimmerman

Mountain chorus frog (*Pseudacris brachyphona*), an amphibian species found at the Robinson Fork site.