2022

CONSERVING KENTUCKY'S NATURAL HERITAGE

REPORT INCLUDES

- Biennial Report of the Office of Kentucky Nature Preserves
- Annual Report of the Kentucky Heritage Land Conservation Fund
- Quadrennial Kentucky Rare Plant Report

TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET
OFFICE OF KENTUCKY NATURE PRESERVES

The Office of Kentucky Nature Preserves

300 Sower Blvd, Frankfort KY 40601
(502) 573-2886
naturepreserves@ky.gov
eec.ky.gov/Nature-Preserves

The Kentucky Heritage Land Conservation Fund Board

Mr. Russell Meyer, Chairman
Representing the Department of Parks

Mr. Hugh N. Archer, Vice-Chairman
Representing environmental organizations

Executive Director, Sunni Carr
Representing Office of Kentucky Nature Preserves

Derek Beard
Representing the Kentucky Department of Fish and Wildlife Resources

Shannon Galbraith-Kent
Representing the Kentucky Academy of Sciences

Mr. Ted Jessup
Representing agricultural interests

Dr. Paul Sheets
Representing the League of Kentucky Sportsmen

Gordon Slone
Representing the Kentucky Department of Natural Resources

Charlotte Turner McCoy
Representing citizens of the Commonwealth with experience in land acquisition

This report is submitted to the Governor and the General Assembly as directed by KRS 146 and 418 KAR relating to the Office of Kentucky Nature Preserves, the Kentucky Heritage Land Conservation Fund.

Table of Contents

TEAM KENTUCKY®

ENERGY AND ENVIRONMENT CABINET

OFFICE OF KENTUCKY NATURE PRESERVES

Abbreviations Page

Atlanta Botanical Garden (ABG)
Daniel Boone National Forest (DBNF)
Environmental Research Systems Institute (ESRI)
Geographic Information Systems (GIS)
Hemlock woolly adelgid (HWA)
Kentucky Biological Assessment Tool (KY-BAT)
Kentucky Department of Agriculture (KDA)
Kentucky Department of Fish and Wildlife Resources (KDFWR)
Kentucky Division of Forestry (KDF)
Kentucky Division of Water (KDOW)
Kentucky Forest Biodiversity Assessment Program (KFBAP)
Kentucky Heritage Land Conservation Fund (KHLCF)
Kentucky Invasive Plant Council (KIPC)
Kentucky Natural Lands Trust (KNLT)
Kentucky Plant Conservation Alliance (KYPCA)
Kentucky State Parks (KSP)
Kentucky Transportation Cabinet (KYTC)
Kentucky Native Plant Society (KNPS)
Land Between the Lakes National Recreation Area (LBL)
Missouri Botanical Garden (MOBOT)
National Parks Service (NPS)
Non native invasive species (NNIS)
North American Orchid Conservation Center (NAOCC)
Office of Kentucky Nature Preserves (OKNP)
Pine Mountain Settlement School (PMSS)
Plant Conservation Alliance (PCA)
Red River Gorge (RRG)
Southeast Plant Conservation Alliance (SEPCA)
Species of greatest conservation need (SGCN)
State Natural Area (SNA)
State Nature Preserve (SNP)
State Wildlife Action Plan (SWAP)
Tennessee Division of Natural Areas (TDNA)
The Nature Conservancy (TNC)
U.S. Fish and Wildlife Service (USFWS)
U.S. Forest Service (USFS)
United Plant Savers (UPS)
University of Kentucky (UK)
Wendell H. Ford Regional Training Center (WHFRTC)
Western Kentucky University Public Broadcasting Service (WKU PBS)
White fringeless orchid (WFO)
White-haired goldenrod (WHG)

Director's Message

As I write this message, it is hard to imagine that the privilege to work as the Executive Director of the Office of Kentucky Nature Preserves is quickly approaching a one year anniversary. The drive to help support and create opportunities for conservation of Kentucky's beautiful landscapes and natural resources has never lost its luster. As a servant to the Commonwealth since 1995, everyday has brought challenges, victories and opportunities. When the opportunity to be part of the OKNP came to pass, the call was easy to answer. The work carried out under the OKNP; protection and management of rare natural resources owned by OKNP, the Kentucky Heritage Land Conservation Fund and Wild Rivers, is truly one of the brightest gems in the Commonwealth. To discover new species of plants and animals, inventory remote areas untouched in recent times, and to forge creative partnerships, holds so much excitement and anticipation.

In the past year here at OKNP, staff have continually pushed the bar upwards, accepting nothing less than excellence in project design and execution, thus creating opportunities for the public to visit and enjoy beautiful natural areas, learn of the importance of the natural communities right in their own "backyard" and work with partners in bold and creative ways. The discoveries made, acres restored and vigilant monitoring give credit to the continual hard work and dedication of the staff at OKNP. Everyday, staff share ideas about how to move forward. Perhaps it is new updated signs for visitors, discussions on how to have more ADA access, how to adapt management techniques to help rare plants and insects flourish, or simply visiting a remote and secluded site assuring that a rare community is thriving; nonetheless, the excitement and commitment from every staff member is noted.

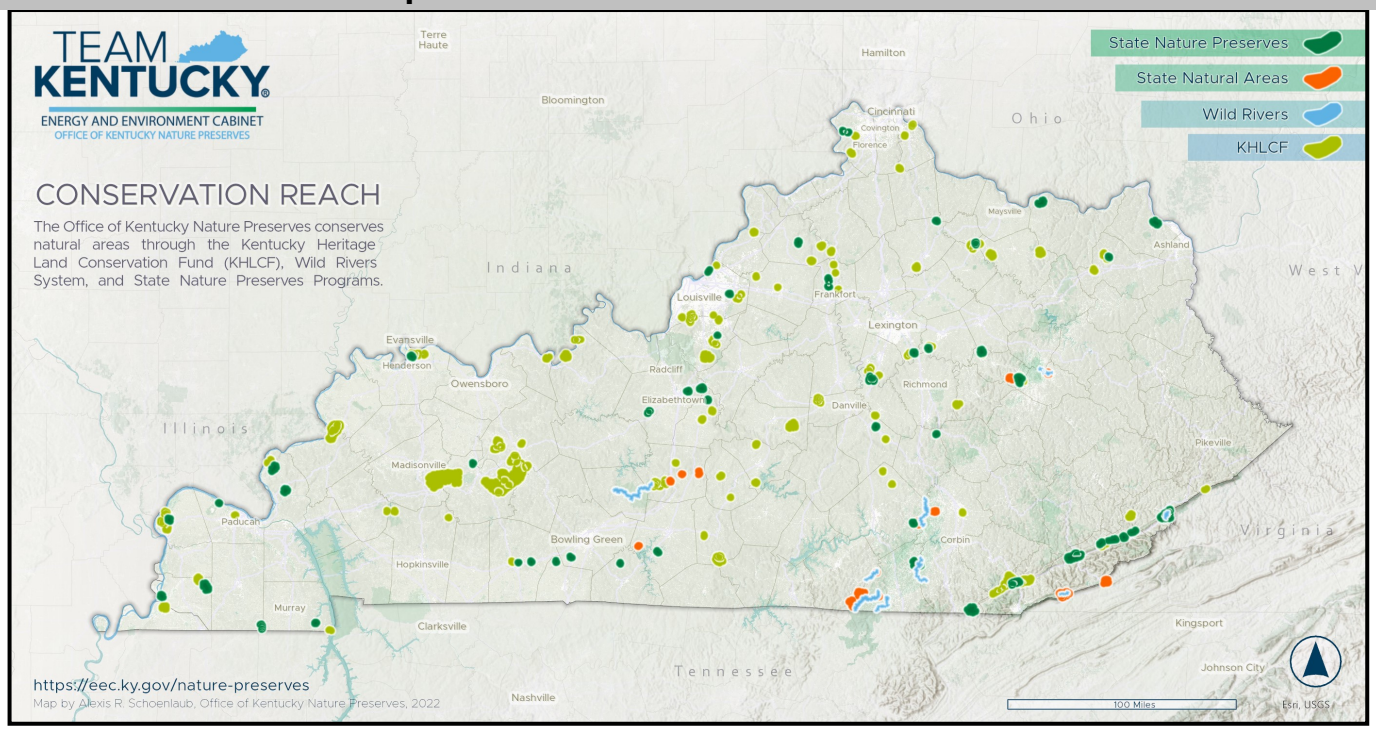
As we have worked together to document work for the OKNP over the last year, it is inspiring to see how far we have come, hurdles we have cleared and conservation victories we have achieved. The biodiversity of Kentucky has proven to be a never ending surprise full of beauty and intrigue. Moving forward, we must continue to challenge ourselves as a society to recognize the importance of being stewards for those generations of Kentuckians to come. Without meaningful conservation actions today, we will certainly deny those that come after us the full breadth of beauty and integrity that our land and waters hold.

As you take time to read through this report, my hope is that you will reflect on the accomplishments recorded here by the talented and dedicated staff of the OKNP. Their recording of places, activities and findings are a glimpse into what makes our Commonwealth so special.

In your Service,

Sunni L. Carr-Leach

OKNP Natural Areas Map



OKNP manages four distinct programs to conserve Kentucky's natural areas.

- The Kentucky Heritage Land Conservation Fund

Assists with funding conservation at the local and state level.

- The State Nature Preserve System

Prioritizes rare species habitat conservation and quiet enjoyment of natural areas.

- The Natural Areas Registry

Recognizes private landowners and others who own land with outstanding ecological attributes.

- The Wild Rivers Program

Focuses on riparian forest conservation and paddling opportunities on pristine rivers and streams.

· 19,880 ac owned by OKNP in 39 State Nature Preserves.
· 8,090 ac owned by OKNP in 13 State Natural Areas.
· 7,140 ac dedicated by OKNP in 18 State Nature Preserves owned by partners.
· 13,710 ac of conservation easements owned by local groups in 61 KHLCF natural areas.
· 71,600 ac of deed restrictions owned by other state agencies in 26 KHLCF natural areas.
· 9,220 ac owned by private landowners and others in 77 Registered Natural Areas.
· 26,960 acres owned by private landowners and others in 9 Wild Rivers Corridors.

While the grand total of 156,600 acres in these programs is an impressive number, it is 0.6% of Kentucky's 25 million acres! Appendix I has lists of OKNP natural areas by county and status.

KHLCF

Historic Accomplishments

Since 1995, the Kentucky Heritage Land Conservation Fund (KHLCF) Board has played an integral part in protecting and conserving over 94,000 acres of Kentucky's natural areas and habitats on 172 tracts in 67 counties. KHLCF funds both the acquisition of property and management, including hiking trail development and habitat improvement.

Summary of the Kentucky Heritage Land Conservation Fund efforts as of 1995 - June 2022

Applicant	Projects	Acres Conserved	Funding
Kentucky Department of Fish and Wildlife Resources	8	40,701.18	$ 7,915,255.59
Division of Forestry	6	3,662.77	$ 6,213,849.35
Office of Kentucky Nature Preserves	49	11,788.03	$ 10,155,385.42
Department of Parks	16	5,342.18	$ 7,047,138.74
Wild Rivers Program	16	6,428.61	$ 8,369,489.94
Multiple Agency Partners	6	14,781.09	$ 11,673,455.86
County Governments	35	7,333.11	$ 13,693,295.13
City Governments	10	542.55	$ 1,709,119.25
Metro Governments	8	1,013.24	$ 3,288,294.45
Colleges/Universities	8	2,078.70	$ 4,952,276.55
Conservation Districts	8	1,484.44	$ 4,589,972.66
Non-Profit	4	764.477	$ 1,557,385.50
Totals	**173**	**95,920.38**	**$ 81,164,918.44**
			Note: Includes both acquisition and management costs.

