

PCP's Year in Review

2018

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The North Carolina Plant Conservation Program was established by the Plant Protection and Conservation Act of the North Carolina Legislature in 1979. The Program is part of the Plant Industry Division of the North Carolina Department of Agriculture and Consumer Services.

The mission of the Plant Conservation Program is *to conserve North Carolina's native plants in their natural habitats, now and for future generations.*

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PROTECTION PRIORITIES

PCP's conservation goal is to ensure protection of the two best natural populations of each imperiled plant species within each of the state's 22 ecoregions in which they naturally occur. PCP maintains a list of priority sites available to distribute to partners in both spreadsheet and GIS shapefile formats. Send info requests to lesley.starke@ncagr.gov. We will be working with our partners to alert them to any changes in our priority lands portfolio that are in their working area. Given possible changes to the total protected species list as well as new population discoveries, loss of populations to various causes, and updates regarding the viability of known locations, the PCP staff anticipates the need to reassess which are the two best sites per ecoregion periodically. We remind all of our conservation partners to help us do this by submitting your data and observations of rare plants and communities to the NC Natural Heritage Program whose databases greatly inform our prioritizations.

Conservation Targets

Plant Conservation Preserves are the only public lands in North Carolina established and managed specifically to protect imperiled plant species. To help accomplish PCP's mission of conserving North Carolina's native plant species *in their natural habitats*, each of our 25 preserves is specifically designed with a focal species; yet in most cases, multiple species are protected at a given site. As of December 2018, the Plant Conservation Program's preserve system protects 74 extant threatened, endangered, or vulnerable species (11 of which are federally protected species; see page 23).

Property Acquisition Updates

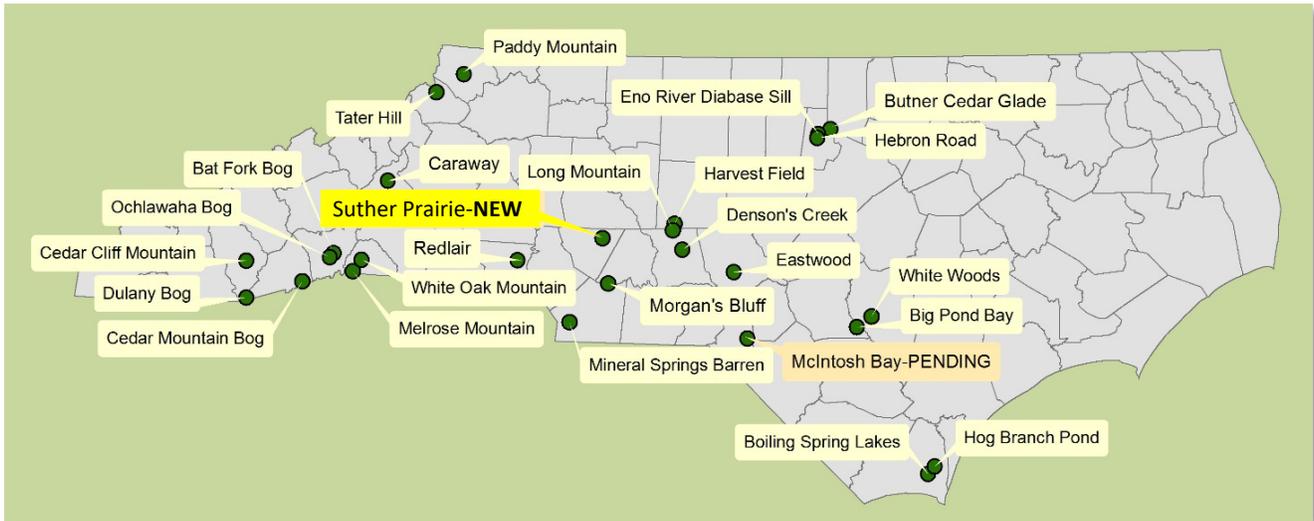
Suther Prairie (+78 acres): In October, Suther Prairie became PCP's 25th Plant Conservation Preserve. This site is located in Cabarrus County, bringing the total number of counties with PCP preserves to 19. Suther Prairie is home to several imperiled plants including the state-protected red Canada lily (*Lilium canadense* ssp. *editorum*) and small sundrops (*Oenothera perennis*). This site is famous for never being farmed or plowed. The wet meadow central to the site has been kept open by mowing and cutting for hay since it was first settled in the mid-1700s.

Tater Hill (+200 acres): The Blue Ridge Conservancy was awarded state grant funding in 2017 to acquire the Harmon Knob (Phase 2) tracts as additions to the Tater Hill PCP Preserve in Watauga County. These properties closed, and deeds were recorded and transferred to the state in May 2018. This added approximately 200 acres to the eastern side of Tater Hill PCP Preserve. The combined Phase I and II area encompasses 360 acres of exceptional habitat and improves the boundary of the preserve to better include the Harmon Knob amphibolite mountain feature.