KHLCF

Fiscal Year Acquisitions

Summary of the Kentucky Heritage Land Conservation Fund efforts as of 1995 - June 2022

Project	Agency	County	Acres
Perryville State Nature Area	OKNP	Boyle	384
Red River—Gritter Ridge	OKNP	Powell	375.44
		Total:	**759.44**

Funding awarded was for land purchase, associated pre-acquisition costs (appraisals, title, and survey work), or approved management activities. Due to complexities of the land acquisition process it often takes several years for the KHLCF to successfully complete projects. In some cases, projects are withdrawn by the seller and not completed. This fiscal year no projects were awarded.

Since 1995 to 2022 The Kentucky Heritage Land Program has protection on:

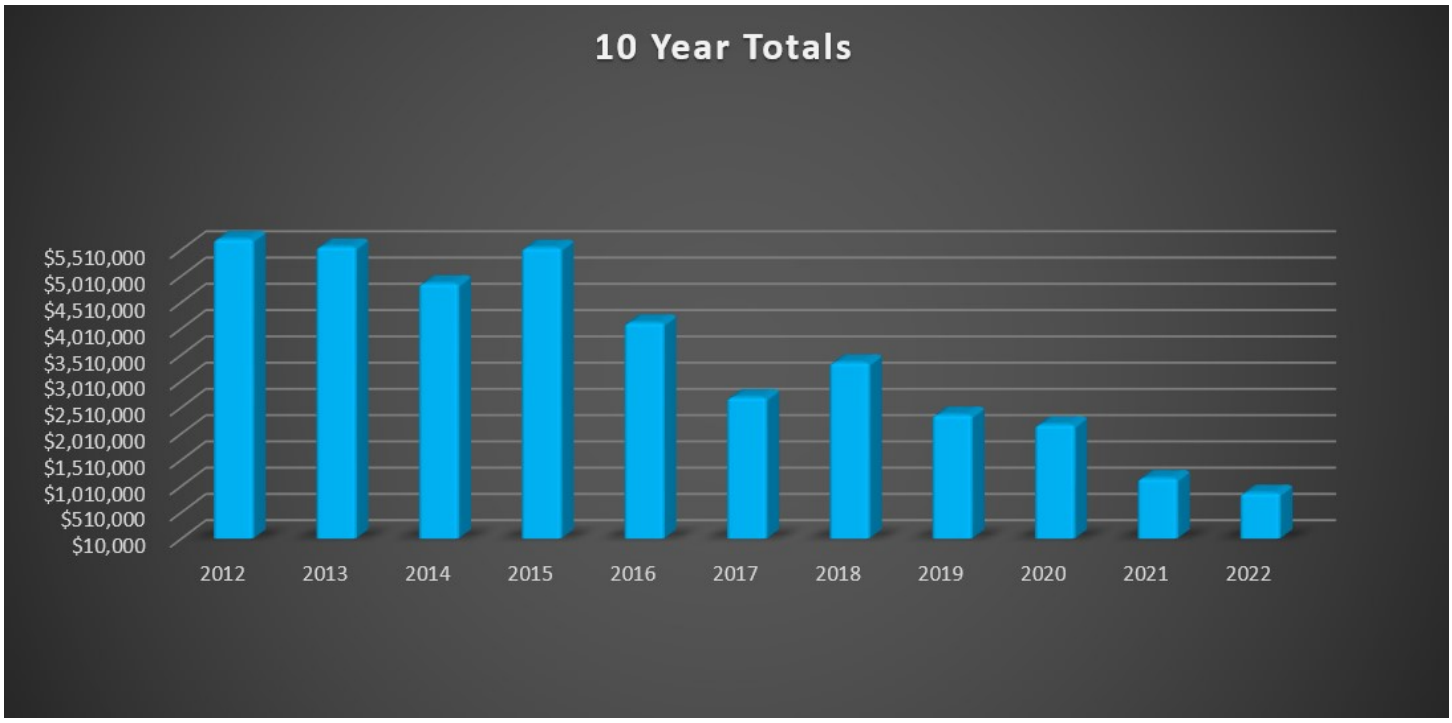
- **67** Competitive sites totaling **17,183.497** acres.
- **69** Non-competitive sites totaling **90,193.438**.

KHLCF

Annual Revenue

Funding for the KHLCF is generated from the sale of nature license plates, the state portion of unmined mineral tax on coal, environmental fines, interest income, and donations. By statute, the Kentucky Environmental Education Council receives the first $150,000 collected from environmental fines and the Office of Energy Policy receives the first $400,000 of unmined minerals taxes. However, in FY2022 the unmined mineral tax only generated $7,781 all of which was transferred to the Office of Energy Policy.

FY	License Plates	Fines	Un-Mined Tax	Interest	Other	KEEC/OEP deductions	TOTALS
2012	$571,970	$2,199,708	$2,870,186	$74,111		($550,000)	$5,165,974
2013	$431,100	$2,332,183	$2,820,758	($14,433)		($550,000)	$5,019,608
2014	$412,370	$1,709,373	$2,676,912	$71,526	$71	($550,000)	$4,320,251
2015	$402,118	$2,773,396	$2,287,058	$85,541	$945	($550,000)	$4,999,058
2016	$288,182	$2,070,527	$1,637,571	$126,302		($550,000)	$3,572,581
2017	$379,370	$1,586,457	$676,305	$59,298	$25	($550,000)	$2,151,454
2018	$365,590	$2,262,555	$636,307	$100,261	$385	($550,000)	$2,815,097
2019	$361,050	$1,492,233	$ 333,392	$182,467		($483,392)	$1,885,750
2020	$361,460	$1,909,592	$166,097	$60,986		($166,097)	$2,182,037
2021	$349,170	$961,284	$281,899	($52)		($281,899)	$1,160,402
2022	$365,120	$667,373	$6,559	($7,781)		($6,558.82)	$881,271



KHLCF

Conservation Easement Highlights

When KHLCF funding conserves an eligible natural area, a permanent conservation easement is placed on that property. This ensures that the site will always be managed for conservation and nature-based recreation. OKNP staff inspect each of these conservation easements periodically, and our partners submit reports on their activities. Here are just a few highlights from some of our 54 conservation easement partners:

- Tygarts State Forest, managed by the Kentucky Division of Forestry, recently acquired an additional 238 acres. The new tract increases the size of the state forest to 1,814 acres. Tygarts SF is part of a larger habitat corridor totaling 3,100 acres involving Carter Caves State Park and Bat Cave State Nature Preserve. These lands provide crucial habitat for several imperiled bat species.

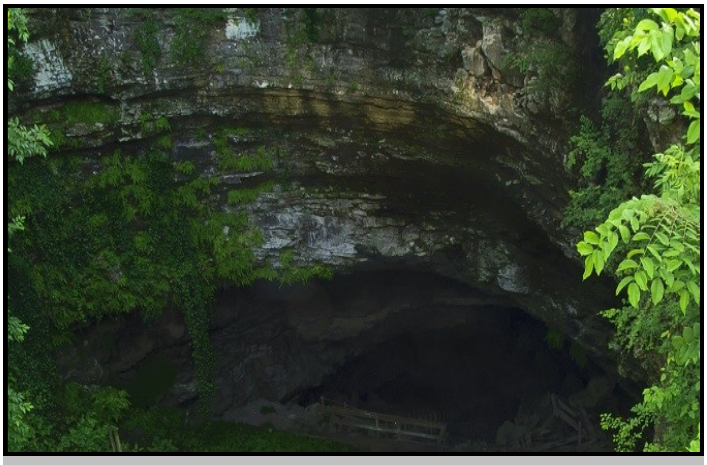
Rafinesque's big-eared bat (*Plecotus rafinesquii*) and Virginia big-eared bat (*Corynorhinus (=Plecotus) townsendii virginianus*). Photo: JRM.

- Logan-Hubble Memorial Park of Lincoln and Garrard County received a $250,000 Recreational Trails Grant through the Recreational Trails Program. The funding will aid with the establishment of an environmental education field operation station that will provide a unique opportunity for students to participate in field lessons, lab work, and other environmental learning opportunities while visiting the park.

Logan-Hubble Memorial Park. Photo: Kentucky Tourism

KHLCF

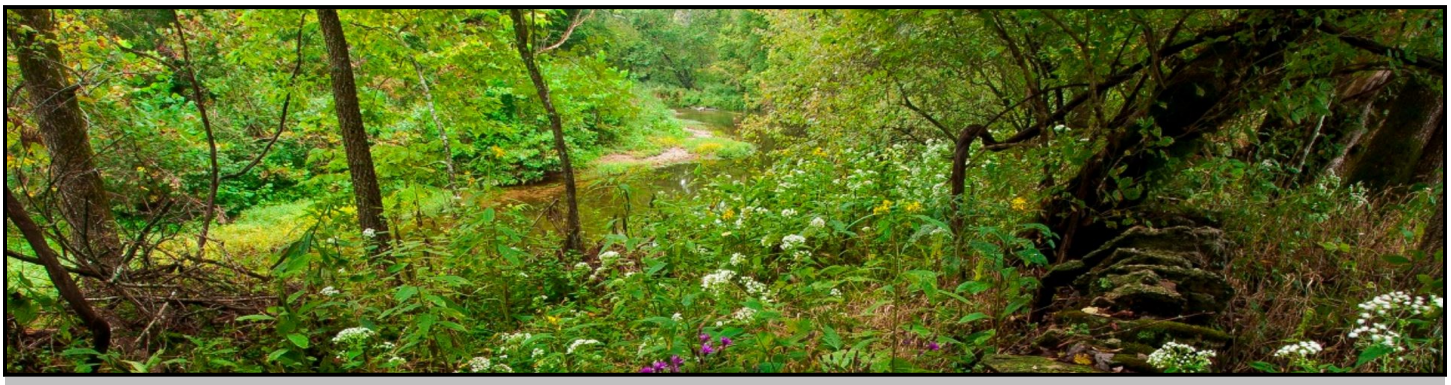
- Hidden River Cave, located in the City of Horse Cave, received a personal record high of visitors for 2021 totaling nearly 29,000. Hidden River Cave was once known as the most polluted cave in North America due to industrial and domestic waste issues. This is significant because the water from the cave system enters the Green River which is one of the most important freshwater streams left in North America. With the help of KHLCF, a new waste treatment facility, the American Cave Conservation Association, and dedicated community members, this cave now helps fuel the local economy through tourism and is an important protected natural area. This incredible natural resource success story was recently featured in a short film produced by EEC's Land, Air & Water webizine.



Hidden River Cave entrance.

- The Parklands of Floyds Fork received a prestigious award from the Garden Club of America. The 2022 Cynthia Pratt Laughlin Medal recognizes outstanding achievement in environmental protection. The Parklands are riparian greenspaces of Floyds Fork covering nearly 4,000 acres in Jefferson County. The Kentucky Heritage Land Conservation has helped purchase over 268 acres of this protected area at Pope Lick Park.

Hidden River Cave.

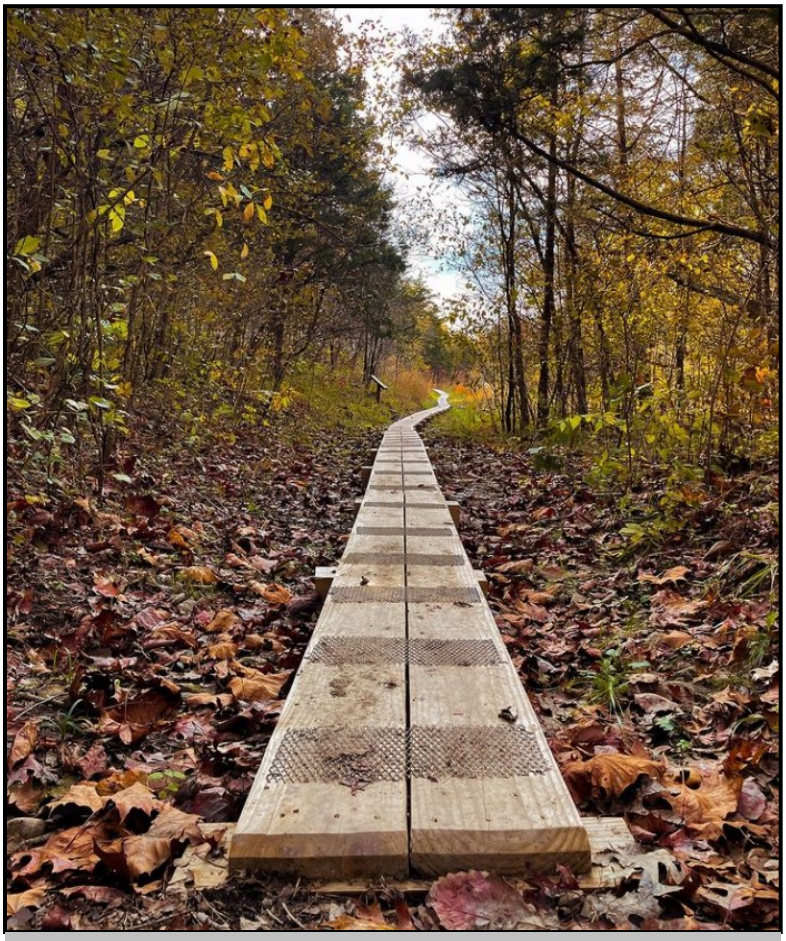


Pope Lick Park of the Floyd's Fork Parklands system.

History and Nature

Lower Howards Creek in Clark County

Nature and history are intricately linked when it comes to conservation in Kentucky. Efforts to conserve historic battlefields, homesteads, camps, and more also aid in the protection of the ecological communities that exist on the landscape. Many of these lands are protected in perpetuity thanks the Kentucky Heritage Land Conservation Fund. In December of 2021, OKNP and KHLCF debuted the short film "The Nature of History". This collaborative piece was put together by WKU PBS with the help of our partners. The film highlights the profound and fascinating mix of natural and historic heritage on KHLCF funded sites: Perryville Battlefield State Historic Site and Nature Preserve, Tebbs Bend Nature Area, Blue Licks Battlefield State Historic Site and Nature Preserve, Lower Howards Creek Nature and Heritage Preserve, and Abraham Lincoln Birth Place. Several rare species or communities have been documented on each of these sites.



Blue Licks Battlefield boardwalk in Nicholas County. Photo by: Kentucky Tourism

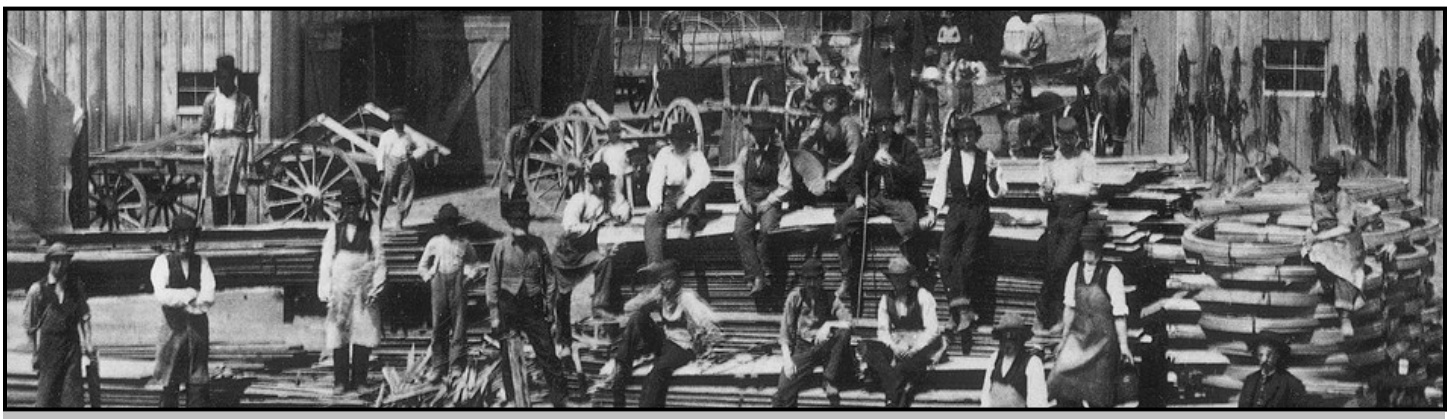
Short's goldenrod is a federally and state endangered, also globally rare, species found at Blue Licks.

Tebb's Bend Nature Area in Taylor County.

History and Nature

Male Bobolink. Photo: Doug Gilmer

OKNP works to unify history and nature conservation goals through additional endeavors. OKNP partnered with KDFWR to host a bird a banding workshop for our NPS partners at Camp Nelson National Monument. This demonstration aimed to highlight the many bird species that rely on the nearly 500 acres of grassland habitat found at the park. One species of particular interest includes the Bobolink (Dolichonyx oryzivorus). Their unique dance and song attracts many birders to Camp Nelson each year during the breeding season. In May of 2022, OKNP helped organize a "History and Birding Hike" led by interpretive staff at Camp Nelson and leaders from the Central Kentucky Chapter of the Audubon Society. This hike aimed to educate participants on the complex history of this site during the Civil War, as well as the biodiversity it holds today. For more information on the history of Camp Nelson please visit their website https://www.nps.gov/cane/index.htm.



Camp Nelson National Monument. Photo: U.S National Park Service.

History and Nature

Perryville Battlefield was one of the most destructive Civil War battles in Kentucky. Natural vistas visible at the park today mimic those seen in 1862. This historic site supports grassland and pollinator habitat for a variety of mammals, birds, insects, and plants. Most notably, it is a crucial stop for the Monarch butterfly on its journey to Mexico to overwinter. In 2021, the first tagged Monarch from Kentucky was recovered at the Monarch Butterfly Biosphere Reserve in Michoacán, Mexico. This individual was tagged at Perryville Battlefield by our partners at KDFWR. In June of 2022, OKNP and Perryville Battlefield hosted an educational hike for UK's Kentucky Master Naturalist Program (KYMN) to learn about the historic battlefield and how fire is used to help maintain grassland habitat and historic view sheds. Prescribed fire is used as an important management tool to remove invasive species, encourage seed germination, and create disturbance for habitat that depends on it. For the last 3 years, OKNP has worked with our State Park partners to create a prescribed fire regime for over 500 acres of this site to manage this habitat. As we continue to remember, learn, and heal from our history, OKNP hopes to strengthen the relationship between these historic and ecologically valuable sites so that we can provide habitat, outdoor recreational opportunities, and aesthetic beauty of our natural areas for future generations to come.

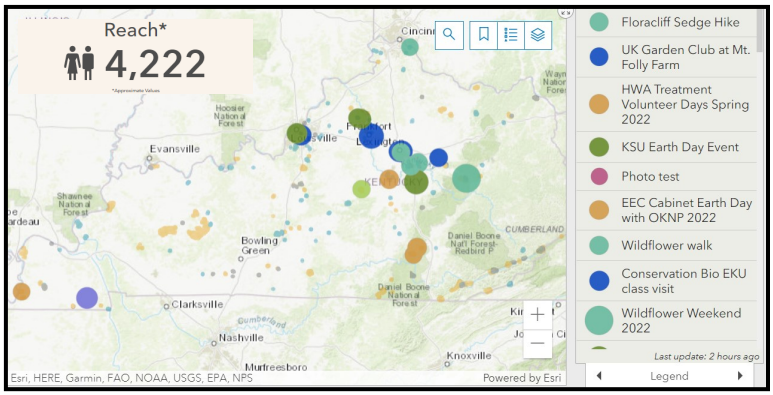
Parks, OKNP, and KYMN hike. Photo: Robert Myers.

Education and Outreach

In the past year, OKNP has hosted, conducted presentations, or collaborated on 50 outreach and educational events across the state reaching approximately 4,200 people. OKNP provides educational opportunities through our volunteer days, trainings, community science, social media engagement, hands-on programming, and presentations.

Outreach Dashboard:

OKNP created an education and outreach survey to efficiently record our involvement in hosting/participating in partner events or programs. This new tool pairs with a data driven dashboard to help us effectively communicate our mission and provide targeted environmental education.



Volunteer Hemlock Heroes:

OKNP partnered with the Kentucky Division of Forestry to host a series of volunteer events to help partners treat hemlock woolly adelgid (HWA) on private and public lands within the Rockcastle river watershed. Kentucky's hemlock trees have been threatened by the non-native hemlock woolly adelgid (HWA), an insect that sucks the sap from needles of the tree slowly killing it over time. Hemlocks help maintain water quality and temperature, prevent erosion, provide food, and nesting habitat for birds and other animals in southeastern Kentucky. Volunteers and partners who participated in these events treated 2,524 trees in the course of one week. Thank you to all who participated!

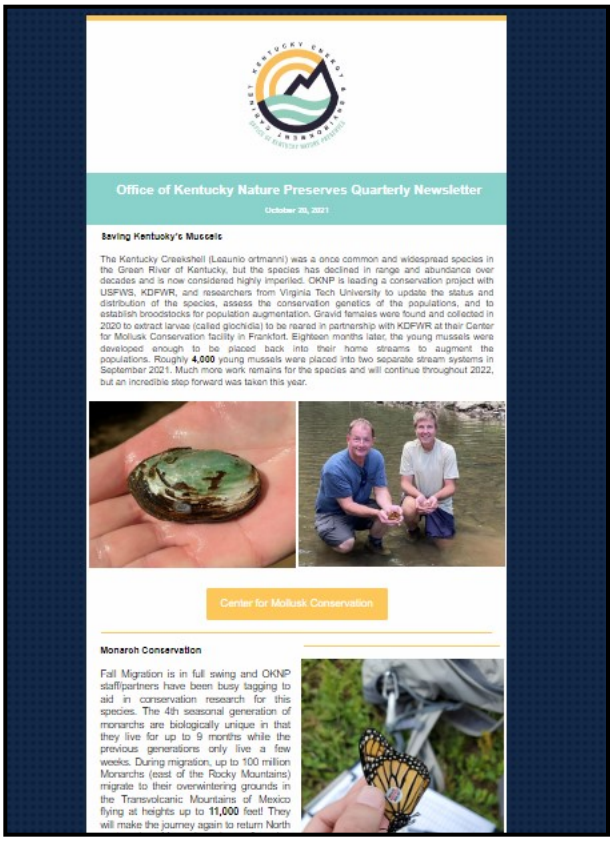
Education and Outreach

Earth Day:

In 2022 OKNP hosted an Earth Day event for employees of the Energy and Environment Cabinet. Members from a variety of agencies grabbed trail tools and got to work on improving a section of trail at Tom Dorman State Nature Preserve. Volunteers worked on removing and replacing 107 new steps that make the trail more accessible and safer for visitors.