Tater Hill (2-acre boundary adjustment): PCP worked with the NC Natural Heritage Program, the NCDA&CS Property and Construction Office, and the owners of a private property adjacent to the Tater Hill preserve to agree on a small boundary adjustment. This adjustment involved trading two acres with the private landowner. The trade increased the conservation value of the preserve and allows for the protection of previously unprotected patch of Gray's lilies (*Lilium grayi*).

Butner Cedar Glade (+1 acre): In 2016, PCP staff discovered a population of state endangered veined skullcap (*Scutellaria nervosa*) on the parcel immediately adjacent to the Butner Cedar Glade PCP preserve in Granville

County. This 1-acre parcel is owned by the Town of Butner. Acquisition will enable the community to be managed as part of the same site for the benefit of this and other rare species, to provide additional habitat for the rare species currently within the preserve, and to allow for better management of non-native invasive plant species within both parcels, but especially the larger infestations of Japanese stiltgrass (*Microstegium vimineum*) on the Town’s parcel. In November 2018, this land transfer was approved by Council of State and the Butner Town Council and is currently in the closing process.



The PCP Preserve system includes 25 preserves in 19 counties across the state, totaling >14,240 acres.

NEW STAFF

In March of this year, John Eaton joined the PCP staff as a full-time field technician. John has a background in conservation biology as well as auto mechanics, which means not only can he manage our preserves, he is also able to diagnose and help fix the tools needed for the job!

In August of this year, Mamie Colburn was hired by FoPC as a part-time volunteer coordinator. With degrees in environmental science as well as her previous work as a steward and volunteer coordinator for The Nature Conservancy, Mamie has been a great addition to the team.



VOLUNTEERS

In addition to staff time, PCP's stewards and other **volunteers logged 2,843 hours** across 9 preserves in 2018! Their time and efforts included hundreds of stewardship site visits, volunteer workdays, and time spent on augmentation projects. Tasks included invasive species control, brush cutting and piling, monitoring, trash removal, and much more. There is more to do! If you or someone you know who would like to help, please contact Mamie Colburn, Volunteer Coordinator for Friends of Plant Conservation (mamie.fopcvolunteers@gmail.com).



Students lending a hand: ASU trash removal at Tater Hill, Camelot Academy oriental hawksbeard (*Youngia japonica*) removal at Hebron Road, and Caldwell College marsh dayflower (*Murdannia keisak*) removal at Bat Fork Bog.



Staff and volunteers brave sweltering August temperatures to tackle sweetgums at McIntosh Bay. Members of the French Broad River Garden Club hand-pull microstegium at Caraway.

FOPC TOURS/WORKDAYS

The goal is to provide a workday or tour approximately once per month throughout the growing season. While a few of these events were cancelled due to unforeseen circumstances, PCP staff successfully hosted nine workdays and tours in 2018. The primary purpose of these events is to engage folks in a variety of ways:

- Increasing awareness of rare plants and their habitats through educational tours
- Educating the public about the threats to these natural communities and the need to conserve, protect and restore them
- Providing individuals with hands-on experience in land management and related tasks that directly benefit these important ecosystems

PCP's tours and workdays are open to the public and free for Friends of Plant Conservation members (www.ncplantfriends.org). Each trip provided the opportunity to observe rare plants, while also learning more about land management and ecological stewardship. The schedule of events for this year will be posted by early March and can be found on our website: www.ncplant.com.

FoPC Tours/Workdays held in 2018

Date	Preserve/Site	County	Task
Mar. 23	Caraway	McDowell	Counting Oconee bells
May 11	Redlair	Gaston	Bigleaf magnolia tour
Jun. 26	McIntosh Bay	Scotland	Tour and brush removal workday
Aug. 21	Picture Creek Diabase Barrens	Granville	Invasives workday
Oct. 8	Mineral Springs Barren	Union	Schweinitz's sunflower count
Oct. 9	Redlair	Gaston	Schweinitz's sunflower count and invasives removal
Oct. 12	Eno River Diabase Sill	Durham	Invasives workday
Nov. 10	Redlair	Gaston	FoPC Annual Meeting + Redlair Field Trip
Dec. 7	Picture Creek Diabase Barrens	Granville	Smooth coneflower seed cleaning at the NC Botanical Gardens



FoPC Workdays/Tours (*in reading order*): Volunteers monitoring Schweinitz's sunflower at Redlair, counting Northern Oconee bells at Caraway, admiring bigleaf magnolias at Redlair, removing brush at Picture Creek Diabase Barrens, and cleaning smooth coneflower seeds at the NC Botanical Gardens for future population augmentation efforts at Picture Creek.