OKNP and KHLCF Quarterly Letter:

OKNP has a growing mailing list for our quarterly letter. This letter includes the latest news, projects, success stories, and volunteer opportunities at OKNP. Sign up to be added to the mailing list and never miss out on exciting OKNP conservation news.


Office of Kentucky Nature Preserves Quarterly Newsletter

October 20, 2021

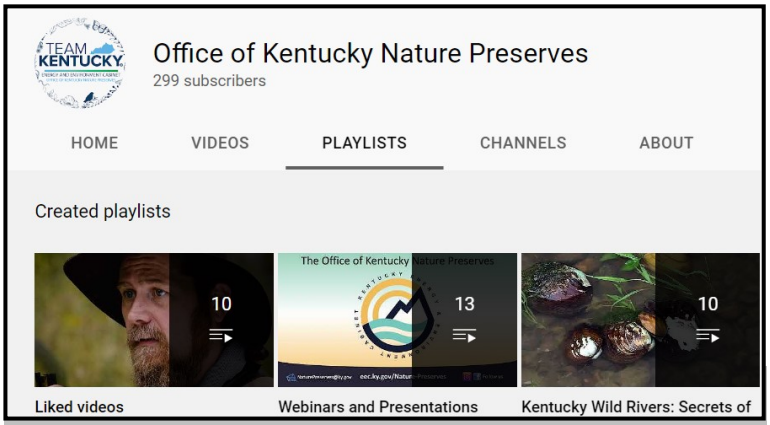
Saving Kentucky's Mussels

The Kentucky Creekshell (Leaunio ortmanni) was a once common and widespread species in the Green River of Kentucky, but the species has declined in range and abundance over decades and is now considered highly imperiled. OKNP is leading a conservation project with USFWS, KDFWR, and researchers from Virginia Tech University to update the status and distribution of the species, assess the conservation genetics of the populations, and to establish broodstocks for population augmentation. Gravid females were found and collected in 2020 to extract larvae (called glochidia) to be reared in partnership with KDFWR at their Center for Mollusk Conservation facility in Frankfort. Eighteen months later, the young mussels were developed enough to be placed back into their home streams to augment the populations. Roughly 4,000 young mussels were placed into two separate stream systems in September 2021. Much more work remains for the species and will continue throughout 2022, but an incredible step forward was taken this year.

Center for Mollusk Conservation

Monarch Conservation

Fall Migration is in full swing and OKNP staff/partners have been busy tagging to aid in conservation research for this species. The 4th seasonal generation of monarchs are biologically unique in that they live for up to 9 months while the previous generations only live a few weeks. During migration, up to 100 million Monarchs (east of the Rocky Mountains) migrate to their overwintering grounds in the Transvolcanic Mountains of Mexico flying at heights up to 11,000 feet! They will make the journey again to return North



Visit our YouTube channel for an education library filled with recorded trainings and presentations under the "Webinars and Presentations" playlist.

Land Management and Habitat Restoration

Prescribed Fire Program

OKNP Prescribed Fire Crew after a controlled burn in 2022 of a pollinator field at Perryville Battlefield State Historic Site, Boyle County, Kentucky.

Prescribed fire is an integral tool OKNP has utilized for decades to manage and restore our state natural areas. Many native plants are adapted to thrive with fire, for example prairie grasses and wildflowers that have deep roots, which allow them to withstand the heat, or oak trees with thick bark that can avoid being top-killed. Prescribed fire also allows us to maintain habitat structure of a plant community. Without fire, the structure of a plant community will change over time to favor shade tolerant species that will out-compete the fire-tolerant species. This is especially important as many of our rare plant communities, like pine barrens and other grassland habitats, are fire dependent and host numerous rare plants, insects, and animals. Non-native species tend to have shallow roots that succumb to the heat and reduced soil moisture brought on by fire. Through an integrative approach with chemical, mechanical, and fire management, we can control non-native invasive species, maintain habitat structure, stimulate the growth of native plants, which will attract pollinators. Prescribed fire will also replenish nutrients back into the soil from the burned vegetation.

Over the past several years, OKNP's prescribed fire program has grown through increased staff training, partnerships with other agencies, and implementation of a fire effects vegetation monitoring program. We currently have five staff members in our Natural Areas Branch certified as Kentucky Burn Bosses through the Kentucky Prescribed Fire Council. In 2021, OKNP signed a joint Memorandum of Understanding (MOU) with KDF

Land Management and Habitat Restoration

and KDFWR to assist each other in the implementation of prescribed fire on lands purchased and protected by the KHLCF. Both increasing the number of burn bosses on staff and working to forge partnerships with other agencies have allowed our staff to burn more acreage each year and larger units. The benefits of burning larger units are cost effectiveness and landscape level burning, which allows us to work on restoring ecosystems on a larger scale, rather than focusing in on specific habitats as we have in the past. For example, in 2021, OKNP carried out a 203 acre burn in Pulaski County with the help of the U.S. Forest Service and KDF. This burn helped restore multiple rare plant communities across an entire nature preserve, along with habitat for a federally endangered plant. The MOU with KDF and KDFWR has led to over 600 acres of KHLCF land being burned through the agencies joint efforts. The final step OKNP has taken to grow our fire program in the last several years is the creation of a fire effects vegetation monitoring program to gather ecological data before and after a prescribed burn. The data will facilitate future fire planning to fine-tune our fire management practices to achieve desired objectives. OKNP has also aided KDF by facilitating the training of Apprentice Burn Bosses from their staff to lead burns under the supervision of OKNP certified Burn Bosses. In the spring of 2022, OKNP burned seven units for a total of almost 100 acres.

Land Management and Habitat Restoration

Pine Barrens Restoration Project

In the spring of 2019, OKNP began work on a large-scale project to restore pine barren communities at nature preserves in Pulaski, Wolfe, and Harlan counties. Historically, pine barrens were an open canopy plant community maintained by wildfire and supported a diverse herbaceous layer with grasses and forbs more adapted to prairie-like conditions. OKNP currently tracks over 20 rare plant and animal species due to habitat loss, that are associated with the pine barrens plant community. Pine barrens have become increasingly rare due to fire suppression, invasive species, woody species encroachment and modern logging practices, and are now designated as a globally rare plant community. Work conducted to restore the pine barrens on these three sites includes removal of the forest midstory to increase sunlight to the forest floor, removal of invasive species, reestablishment of pines, and reintroduction of fire onto the landscape. All of this is in an effort to create more of an open ecosystem dominated by pines, as it was historically.

At the Pulaski County site, all mature shortleaf pines were mapped in 2018, and six management units were created based on where the shortleaf pines were densest along two ridgelines to start work on midstory removal. Beginning in April 2019, and continuing into that fall, three of the management units were established manually using chainsaws to girdle or fell undesirable trees (i.e. red maple, tulip poplar, sassafras, sourwood, etc.) depending on their size class. All of the stumps and girdled trees were treated with herbicide to increase mortality and reduce the chances of resprouts. In June of 2020, the three remaining units were established by mechanical means via a masticator, with undesirable tree species being mulched. A firebreak encompassing all six management units was then installed and an initial prescribed burn was completed in April of 2021. The prescribed burn unit encompassed over 200 acres. Since the establishment of the original six management units (approximately 66 acres), work has continued with the aim of expanding and connecting these units within the nature preserve. Today, the managed area of midstory removal has increased to over 80 acres.

On the Wolfe County preserve, a prescribed burn was conducted in March of 2019. Following the burn, three management units were established in May of 2020 using similar

Pine barrens restoration at a nature preserve in Pulaski County after a midstory removal treatment was completed in 2019 and followed up by a prescribed burn in 2021.

Land Management and Habitat Restoration

management strategies to the Pulaski County site. These management units were established on three separate ridgelines and total approximately 32 acres. In February of 2021, a tree planting was completed on the property in collaboration with Green Forest Works. Nearly 48,000 shortleaf pine seedlings were planted across the three management units as well as in 50+ acres of field adjacent to the management units.

One of OKNP's most unique nature preserves is located on the south face of Pine Mountain in Harlan County and is our third site for pine barrens restoration. The vegetation at Hi Lewis Pine Barrens SNP is specifically classified as a pitch pine woodland, a plant community considered globally imperiled. In 2019, OKNP staff, assisted by our partners at KDF, cleared 21 acres of woody species to increase sunlight to the forest floor, and in the fall of 2020, a prescribed fire was conducted over 12.5 acres.

Over the past four years, this restoration work has continued to expand on these three sites thanks to grants awarded by the National Fish & Wildlife Foundation. Moving forward, efforts will continue to expand the current management units in OKNP's effort to restore this globally rare plant community, and all the plant and animal species it supports.

A cleared area at Hi-Lewis State Nature Preserve in Harlan County following the 2020 prescribed fire. This area was opened to encourage pine regeneration and increase herbaceous layer diversity.

Prescribed burn at the Pulaski County nature preserve conducted to restore the pine barrens community.

Land Management and Habitat Restoration

Hemlock Woolly Adelgid Control

Hemlock Woolly Adelgid or HWA on the underside of an eastern hemlock tree branch at Blanton Forest State Nature Preserve in 2008.

Eastern hemlock (*Tsuga canadensis*) is a shade-tolerant evergreen tree found in eastern Kentucky that grows in moist ravines. These trees play a vital role in cooling mountain streams with their dense canopies and providing habitat for a variety of birds and other wildlife. Unfortunately, eastern hemlocks are under attack from the hemlock woolly adelgid (*Adelges tsugae*) or HWA, which is a small aphid–like insect native to Asia. HWA is covered with white wool-like hairs that make the insects look like small tufts of cotton. HWA attach themselves to the underside of hemlock branches and feed on the sap, causing hemlocks to die within 4 to 10 years of infestation. This insect was first introduced to the U.S. in the 1920's along the west coast and has spread to the eastern U.S. causing devastating mortality rates to the native hemlock tree populations. Kentucky's first discovery of HWA was during the spring of 2006 in Harlan County.

OKNP first discovered HWA infested trees on nature preserves properties during the fall of 2007 at Blanton Forest SNP in Harlan County and Bad Branch SNP in Letcher County. A plan was developed to treat hemlock trees at these preserves during the winter of 2007 with treatments beginning during the spring of 2008. The initial treatments were conducted each spring and fall through the spring of 2010. Over 28,000 trees were treated along the rugged streams and cliff lines that make up much of these two preserves. An additional 3,000+ trees were treated during 2009 at three additional sites: Martins Fork SNA, Stone Mountain SNA and James E. Bickford SNP. Many of the same trees have undergone retreatments during the following field seasons: 2014, 2015, 2016, 2018, 2019 and 2020. Most treatments and retreatments utilized the soil injection method, and a few retreatments received the soil drench method. Both methods were conducted by administering the required dosage of the insecticide Imidacloprid to the roots of the hemlock trees.

Hemlock Woolly Adelgid (HWA) soil injection treatment at Bad Branch State Nature Preserve in Letcher County, Kentucky in 2008.

Along with OKNP staff, several other organizations and volunteers have played key roles in helping us save these wonderful trees. Assistance with treatments include help from KNLT, KDF, TNC, KDOW, and PMSS. Much of the funding was provided by KHLCF, USFWS, and USFS.