HABITAT RESTORATION

Habitat restoration is an integral part of PCP's mission to protect the rare plants of North Carolina and their habitats. Management and restoration efforts are ongoing at many of our preserves, with the three Durham and Granville County preserves receiving the most attention. Together, these sites support a total of two federally listed species and fifteen state listed species, and an additional thirteen species considered to be rare by the NC Natural Heritage Program. Our management technician, along with staff and volunteers, have been working hard to restore these sites to their natural prairie/savanna landscape which has declined dramatically across its range over the past few centuries.

To achieve our restoration goals, we have been gradually thinning the canopy at these preserves to a more natural, open structure through selective mechanical removal and burning. During the growing season, weedy and invasive plants are the primary target of management efforts. Invasive species such as Japanese stiltgrass (*Microstegium vimineum*), Chinese privet (*Ligustrum sinense*), heavenly bamboo (*Nandina domestica*), wisteria (*Wisteria sinensis*) and lespedeza (*Lespedeza cuneata*) as well as weedy natives such as sweetgum and blackberry are controlled with various methods including manual, mechanical, and chemical methods.

Restoration needs vary widely across our 25 preserves. While some sites have experienced significant anthropogenic disturbance, others have been relatively unscathed by logging, grazing, agriculture, or fire suppression. For instance, preserves in the Coastal Plain typically need fire every 2-3 years to thrive while some of our high elevation mountain sites may only experience natural fire events once every 1,000 years! Restoring the natural hydrology to mountain bogs, removing invasives from our more urban sites, and reintroducing regular fire to the majority of our preserves are vital to the conservation of the rare species and natural communities that occupy them.



Staff cut down multiple loblolly pines to create more open conditions around the dwarf sumac and smooth coneflowers at the Eno River Diabase Sill preserve. Students from Camelot Academy helped haul the biomass into the woods and scatter it to facilitate natural decomposition. In early summer, two new coneflowers were discovered nearby, likely representing natural spread of the species into previously unoccupied areas. Our thinning and constant invasive removal efforts in this spot seem to be paying off!

Controlling Invasive Species

Ongoing control measures are occurring at several preserves, such as *Lespedeza* species, Japanese stilt grass, (*Microstegium vimineum*), privet (*Ligustrum sinense* and *L. japonicum*), wisteria (*Wisteria sinensis*), heavenly bamboo (*Nandina domestica*), and Queen Anne's lace (*Daucus carota*). We use a combination of staff and volunteer time on these management projects.

Invasive control efforts this year focused primarily on the three Piedmont preserves located in Durham and Granville Counties. Staff, stewards and volunteers have been working hard to remove these species, which tend to outcompete native plants and reduce floristic diversity. In addition to the ongoing work at these preserves, large-scale efforts to eradicate invasives also continue at the Redlair preserve in Gaston County. Preserve steward Haywood Rankin—with the help of staff, dedicated volunteers, and contractors—continues to contribute hundreds of hours each year to invasives management effort.

While our Piedmont preserves support by far the most widespread infestations of invasives, our Bat Fork Bog preserve in the mountains also contains large areas of these species. Volunteers, staff and contractors have spent many days working to remove invasives from the bog and surrounding wooded swamps. Several volunteer workdays have targeted *microstegium* and *Murdannia keisak* in the vicinity of the federally listed *Sagittaria fasciculata* and *Helonias bullata* populations. The most wide-spread invasive issue at the bog however, is a monoculture of invasive grass that has dominated the main bog for over 50 years. For the second year in a row PCP and NCDA&CS support staff tackled a larger project this year at the Bat Fork Bog, dealing with the invasive reed canary grass (*Phalaris arundinacea*) which occupies nearly half of the preserve. In previous years, PCP staff used herbicide spray treatments to begin to control this monoculture; however, we were unsuccessful in obtaining lasting results. In 2017, PCP staff teamed up with Dr. Bridgett Lassiter, Weed Specialist with NCDA&CS Plant Industry Division, to create a new treatment plan. We examined new research and modified our strategy to include different herbicides and multiple treatments in the same year. In 2018 we applied four treatments throughout the summer and, as in 2017, no resprouting *Phalaris* was observed.

The results of these first two years of treatments have been dramatic and the progress being made is very encouraging. Application of current chemical cocktail has shown a near 100% *Phalaris* mortality rate while appearing to have virtually no negative impacts to the surrounding vegetation. Due to wet/thick conditions in the bog, it is difficult to access all of the *Phalaris*, which is one reason for the multiple treatments per year. Each treatment paves the way for us to treat previously inaccessible areas.

Significant progress has been made over the past two years in tackling this invasive grass. PCP will continue treatments with the goal of total eradication of *Phalaris* from the bog.



June 2018: Killing *Phalaris* with drones, backpacks, and ATVs.



July 2018: Second round of treatment following a very successful first round one month prior.



August 2018: Round three, using backpack sprayers to treat previously inaccessible areas. Formerly suppressed species are now beginning to colonize. A fourth treatment was conducted in **September 2018** using backpack sprayers to spray the remaining *Phalaris*.



Before and after photos showing the effects of an herbicide treatment on microstegium (*left and center*). PCP staff cutting brush in Durham (*right*).

Controlled Burning

Controlled burns are one of the most important management and restoration activities employed across the PCP preserves and for North Carolina’s rare plants in general. Fire suppression is the second greatest threat to plant species in our state (following habitat destruction by development), and in fact, hundreds of rare species benefit from controlled burns. PCP staff have identified burning needs at 20 of our 25 preserves. This year, PCP staff and the NC Forest Service conducted **17 prescribed burns at nine preserves** across the state from the mountains to the coast. These burns benefitted rare species as varied as Venus flytrap, rough-leaf loosestrife, smooth coneflower, smooth aster, swamp pink, and Schweinitz’s sunflower. In one week, and with significant help from NC Forest Service and other partners, staff conducted burns at three preserves as far apart as Durham and Transylvania Counties, benefitting no fewer than four federally listed plants plus many more state-listed and/or rare species!

Burns conducted at PCP preserves in 2018

Preserve	County	Region	Date	Acres
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	2/28/2018	9
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	6/5/2018	50
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	6/5/2018	8
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	7/3/2018	205
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	8/21/2018	3
Boiling Spring Lakes	Brunswick	Coastal Plain (outer)	8/21/2018	10
Cedar Mountain Bog	Transylvania	Mountains	4/13/2018	47.6
Eastwood	Moore	Sandhills	12/6/2018	9
Eastwood	Moore	Sandhills	12/6/2018	10
Eastwood	Moore	Sandhills	12/6/2018	16
Eno Diabase Sill	Durham	Piedmont	3/16/2018	4
Hebron Rd. Prairie	Durham	Piedmont	4/10/2018	6
Hog Branch Ponds	Brunswick	Coastal Plain (outer)	3/13/2018	55
Mineral Springs Barrens	Union	Piedmont	4/12/2018	22.4
Mineral Springs Barrens	Union	Piedmont	4/12/2018	12
Pondberry	Sampson	Coastal Plain (inner)	2/21/2018	22
Redlair	Gaston	Piedmont	3/16/2018	1
9 PRESERVES	7 COUNTIES	5 REGIONS	12 DAYS	486 ACRES



Response to April 10th Hebron Road burn (*left to right*): Day of burn; three weeks post-burn wild quinine and prairie dock begin to emerge; eight weeks post-burn wild quinine is in flower and saplings show successful top-kill.



Wanderlust tract and Penny's Bend burn April 20th (*in reading order*): Penny's Bend uplands. Successful reduction in sapling layer along river floodplain. New rare plant population found in thinned area following the burn: Earle's blazing star. The addition of one smooth coneflower plant, grown from seed collected on site, doubled the population at the Wanderlust tract 😊.





Cedar Mountain Bog burn April 13th (in reading order): Upland areas burning. Fuel consumption in the bog. *Sarracenia purpurea* var. *montana* singed by the low intensity fire in the bog. Burn in uplands surrounding bog successfully killed invading white pines and reduced shrub cover.



Boiling Spring Lakes burn June 5th in an area supporting both Venus flytraps and federally endangered rough-leaf loosestrife (*Lysimachia asperulifolia*).

Management Plans

PCP staff are in the process of writing management plans for all 25 plant conservation preserves. Two management plans covering three preserves have been drafted and are under review. Due to their similarities in habitat and management needs, the Eno River Diabase Sill and Hebron Road preserves in Durham County have been written into a single plan. The second management plan covers the Redlair plant conservation preserve in Gaston County.

Augmentations and Reintroductions

PCP continued to work on an ongoing smooth coneflower augmentation project at the PCP Preserves in Durham County led by veteran volunteer stewards Herb and Pat Amyx. We also expanded this work onto privately-owned land adjacent to PCP property to support the native smooth coneflowers growing there. Several hundred smooth coneflower seeds were sown at the Freudenberg Performance Materials property. In May, staff counted ~130 seedlings which had sprouted! We will continue to monitor the survivorship of these plants in coming years.



Smooth coneflower seeds collected from the Freudenberg site near Eno River Diabase Sill were cleaned and then planted back on site following a spring burn.