Land Management and Habitat Restoration

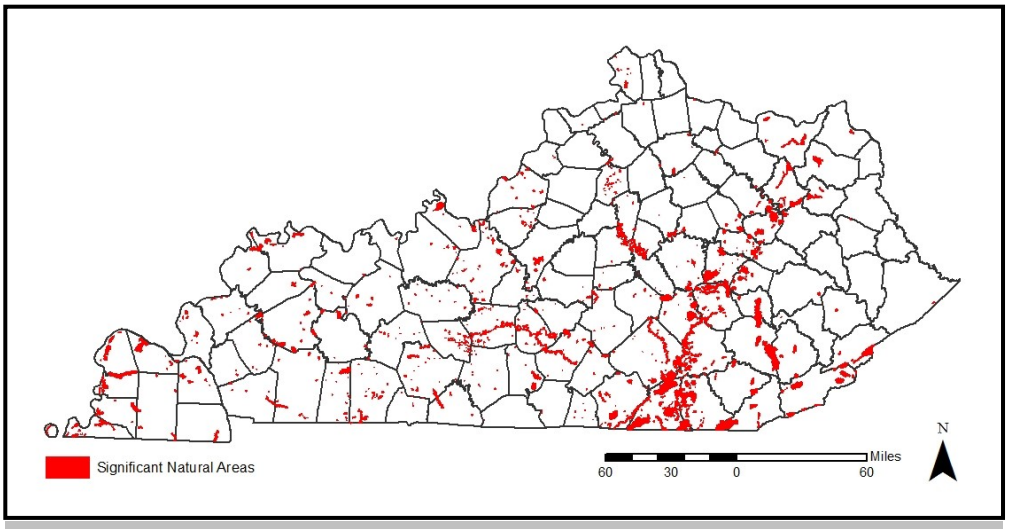
Drennon Creek SNP: Grassland Restoration

Work continues on one of OKNP's newest preserves, Drennon Creek SNP to improve the grassland component of the site. This property was generous donation to OKNP in 2018 by Mary Margaret Lowe and Eugene Lacefield. At nearly 350 acres in size, this property has a diverse range of natural community types ranging from riparian woodlands to restored upland grasslands. The property contains nearly one mile of frontage on Drennon Creek, a tributary of the Kentucky River.

Management has been multi-faceted including baseline biological inventories, invasive species control in upland forested sites and open lands, as well as use of prescribed fire. Prescribed burning within two old field portions has allowed staff to combat non-native vegetation, set back woody encroachment, and help promote native vegetation. Following the burn, OKNP staff conducted several rounds of targeted herbicide applications in order to control any response of invasive species. In this case, staff used a prescribed burn that not only consumes standing mature plants but releases nutrients into the soil, reinvigorating a herbaceous response. When invasive species respond, as they always do, they are easily targeted for control. Moving forward, management will still include combating invasive species and using fire across the property, with hopes of expanding to forest stand improvement projects, native grassland and wildflower conversions, as well as potentially introducing the federally endangered Braun's rockcress (*Borodinia perstellata*) into suitable habitat on the property.

Natural Areas Inventory

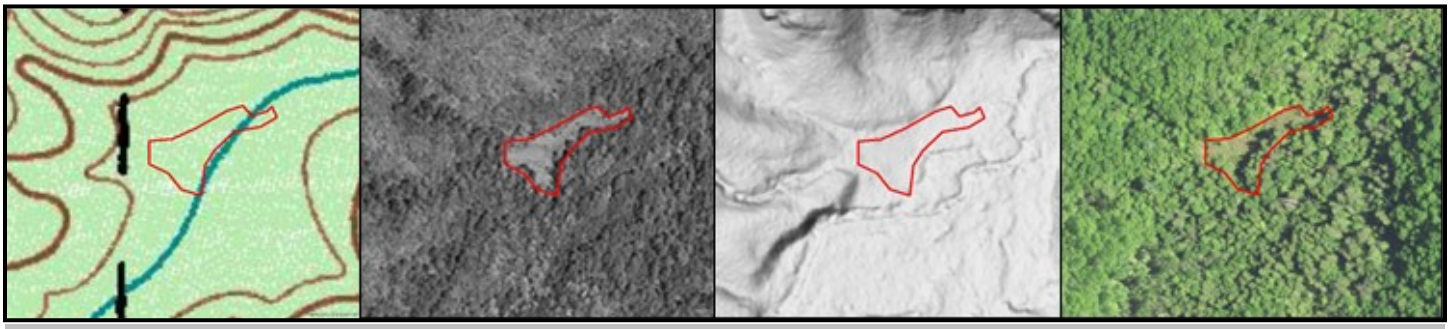
One of OKNP's main functions is to help protect the most important natural areas in Kentucky. Kentucky's rich biological diversity is expressed by the variety and variability of the natural communities in the state. Natural communities are distinct assemblages of plants, animals and other organisms that tend to be repeated across the landscape where similar environmental conditions occur. OKNP recognizes approximately 80 different natural community types in the Commonwealth.



Map of Kentucky's significant natural areas.

More than half of Kentucky's terrestrial natural communities and more than 80% of its wetland communities have been converted to land uses dominated by non-native species, such as pastures, croplands, and lawns. Nearly all natural communities in the state have been altered by impacts such as logging, mining, fire, grazing, invasive species, hydrological changes, or erosion. In addition, many are fragmented by agriculture and development. As a result, high quality natural communities of any type are rare.

In order to locate and identify the best natural areas, our agency utilizes a process called the Kentucky Natural Areas Inventory (NAI). For the past three decades, OKNP biologists have used NAI to systematically search the state county by county to find these ecological gems. In the past, this used to involve careful analysis of aerial photos and surveys done by helicopter. Now, sophisticated spatial GIS analyses, involving a wide variety of land cover data, eliminates the need for those labor-intensive methods used in the past. OKNP biologists can identify natural features such as potential prairie remnants, high quality wetlands and old growth forests without leaving the office.



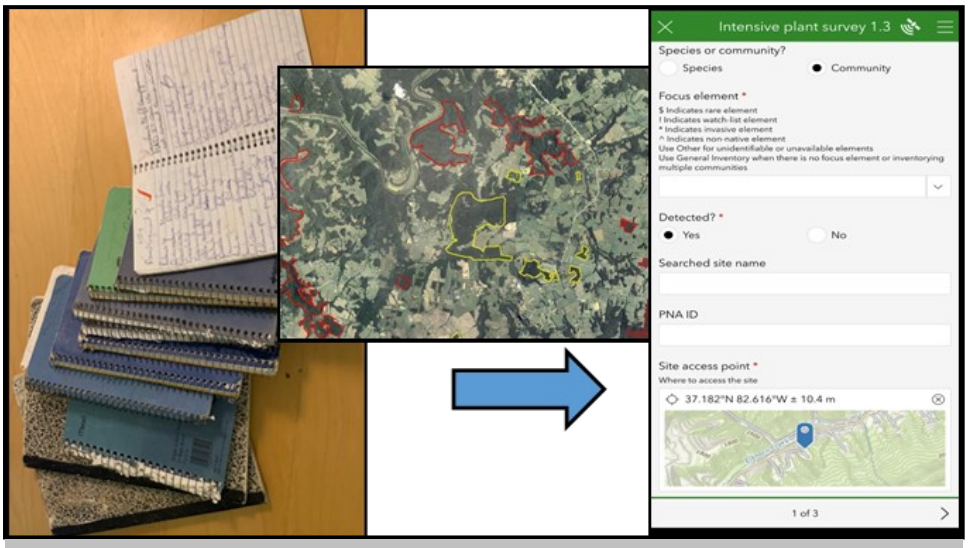
Geospatial layers help OKNP biologists identify potential natural areas, such as this state notable Cumberland Mountains acid bog in Harlan County, outlined in red. Left to right, various imagery used includes topographic maps, "leaf off" winter imagery, lidar elevation maps, and aerial imagery.

Natural Areas Inventory

However, fieldwork is still necessary to confirm the ecological quality of a natural area and to collect data on species composition. OKNP works with landowners to visit their potential natural areas and offers various protection options if the area turns out to be of biological significance. Every state nature preserve and state natural area in Kentucky exists because of voluntary cooperation by willing landowners.

Over the years, hundreds of potential natural areas have been identified. Approximately two thirds have received field visits, and perhaps a quarter of those sites have been found to be important biological sites worthy of protection. While thorough inventories have yielded no significant sites in some counties, some of the most interesting counties include McCreary and other counties in southeastern Kentucky, Edmonson County on the Pennyrile Plain and Ballard County in far western Kentucky.

The majority of the NAI data is stored in paper notebooks and on paper topographic maps. In the last year, OKNP started using Survey123 by ESRI to create a cohesive electronic database to hold all previously collected and future NAI data. This database is important to inform biologists about which areas have already been visited and the quality of those sites. Biologists will also use this database to identify potential habitat for rare animal and plant species.



OKNP is working to digitize over 30 years of Natural Areas Inventory data and create an electronic database for future data collection using Survey123.

Since the start of a systematic natural areas inventory, OKNP biologists have identified 4,381 potential natural areas in Kentucky. Unfortunately, 2,110 of these area have since been destroyed or degraded. However, 629 natural areas of significant biological importance were successfully identified. Many of these are protected, either on public lands or through an agreement with the private landowner. The remaining 1,662 have not yet been surveyed, often because landowners lacked interest or could not be contacted.

In coming years OKNP plans to reduce the number of remaining unvisited sites and, with the help of landowners, protect additional important natural areas.

Rare Plant and Community Conservation

Assessment of Kentucky's Rare Plant List

Importance of Plant Conservation:

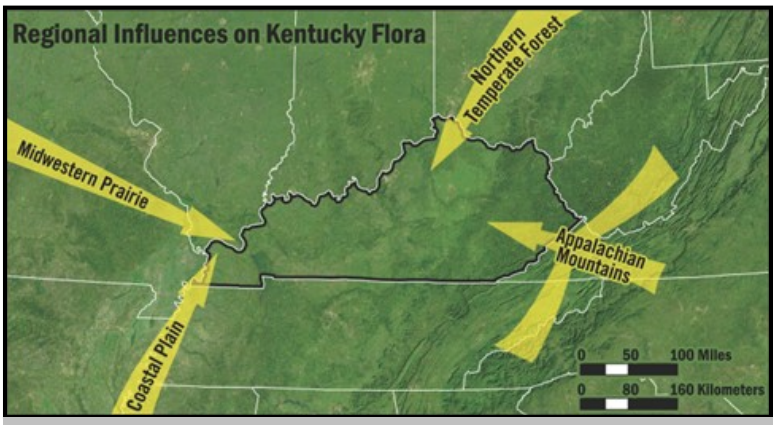
Plants form the foundation of life on Earth: they form the basis of the ecosystem food chain, regulate our climate, purify our water and air, mitigate erosion and enrich the soil when they decompose. Plants, in their astonishing variety, are also an essential resource for human sustenance and well-being, providing food, medicine, shelter, and clothing, while providing extraordinary beauty and spirituality to the planet. Plants form the habitats on which all life depends.

Small white lady's slipper, (*Cypripedium candidum*).

Plants, so essential to all life, are facing threats to their survival. Approximately 1/3 of all plant species on earth are rare, threatened, or endangered and this trend holds in Kentucky as well. Declines are caused by habitat destruction, lack of appropriate disturbance regime and habitat management, invasive species, and excessive herbivory. OKNP's mission is to reverse these trends on our natural areas.