On June 21st, staff and volunteers assisted with the planting of 57 *Helonias bullata* rosettes, grown at the Atlanta Botanical Garden from seeds collected from EO #19 in 2015. First reported in 1982, the declining natural population at Cedar Mountain Bog had been extirpated by 2006.



Staff from PCP, US Fish and Wildlife, and the Atlanta Botanical Garden planted *Helonias* at Cedar Mountain Bog in June following an April burn.

Augmentation and Reintroduction activities at PCP Preserves in 2018.

Site name	Unit name	Date	Species	Activity	Notes
Eno River Diabase Sill	Williams	Jul. 2018	<i>Echinacea laevigata</i>	Seedling planting	9 outplanted
Eno River Diabase Sill	Williams	Aug. 2018	<i>Echinacea laevigata</i>	Seedling planting	8 outplanted
Eno River Diabase Sill	Williams	Sept. 2018	<i>Echinacea laevigata</i>	Seedling planting	3 outplanted
Cedar Mountain Bog	Bog	Jun. 2018	<i>Helonias bullata</i>	Seedling planting	57 outplanted

RARE SPECIES MONITORING

Understanding the current status and trends of the populations we protect is very important. To that end, we have been collecting flowering data on several species across the state. In 2018, census and/or population monitoring work was conducted for the following species:

- **Bunched arrowhead** (*Sagittaria fasciculata*) - Henderson Co. (2 sites)
- **Swamp pink** (*Helonias bullata*) - Henderson, Transylvania Cos. (8 sites)
- **Schweinitz's sunflower** (*Helianthus schweinitzii*) - Randolph, Montgomery, Union, Gaston Cos. (4 sites)
- **Smooth coneflower** (*Echinacea laevigata*) - Durham, Granville Cos. (5 sites)
- **Mountain sweet pitcher plant** (*Sarracenia purpurea* var. *montana*) - Transylvania Co. (1 site)
- **Montane purple pitcher plant** (*Sarracenia jonesii*) - Transylvania Co, (1 site)
- **Heller's blazing star** (*Liatris helleri*) - Ashe Co. (1 site)
- **Gray's lily** (*Lilium grayi*) - Watauga Co. (1 site)

Additional rare plant surveys/monitoring conducted this year:

- **Canby's dropwort** (*Oxypolis canbyi*) - Scotland Co. (1 site)
- **Northern Oconee bells** (*Shortia galacifolia* var. *brevistyla*) - McDowell Co. (1 site)
- **Michaux's sumac** (*Rhus michauxii*) - Durham Co. (1 site)
- **Canada lily** (*Lilium canadense* ssp. *editorum*) - Henderson Co. (1 site)
- **Sandhills Lily** (*Lilium pyrophilum*) - Moore Co. (1 site)
- **Buffalo clover** (*Trifolium reflexum*) - Granville Co. (1 site)
- **Pursh's wild petunia** (*Ruellia purshiana*) - Durham Co. (1 site)
- **Reticulate nutsedge** (*Scleria reticularis*) - Scotland Co. (1 site)



Volunteers assist PCP and National Park Service staff with monitoring Heller's blazing star and installing permanent plant markers at Paddy Mountain.

Species Status Review

The Plant Conservation Board has a Scientific Committee which advises them on a number of topics. One of the primary tasks of the committee is to make recommendations to the Board for changes to the NC Protected Plant List. The last update to the list was published in 2010 after a lengthy review process which began in 2008. This process included the development of a more consistent, intuitive, and scientifically defensible review protocol. This method incorporated guidelines developed by NatureServe and the World Conservation Union (IUCN). Each species in the NC Natural Heritage Program database of tracked plant species was reviewed for its rarity, short-term trends, and threats. Following the last update, the committee decided to perform update reviews every five years which they did initiate in 2015. However, after a couple of pauses for various reasons, this process was reinstated in earnest in late 2017 and continued throughout 2018. The Scientific Committee created an informal subcommittee consisting of the committee chair, Dr. Alan Weakley, botanist with NC NHP, Laura Robinson, and PCP staff, Lesley Starke. It is expected that the Scientific Committee will review the recommendations from the subcommittee in early to mid-2019 and share their final recommendations to the Plant Conservation Board by end of 2019. A public comment period will be announced once the Board has received the recommendations from the committee.

Pests and Pathogens

Identifying and controlling the spread of exotic invasive diseases is a global challenge. While the vast majority of these pests and pathogens may be host-specific, the impact that the death of these host species has on the landscape can be devastating and may fundamentally change the structure and integrity of the entire ecosystem. PCP has been working to assess these threats and identify the best options for protecting the rare plants and natural communities on the preserves.

Hemlock Woolly Adelgid (Insect)

In January, PCP staff visited Paddy Mountain to map its population of Carolina hemlocks and survey them for Hemlock Woolly Adelgid (HWA) infestation. This information was shared with the US Fish and Wildlife Service who had put out a request for data on the health and distribution of these plants throughout their limited range. The HWA is an exotic insect that has decimated most of the hemlock forests throughout the eastern US and chemical controls are cost-prohibitive and their potential risk to pollinators and nearby rare plants is concerning. Though few PCP's preserves have significant amounts of Carolina or Eastern hemlock, we have been working with the NCDA&CS Beneficial Insects Lab to identify populations that may benefit from the release of a beetle (*Laricobius* spp.) that feeds only on HWA. In May, the Department's Beneficial Insect Lab released 132 adult beetles at Caraway Preserve plus what they estimate as hundreds of larvae onto HWA-infested eastern hemlocks there. The preserve will be monitored over the next few years by the lab to assess if a successful insectary is being established at Caraway.



PCP staff maps hemlocks at Paddy Mountain and assesses the level of Hemlock Woolly Adelgid infestation within the population.

Lily Leafspot Disease (Fungus)

Lily leafspot is a disease caused by a fungus that affects native lilies throughout the east coast. The fungus causes spots and discolorations of the stem and leaves each growing season. While the plants are often able to flower, they generally die back before mature fruits can be produced. Tater Hill supports three native lily species, including two which are state-listed—Grays’ lily (*Lilium grayi*) and wood lily (*Lilium philadelphicum*). While this disease has been known for some time, little attention had been paid to the impacts it was having on the plant’s ability to reproduce. Since lilies are perennials and they continue to produce flowering stems year after year in spite of yellowing leaves, their effects on fruiting had been overlooked until recently.

Recent research has shown just how wide-spread and significant a problem lily leafspot disease is and causing alarm among the landowners and agencies that protect and monitor these plants. In June, PCP installed twenty 1m² plots at Tater Hill to collect baseline data on the rate of reproduction within the Gray’s lily population. Half of the plots were established in the forested portion of the population while the other half were installed on the open bald. The plots were selected for their relatively high densities of flowering lilies and were monitored several times over the course of the summer. Data recorded at each visit included the number of vegetative and flowering stems present, the extent of wilt on each plant, and the number of plants that produced fruits. 10% or less of viable seeds were collected from these plots and were transported to the NC Botanical Garden for seedbanking.

Gray’s lily plot data from Tater Hill preserve, 2018.

Date	Total # stems	# flowering stems	# stems with lesions	# stems dead/dying
6/14/2018	131	65	11	104
7/13/2018	107	15	62	42
8/24/2018	-	4 (fruiting)	-	-



Assessing the effects of lily leafspot on fruit production in Gray's Lily at Tater Hill, August 2018.

Laurel Wilt (Insect + Fungus)

The redbay ambrosia beetle (*Xyleborus glabratus*) is an invasive exotic species which bores into plants in the Laurel family to lay eggs, carries with it the fungal pathogen *Raffaellea lauricola*. First detected in North Carolina in 2011, laurel wilt disease is causing the death of *Persea* species throughout the southeast but is capable of also impacting related species such as federally endangered pondberry (*Lindera melissifolia*) and state threatened pondspice (*Litsea aestivalis*). Infected plants show signs of distress with yellowing wilting leaves; however, in many cases, by the time symptoms are visible, the plant is doomed to death. Mortality is extremely high with this species and treatments after infection are typically ineffective. Laboratory and greenhouse experiments have identified an effective fungicide for pre-treating susceptible avocado plants; however, this chemical has not been used in natural landscapes, nor on small-diameter species such as pondberry. PCP has developed a three-prong plan moving forward to address concerns regarding this spreading disease and imperiled species: (1) conduct additional monitoring by trapping for beetles in areas near pondberry and pondspice populations, (2) remove/topkill large diameter swamp bays (*Persea palustris*) with fire and mechanical treatments to limit the availability of suitable hosts for the beetles, and (3) field test the use of an approved fungicide on imperiled species.

As of fall 2018, all three phases have been completed. In April, two teams hung traps within 2-3 miles of the Pondberry Bay and Big Pond Bay preserves. Sixteen Lindgren funnel traps using alpha-copaene lures were set up. Staff checked the traps every two weeks from June through September and identified contents. This time frame was determined based on the vector flight period, the beetles are most active in North Carolina from June to September. Target beetles were not detected in any of the traps, suggesting that the species has not yet reached the area immediately around these preserves.

The second part of the grant was to remove non-imperiled host plants around rare plant locations to reduce the beetle's food sources. Volunteers removed all large diameter (>1") swamp bay trees within the primary bay using hypo-hatchet injection method. Over 4 visits, 124 swamp bays were treated.