Overview of Kentucky's Plant Diversity:

Kentucky has 3,026 vascular plant species and lesser taxa documented in the state; approximately 73% (2,207 species) are native plants and 27% (817 species) are non-native or naturalized. Additionally, Kentucky has 585 species of non-vascular plants (bryophytes) and 680 species of lichen. Kentucky's geographic position on the continent contains portions of the Appalachian Plateau, Interior Low Plateaus, and Coastal Plain Physiographic Provinces. This diverse physiography allows multiple floristic influences to overlap, yielding a plethora of plant life.

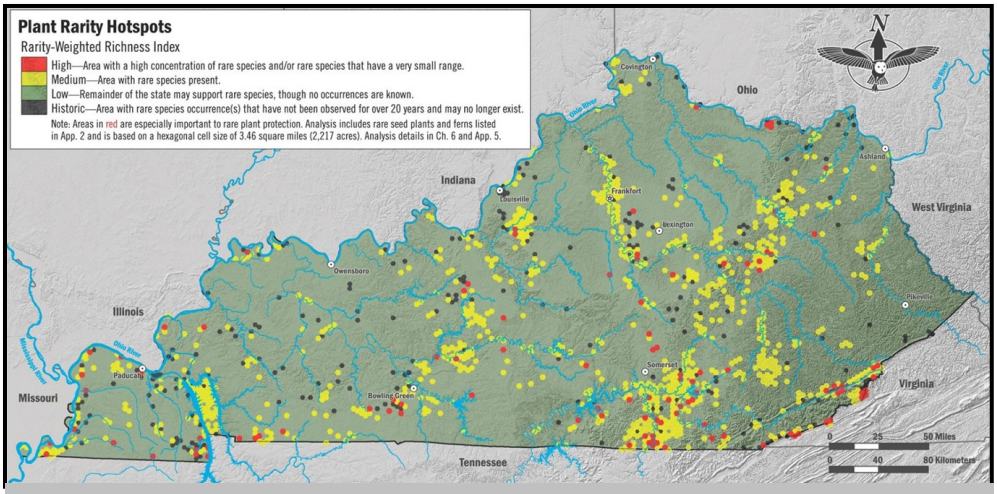


Regional influences on Kentucky flora.

Unlike vascular plants, lichens and bryophytes are non-vascular, meaning they do not have a specialized vascular system to transfer minerals, water and nutrients from the roots to other parts of the plant. Non-vascular plants lack the true root, stem and leaves that are associated with vascular plants. Lichens are composite organisms, consisting of a symbiotic relationship between algae and fungi. Bryophytes consist of three groups of non-vascular land plants: the liverworts, hornworts and mosses. These differences in anatomy and

physiology allow lichens and bryophytes to thrive in niches that are inhabitable to vascular plants, such as bare rock, tree surfaces, and even man made materials. Lichens and bryophytes play many important roles in soil creation, erosion prevention, soil moisture, forest humidity retention, and the nitrogen cycle. They are also utilized by wildlife as a food source, nesting material for birds, and camouflage for certain insects. The vital functions these groups provide in the states' rare ecosystems are invaluable to the sustainability of those systems; therefore these groups will be monitored and considered in future conservation decisions.

Kentucky contains several exceptional botanical hotspots from east to west like the high elevations of the Cumberland Mountains, the gorges of the Cumberland Plateau, the Kentucky River Palisades, the shaley slopes of the Knobs, grasslands of the Highland Rim and Shawnee Hills, and swamps of the Jackson Purchase. Kentucky is home to nearly a dozen federally listed plants and at least 63 globally rare plants. Most plants of conservation concern found in the state are "edge of range" species that may hold unique genetic makeup, but more globally rare plants also occur here as well like narrow endemics and regional endemics. Endemic plants are those that occur within a limited geographic range and it is common for multiple endemic species to occur in a given region or habitat type. Kentucky's areas of endemism occur mainly in the dolomite glades of the bluegrass, various habitats of the Cumberland Plateau, and woodlands of the eastern knobs, and limestone glades of the Pennyroyal Plain, though investigations are always seeking undiscovered hotspots.



Map of Kentucky's plant rarity hotspots.

OKNP is the Threatened and Endangered Plant Authority in Kentucky:

Kentucky Rare Plant Recognition Act. KRS 146.600

The Kentucky Energy and Environment Cabinet, through OKNP, is the listing authority for plants. The ability to legally list plants as threatened or endangered is derived from the Rare Plant Recognition Act of 1994.

> *The General Assembly finds and declares that it is the policy of the Commonwealth to recognize endangered and threatened species of plants for human enjoyment, for scientific purposes, and to ensure their perpetuation as viable components of their ecosystems for the benefit of the people of Kentucky. ~~~ Kentucky Rare Plant Recognition Act. KRS 146.600*

Rare Plant and Community Conservation

Twisted yellow-eyed grass (*Xyris torta*)

Assessing the Conservation Status of Kentucky Plants:

OKNP is the clearinghouse for native plant information in Kentucky and has created the only plant conservation program in Kentucky state government. OKNP focuses on several groups of plants, including vascular plants, non-vascular plants such as mosses, liverworts, and hornworts, as well as organisms that are plants (algae) with a symbiont relationship with fungi, the lichens. The primary function of this program is to legally recognize threatened and endangered plants and ensure their perpetuation as viable components of their ecosystems. In order to fulfill these obligations, OKNP's plant conservation program maintains a rare plant database that tracks populations of threatened and endangered plants, along with plants belonging to lower-priority conservation statuses (special concern, commercially exploited, watch list, historic, and extirpated) that may become threatened or endangered in the near future, though watch list plants are excluded from the rare plant list. The rare plant list then serves as the backbone of conservation prioritization in terms of species recovery, land conservation, and environmental planning on the local, state, regional, national, and global levels.

We publish the state rare plant list every 4 years in accordance with the Act, which allows for constant revision as new data and new scientific understanding become available. The two main sources of influence for the rare plant list are professional expertise and data. OKNP botanical experts rely heavily on collaboration with partners across the state in academia, state and federal agencies, land trusts, and non-profits to help in the assessments of conservation ranks for plants. A committee of experts, including several OKNP botanists, participated in the 2022 Rare Plant Committee, which reviewed conservation statuses and ranks for the vascular plants of Kentucky. OKNP botanists and lichenologists partnered with Dr. Allen Risk of Morehead State University to assess the bryophytes and lichens of Kentucky. This statewide assessment incorporated field surveys, state nature preserves inventories, and herbarium specimen review. OKNP conducted species status assessments to determine the state ranks and conservation needs of these groups. **Table 1** defines each conservation status.

Rare Plant and Community Conservation

Table 1. OKNP Definition of Kentucky Conservation Status	
Kentucky Conservation Status	Definition
Endangered (E)	A taxon or natural community in danger of extirpation and/or extinction throughout all or a significant part of its range in Kentucky (generally 5 or less populations or up to 10-15 populations with significant declines, threats, or a small total population).
Threatened (T)	A taxon or natural community likely to become endangered within the foreseeable future throughout all or a significant part of its range in Kentucky (generally 10-20 populations or up to 30 populations with significant declines, threats or a small total population).
Special Concern (S)	A taxon or natural community that should be monitored because (1) it exists in a limited geographic area in Kentucky, (2) it may become threatened or endangered due to modification or destruction of habitat, (3) certain characteristics or requirements make it especially vulnerable to specific pressures, (4) experienced researchers have identified other factors that may jeopardize it, or (5) it is thought to be rare or declining in Kentucky but insufficient information exists for assignment to the threatened or endangered status categories (generally 20-100 populations).
Commercially Exploited (CE)	A commercially harvested taxon that is declining substantially due to harvesting practices, especially unsustainable harvest and poaching.
Watch List (W)	A taxon likely to become special concern within the foreseeable future throughout all or a significant part of its range in Kentucky. It is also used for plants that appear to be endangered, threatened, or special concern, but have ongoing taxonomic issues or lack sufficient data to recognize them with a higher conservation status. Though tracked by OKNP, these plants are excluded from the rare plant list.
Historic (H)	A taxon or natural community that has not been reliably reported in Kentucky in 20 or more years but is not considered extinct or extirpated---see next designation.
Extirpated (X)	A taxon for which habitat loss has been pervasive and/or concerted efforts by knowledgeable biologists to collect or observe specimens within appropriate habitat have failed. Extinct species are those that have been eliminated throughout their entire range and extirpated species are those that have been eliminated from a jurisdiction (i.e., nation or state/province).

Rare Plant and Community Conservation

The rare plant database serves as the primary data source for conservation status assessments, but we also consult additional resources like physical specimens, online specimen databases, online plant atlases, and the observational crowd-sourced database iNaturalist. This collective dataset is then analyzed using conservation rank assessment guidelines outlined in NatureServe's core methodology, a scientifically and empirically based method for rare species data collection and analysis. It calls for consideration of 11 weighted factors across four categories: 1) rarity (area of occupancy, range extent, population size, number of occurrences, number of occurrences with good viability, environmental specificity), 2) threats (overall threat impact, intrinsic vulnerability), 3) trends (long term and short term), and 4) other (number of protected and managed occurrences). These factors help calculate a conservation rank, which is a NatureServe-standardized five point scale of conservation priority used across the NatureServe Network. Definitions of conservation ranks very closely match definitions of conservation statuses recognized by OKNP, so calculating ranks greatly informs the status recognition of plants as endangered, threatened, or other statuses.

Kentucky's Official Rare Plant List:

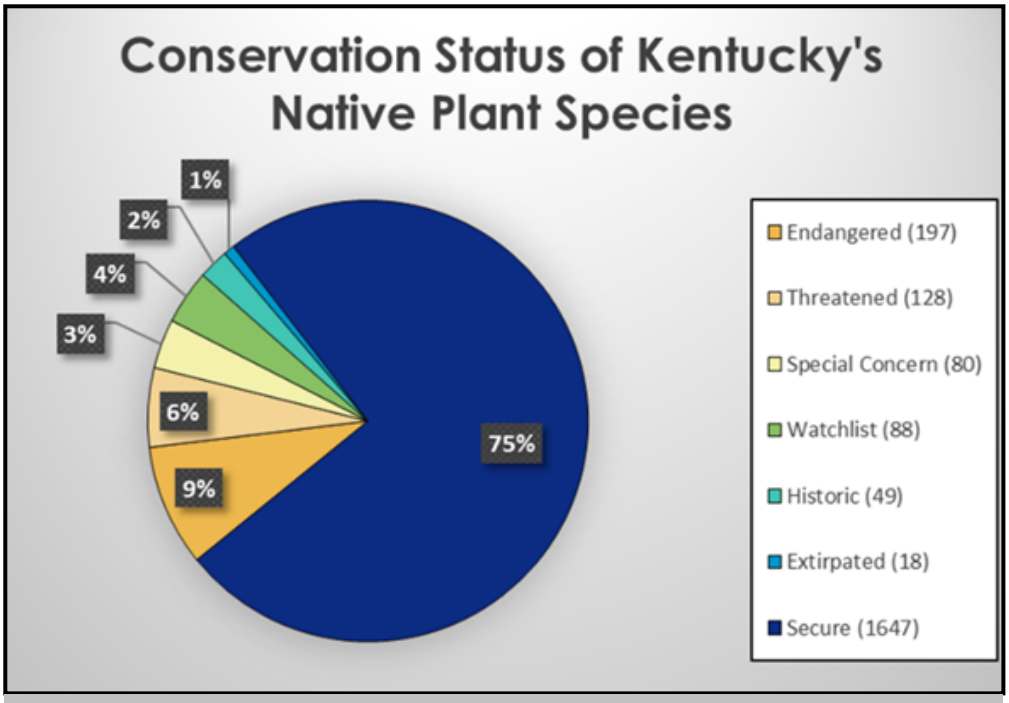
In 2022, we revised our rare plant list for Kentucky. It can be accessed on our website and is attached in **Appendix III**. This list includes vascular, non-vascular, and lichen species and is arranged according to those groups including endangered, threatened, special concern, commercially exploited, historic and extirpated plants. **Table 2** summarizes the resulting number of taxa within each conservation status for Kentucky with 272 endangered species and 194 threatened species across all plant groups. The rare plant list, along with photographs, distribution maps, herbarium specimens, and other associated information is available online via our Rare Plant Database and Kentucky Biological Assessment Tool. Current conservation statuses for Kentucky plants will be updated in all relevant scientific and educational digital resources for the benefit of the people of Kentucky.