The final part of the grant was to test and utilize effective chemical treatments to prevent laurel wilt. There is little knowledge of success in controlling the vector of this disease and that is typically not viewed as the primary strategy among researchers and practitioners familiar with LWD. Therefore, a small phytotoxicity study was developed to determine whether *Lindera melissifolia* experiences any ill effects from the fungicide Propiconazole.

A total of seven plots were selected based on their distance from nearby plants as well as their size and distribution within the population. Regular visits were made to the plots throughout the summer to monitor the plants for visual changes. No significant detrimental changes were observed to the chemically treated pondberry. In preparation of this treatment, in August 2017, PCP along with the Botanical Garden, and USFWS staff collected ripe fruits from throughout the bay for safeguarding. The group collected 539 seeds from 29 maternal lines.



Staff installing Lindgren funnel traps.

Permits & Regulations

In North Carolina, a protected plant permit is required to (a) remove from the wild, (b) to propagate or offer for sale/donation/gift, or (c) to plant or reintroduce any protected plants or plant parts into a non-garden environment. Exempt activities include: purchase of propagated protected plant species from nurseries or dealers with necessary permits, activities allowed under existing state laws and regulations, collection or removal from one's own land, or propagation or sale covered by a current certificate of origin. See 02 NCAC 38F.0407 for more information. PCP staff share all project details as well as copies of permits with partners at the NC Natural Heritage Program and US Fish and Wildlife Service for their records. Most permits require a final report be sent to PCP. We maintain a copy of all findings and reports in an effort to collate available knowledge on the protected

plants of North Carolina and their habitats. A total of 18 regulatory permits were issued in 2018 along with an additional 39 preserve access permits.

Ginseng

PCP regulates the sale of American ginseng (*Panax quinquefolius*) in North Carolina by issuing licenses to dealers and tracking all exports out of the state. All international exports require additional USFWS Convention on International Trade in Endangered Species (CITES) export certification. Before being exported out of state, all ginseng, both wild and cultivated, must be certified by NCDA&CS staff and reported to PCP. PCP Staff work directly with the licensed dealers to obtain as much data as possible regarding the locations and weights of harvested wild ginseng to monitor the health of the state's population. With these data, staff tally the total pounds of wild ginseng roots that are harvested per county which allows an estimate of the number of harvested plants per year. These data also inform us to the size of the plants being harvested and changes in the number of roots per pound, allowing staff to infer the availability of mature ginseng plants.

NCDA&CS issued a total of 44 ginseng dealer licenses for the 2017-2018 season. These licensed dealers certified over 5,910 pounds of wild collected ginseng for export, compared to the 2016-2017 season (>5,700 pounds).

PCP Staff participated in the 2018 annual Ginseng Marking Blitz in the Great Smoky Mountains National Park, a collaborative effort between NCDA&CS and the National Park. Removal of plants is illegal in US National Parks without a permit. Each year thousands of wild American ginseng plants in National Parks and other lands are marked with a permanent dye so that if the plants are poached and attempted to be sold for export, it is possible to identify the roots as illegally poached from the park. PCP has begun using this same method to mark ginseng within PCP Preserves. This year **1,573** plants were marked over three days, helping to protect these native plants. To date, this program has marked >64,000 plants!



The 2018 Ginseng Marking Blitz Crew, American ginseng root, and a mature plant with ripe fruits.

Protected Plant Species Currently Documented on NC Plant Conservation Preserves

Federally listed species are in **bold**. PCP staff continues to verify/update each of these records.

1. <i>Acmispon helleri</i>	35. <i>Lilium canadense</i> spp. <i>editorum</i>	69. <i>Symphyotrichum concinnum</i>
2. <i>Agalinis virgata</i>	36. <i>Lilium grayi</i>	70. <i>Thermopsis fraxinifolia</i>
3. <i>Amorpha confusa</i>	37. <i>Lilium philadelphicum</i> var. <i>philadelphicum</i>	71. <i>Trichostema brachiatum</i>
4. <i>Anemone berlandieri</i>	38. <i>Lilium pyrophilum</i>	72. <i>Trillium simile</i>
5. <i>Arethusa bulbosa</i>	39. <i>Lindera melissifolia</i>	73. <i>Utricularia cornuta</i>
6. <i>Asclepias pedicellata</i>	40. <i>Lithospermum canescens</i>	74. <i>Vaccinium macrocarpon</i>
7. <i>Astragalus michauxii</i>	41. <i>Litsea aestivalis</i>	
8. <i>Baptisia alba</i>	42. <i>Ludwigia suffruticosa</i>	
9. <i>Baptisia aberrans</i>	43. <i>Lysimachia asperulifolia</i>	* Reintroduced in 2018
10. <i>Berberis canadensis</i>	44. <i>Lysimachia fraseri</i>	
11. <i>Boechera missouriensis</i>	45. <i>Magnolia macrophylla</i>	
12. <i>Carex buxbaumii</i>	46. <i>Micranthes pensylvanica</i>	
13. <i>Carex radfordii</i>	47. <i>Oenothera perennis</i>	
14. <i>Carex trisperma</i>	48. <i>Packera schweinitziana</i>	
15. <i>Celastrus scandens</i>	49. <i>Panicum flexile</i>	
16. <i>Chelone cuthbertii</i>	50. <i>Pellaea wrightiana</i>	
17. <i>Cirsium lecontei</i>	51. <i>Platanthera grandiflora</i>	
18. <i>Coeloglossum viride</i> var. <i>virescens</i>	52. <i>Polygala hookeri</i>	<u>Other species of special note:</u>
19. <i>Cyperus granitophilus</i>	53. <i>Portulaca smallii</i>	<i>Phemeranthus piedmontanus</i>
20. <i>Rubus repens</i>	54. <i>Rhexia aristosa</i>	This species is not a North Carolina Protected Plant Species; however, it was not included in the most recent threat assessment because it was not named at the time. PCP Staff believe it will be included in future updates of the protected plant list.
21. <i>Delphinium exaltatum</i>	55. <i>Rhus michauxii</i>	
22. <i>Dichantherium neuranthum</i>	56. <i>Rhynchospora harperi</i>	
23. <i>Dionaea muscipula</i>	57. <i>Rhynchospora pleiantha</i>	
24. <i>Echinacea laevigata</i>	58. <i>Ruellia humilis</i>	
25. <i>Eleocharis elongata</i>	59. <i>Ruellia purshiana</i>	
26. <i>Fleischmannia incarnata</i>	60. <i>Sagittaria fasciculata</i>	
27. <i>Geum geniculatum</i>	61. <i>Sarracenia jonesii</i>	
28. <i>Helianthus schweinitzii</i>	62. <i>Scutellaria leonardii</i>	
29. <i>Helonias bullata</i>*	63. <i>Scutellaria nervosa</i>	<i>Stachys eplingii</i>
30. <i>Houstonia montana</i>	64. <i>Shortia galacifolia</i> var. <i>brevistyla</i>	Although globally secure (G5), PCP protects one of two known extant populations of this species in North Carolina.
31. <i>Ilex collina</i>	65. <i>Silene ovata</i>	
32. <i>Isoetes piedmontana</i>	66. <i>Sisyrinchium dichotomum</i>	
33. <i>Lachnocaulon minus</i>	67. <i>Symphyotrichum depauperatum</i>	
34. <i>Liatris helleri</i>	68. <i>Symphyotrichum georgianum</i>	

Partnerships/Collaborations

Appalachian State University, biology.appstate.edu
Atlanta Botanical Garden, www.atlantabotanicalgarden.org
Blue Ridge Conservancy, blueridgeconservancy.org
Blue Ridge Parkway, www.nps.gov/blri/index.htm
Bog Learning Network, boglearningnetwork.com
Conserving Carolina, conservingcarolina.org
Catawba Lands Conservancy, catawbalands.org
City of Boiling Spring Lakes, www.cityofbsl.org
Duke Forest at Duke University, www.dukeforest.duke.edu
Eno River Association, www.enoriver.org
Foothills Land Conservancy, foothillsland.org
French Broad River Garden Club, www.fbrgc.org
Friends of Mountains to Sea Trail, www.ncmst.org
Friends of Plant Conservation, www.ncplantfriends.org
Great Smoky Mountains National Park, www.nps.gov/grsm/index.htm
Greater Uwharrie Conservation Partnership
Highlands-Cashiers Land Trust, www.hicashlt.org
James F. Matthews Center for Biodiversity Studies, <http://charmeck.org/MECKLENBURG/COUNTY/PARKANDREC>
Three Rivers Land Trust, www.3rlt.org
NC Botanical Garden, ncbg.unc.edu
NCDA&CS Forest Service, ncforestservice.gov
NCDA&CS Research Station Division, www.ncagr.gov/research
NC Museum of Natural Sciences, naturalsciences.org
NC Native Plant Society, www.ncwildflower.org
NC Natural Heritage Program, www.ncnhp.org
NC Division of Parks and Recreation, www.ncparks.gov
NC Wildlife Resources Commission, www.ncwildlife.org
Sandhills Area Land Trust, www.sandhillslandtrust.org
The Nature Conservancy, www.nature.org
UNC-Asheville, www.unca.edu
US Army Corps of Engineers
US Fish and Wildlife Service, www.fws.gov/southeast
US Forest Service, www.fs.usda.gov/nfsnc

**Thank you to the many partners, volunteers, and other supporters
who help us do this work!**