Table 2. Summary of the Conservation Status of Kentucky Plants.

Taxonomic Group	Total Number of Native Taxa in KY	Kentucky Status							U.S Status	
		Secure	E	T	S	W	H	X	E	T
Vascular Plants	2,207	1,647	197	128	80	88	49	18	4	5
Bryophytes	585	504	31	27	16	5	2	0	0	0
Lichens	680	300	44	39	20	137	140	0	0	0
Totals	3,472	2,451	272	194	116	230	191	18	4	5

Rare Plant and Community Conservation

A sample of the beauty of Kentucky Rare Plants, left to right: large yellow lady's slipper (*Cypripedium parviflorum* var. *pubescens*), sweet pinesap (*Monotropsis odorata*), American bluehearts (*Buchnera americana*), and white-leaved leather-flower (*Clematis glaucophylla*).

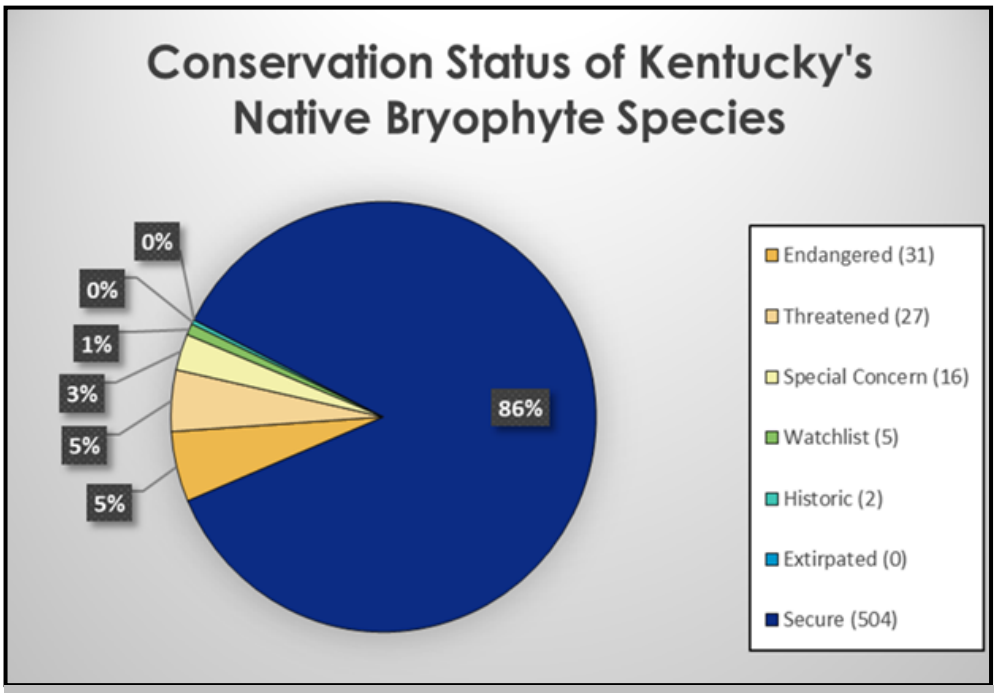


Conservation status of vascular plants in Kentucky.

Prior to the assessment process for the 2022 list, the plant taxonomy and nomenclature of vascular plants of Kentucky was comprehensively updated in the rare plant database to the 2020 edition the Flora of Southeastern North America by Alan Weakley. After 235 species additions, 812 deletions, and 427 name changes across 143 listed taxa and 1,325 non-listed taxa, the rare plant database now reflects the most current scientific names and concepts that are crucial to effective scientific communication. Currently, we track 197 state endangered plants and 128 of state threatened vascular plants, along with detailed information on an additional 234 vascular plants of conservation concern, including 80 special concern, 88 watch list, 49 historic, and 18 extirpated (**Table 1 and 2**). A total of 18 taxa were added as endangered and 19 were removed from endangered with 13 downlisted to threatened, 2 designated as historic, and 4 downlisted to lower conservation priority. A total of 20 taxa were added as threatened (13 of those downlisted from endangered) and 23 were removed from threatened with 1 designated as historic, 10 downlisted to lower conservation priority, and 12 moved to endangered.

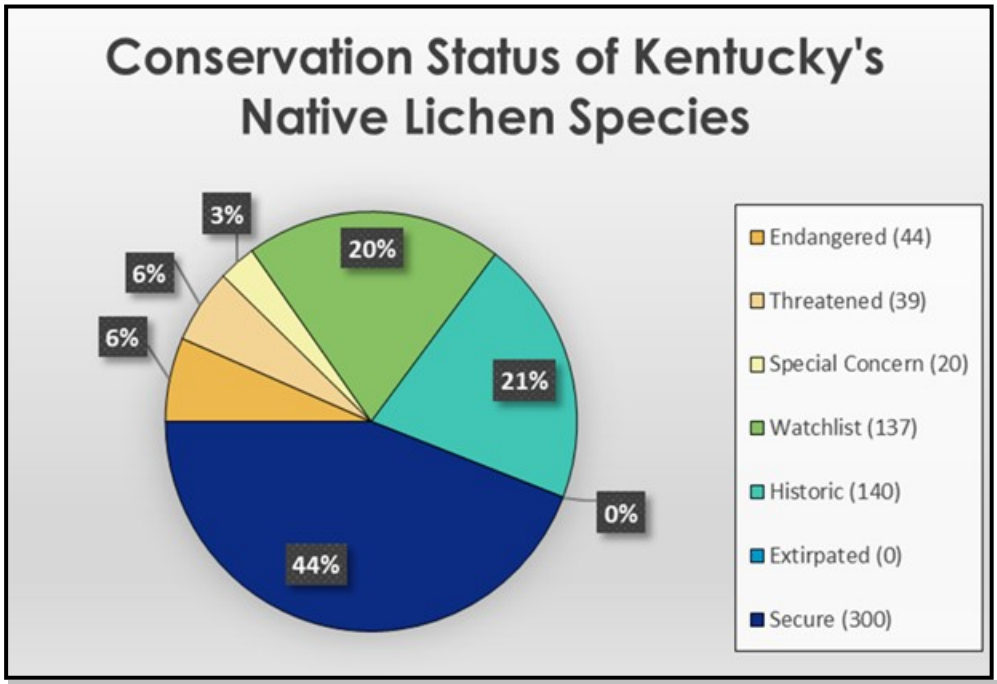
Rare Plant and Community Conservation

Prior to OKNP's efforts, bryophytes and lichens were largely under-documented and poorly understood in the state. This was mostly due to lack of local experts and historical data, creating a large gap in the knowledge of Kentucky flora. To bridge this gap, OKNP and partners collected data to create Kentucky's first complete state list of lichens and bryophytes. It was determined that Kentucky is home to approximately 680 lichen species, with 83 species ranked as state endangered or threatened. The Kentucky bryophytes consist of 585 species, with 58 species ranked as state endangered or threatened.



Conservation status of bryophytes of Kentucky.

In addition to updating our Rare Plant List, we have also been collaboratively working with KDFWR on assessing rare plants to include in the upcoming State Wildlife action Plan (SWAP) as species of greatest concern (SGCN). Those designated as SGCN will be a subset of the larger rare plant list of the most imperiled threatened and endangered species. This is a critical partnership and action step for plant conservation, and we look forward to finalizing these lists in the coming year.



Conservation status of lichens of Kentucky.

Rare Plant and Community Conservation

Interesting Botanical Discoveries Since 2018

OKNP botanists conduct field work all over the Commonwealth, providing abundant opportunity for exciting new surveys in seldom studied areas. Since 2018, several exciting discoveries have been made by OKNP. The most significant discovery was a prairie remnant discovered in 2019 in Pulaski County that contained ten rare plants, most notably the second extant population of spoon leaf sundew (*Drosera intermedia*) and the state record (first documentation in Kentucky) fourangled rose gentian (*Sabatia quadrangula*). The latter represents the first population west of the Appalachian Mountains and is separated from the next closest population by over 200 miles.

State record and state endangered fourangled rose gentian.

Field work in riverscour habitats of the Cumberland Plateau led to several exciting discoveries. Balsam ragwort (*Packera paupercula* var. *paupercula*) hadn't been observed in Kentucky in roughly 40 years, but new populations were discovered Cumberland River and Big South Fork were discovered and old populations were revisited. Also, a new watershed record of the Rockcastle aster (*Eurybia saxicastellii*) was discovered on the Cumberland River. This aster is known from only two rivers in the world, so discovering a third population on a third river represents a significant range extension.

Stone mountain-mint (Pycnanthemum curvipes), a globally rare species discovered in Kentucky in August 2022.

Out in West Kentucky, the barbed rattlesnake-root (*Nabalus barbatus*) was considered extirpated from the state until being re-discovered in Trigg County in 2020 after not being seen for nearly 30 years. Another species, hairy rockcress (*Arabis adpressipilis*), was historically known from just two populations and had not been seen in 45 years, but was re-discovered in 2022 at a KHLCF site in Livingston County. The most significant, recent discovery from this region is a state record of the globally-rare stone mountainmint (*Pycnanthemum curvipes*) in Muehlenberg County. This species occurs in rocky woodlands over mafic rock in just five other states in the Southeast and is an exciting addition to the Kentucky flora.

Rare Plant and Community Conservation

Section 6 of the Endangered Species Act

One important action towards OKNP's goal to prevent species extinctions is recovering globally rare species populations. We accomplish this through targeted surveys, population monitoring, species and community level management, land acquisition, education, research, seed banking, propagation and restoration. Rare plant recovery is an integral part of our plant conservation programs.

Price's potato bean (*Apios priceana*), federally threatened.

Since 1985, OKNP has had a cooperative agreement with the United States Fish and Wildlife Service (USFWS) to serve as the official partner for monitoring and managing federally listed and at risk plants in Kentucky under Section 6 of the Endangered Species Act. Currently, we work on over 30 federally listed, at risk plants and globally rare plants through this agreement. We work closely with USFWS and partners to meet recovery goals and implement conservation action that truly protects those species as well as assess possible additions to the federal list. Often times targeted conservation work on globally rare plants that are not yet federally listed can prevent the need for additional federal listings. Through this program, we annually focus on monitoring, management and restoration throughout the state and work with numerous partner agencies, organizations, universities and private landowners on the conservation of federally listed and globally rare plants.

Kentucky glade cress (*Leavenworthia exigua* var. *laciniata),* became federally threatened in 2015.

Recovering/Delisting Federally Listed Plants:

Since 2005, we have worked to recover and delist 4 species that were formerly listed as federally endangered or threatened, running buffalo clover (*Trifolium stoloniferum*), white haired goldenrod (*Solidago albopilosa*), Cumberland sandwort (*Mononeuria cumberlandensis*) and Eggert's sunflower (*Helianthus eggertii*). These are important accomplishments that take years of hard work and coordination to ensure that populations are recovered and protected into the future.

Cumberland sandwort (*Mononeuria cumberlandensis*) was delisted in 2021 due to the recovery efforts of multiple agencies. It grows in sandstone rock houses in Kentucky and Tennessee.

Rare Plant and Community Conservation

Recovering Federally Listed Plants

Delisting of Running Buffalo Clover:

Running buffalo clover (*Trifolium stoloniferum*) is a perennial clover with showy white flowers and leaves divided into three leaflets. Historically, it was native to West Virginia, Ohio, Kentucky, Indiana, Illinois, Missouri, Kansas, and Arkansas. Based on numerous references to clovers in historical literature, running buffalo clover was likely abundant across its historical range pre-European settlement, which included the Bluegrass Region of Kentucky. However, by 1900, its extent was drastically reduced, and only five populations remained across its range. Throughout the 20th century, there were numerous fruitless attempts to relocate populations, which led scientists to believe the clover was extirpated from many states where it was once common. Finally, in 1983, populations were relocated in West Virginia and Indiana, as well as in northern Kentucky in 1987. In 1987, the U.S. Fish and Wildlife Service (USFWS) listed running buffalo clover as federally endangered because there were so few extant populations and they believed it was at a high risk of extinction.

Running buffalo clover population in an old estate cemetery in Boone County, Kentucky.

The decline of running buffalo clover was a result of European settlement of the land, which led to habitat destruction and introduction of non-native species that became competition for running buffalo clover. Another factor was the loss of the American Bison on the landscape, which was also a result of European settlers engaging in hunting and killing for sport. Historical observations noted the clover's preference for sites where American Bison congregated, such as along bison traces. Bison likely provided a means of fertilizer, seed scarification, seed dispersal, and a periodic disturbance regime necessary for the running buffalo clover's life cycle. The loss of bison from the landscape dramatically affected the species viability.

Running buffalo clover population on a streamside terrace of Boone Creek on the edge of Fayette and Clark counties, Kentucky.

Today, you will find running buffalo clover in areas that have periodical disturbances mimicking bison; for example, along hiking or animal trails where plants get trampled, in old estate lawns or cemeteries that are regularly mowed, and along stream terraces with occasional flooding events. Running buffalo clover also prefers dappled sunlight in a forested setting. If the forest canopy becomes either too closed or too open, the clover population numbers tend to decline as it does not tolerate full shade or full sun.

Rare Plant and Community Conservation

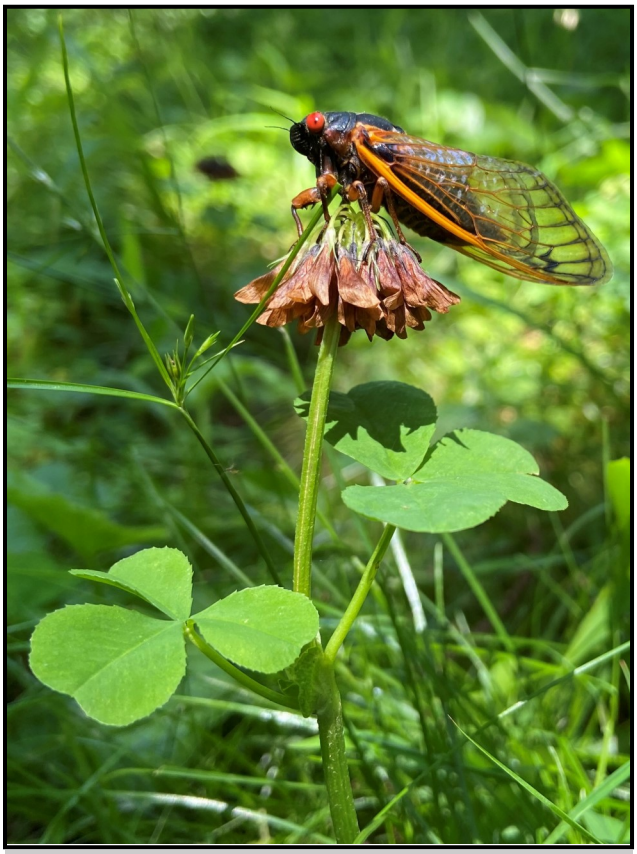
Over the past decade, the Office of Kentucky Nature Preserves (OKNP) has conducted annual monitoring on running buffalo clover to look at population trends and manage for non-native invasive plants. Numerous county records have been discovered during this time, through targeted searches and surveys conducted as a result of stream restoration projects in the Bluegrass Region.

In 2019, running buffalo clover was proposed for delisting by the USFWS, as many populations had been discovered since its initial listing over 30 years prior. In response to the 2019 proposed delisting, OKNP conducted a state-wide assessment of Kentucky's running buffalo clover populations. Despite set-backs from the Covid -19 pandemic, botanists were able to survey 61 populations, which included the majority of the known populations in Kentucky. Sites not included in the assessment were already determined to be extirpated, or inaccessible. Most populations in Kentucky occur on private lands, and although obtaining access to private lands can be difficult, OKNP biologists have been grateful for the curiosity, interest, and enthusiastic response from many property owners. Overall, population trends in Kentucky show approximately half of the populations as stable or increasing in size, while the other half of the populations are declining in size or extirpated (**Table 1**).

Table 1. Population trends of running buffalo clover in Kentucky during the 2019-2020 statewide assessment.

Population Trends	Number of Populations
Relatively stable	11
Increased in size	18
Decreased in size	21
Extirpated**	9
Not applicable*	2
Total	**61**

**Majority previously believed extirpated; extirpation confirmed
* Previously uncounted; unable to compare trend



Mature running buffalo clover fruit from a population in Jefferson County, Kentucky.

A huge success that came as a result of the 2019-2020 statewide survey was the discovery of the largest running buffalo clover population in Kentucky. A population of over 6,000 plants occurs on Mt. Folly Farm in Clark County along Upper Howards Creek. Other large populations of running buffalo clover in the state top out between 1,000 to 2,000 plants. The significance of this population led to the creation of a new Registered Natural Area with OKNP at Mt. Folly Farm. The clover occurs in the floodplain of the creek in cattle pastures and riparian woods.

Rare Plant and Community Conservation

As of September 2021, running buffalo clover was delisted by USFWS, as there is a sufficient number of populations occurring on publicly owned and managed lands to sustain the species' viability. As of 2020, 175 extant populations occur across its range in Indiana, Kentucky, Missouri, Ohio, Pennsylvania and West Virginia, and biologists in these states discover new populations every year. Many populations occur on wildlife management areas where stream restoration projects are ongoing. The key to the future success of this plant is the continued management of populations to keep invasive plants at bay, and reducing the encroachment of woody species from closing the canopy and shading out the plants.

Running buffalo clover population in a lawn setting at the Ashland Estate in Lexington, Kentucky.

OKNP is conducting the five-year post-delisting monitoring surveys for the USFWS in Kentucky, which started in 2021. Seventeen populations were surveyed in 2021 of which, five populations were stable, eleven populations increased in size, and one population decreased in size. Six new populations of RBC were discovered in 2021. Two populations were found in Franklin County, which were county records and one occurs in a privately owned nature preserve, Vaughn Branch Nature Preserve. Two populations were found on state WMA's, in Grant and Lincoln counties, and another population was discovered in Louisville along a walking path in a park. The final new population was discovered at Blue Licks State Resort Park on state protected land. A planted population introduced to Shaker Village of Pleasant Hill in 2014 was also surveyed and appears to be viable and sustaining itself since its introduction.

Running buffalo clover population in a cattle pasture at Mt. Folly Farm in Clark County.

In 2022, twenty populations were surveyed, of which six populations were stable, five increased in size, six decreased in size, and three were confirmed to be extirpated. No new populations have been found yet this year, but the population in Fayette County at the Ashland Estate had numerous new patches pop up, increasing that site's rank from a B to an A rank.

Rare Plant and Community Conservation

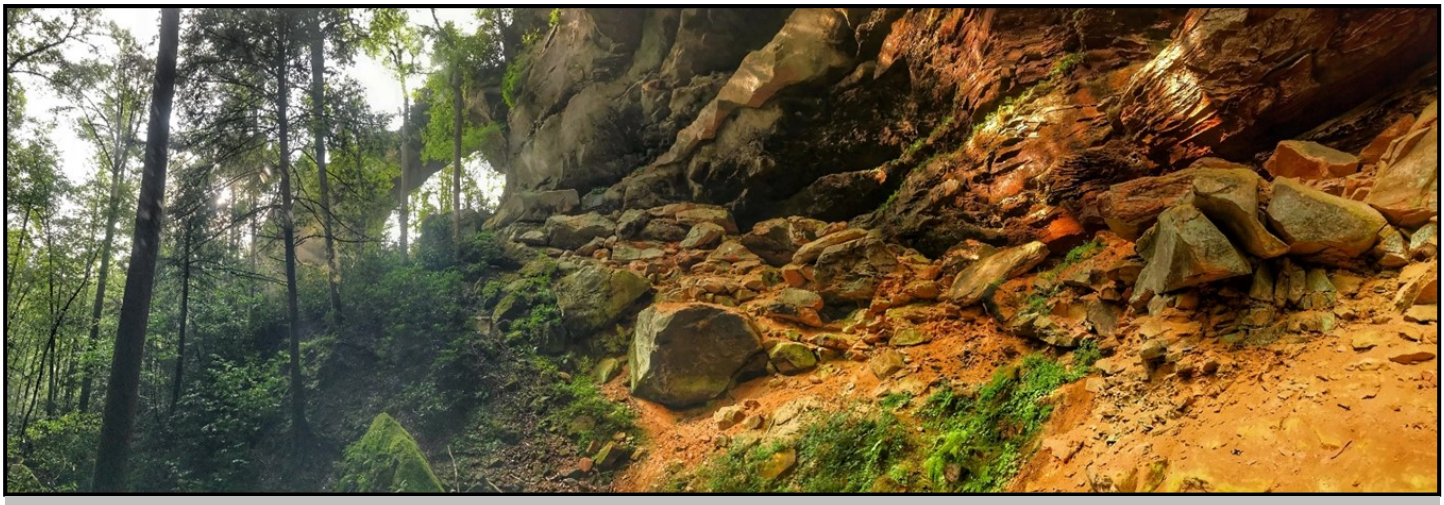
Delisting and Volunteer Monitoring Program for White-haired Goldenrod:

White-haired goldenrod (*Solidago albopilosa)* endemic to the Red River Gorge, KY.

White-haired goldenrod (*Solidago albopilosa*) is a narrowly endemic, globally rare species that only occurs in the Daniel Boone National Forest, within a 30 mile radius of the Red River Gorge (RRG) area of Powell, Menifee and Wolfe counties. First discovered in Menifee County, KY by ecologist Dr. E. Lucy Braun in 1940, white-haired goldenrod (WHG) populations are restricted to the sandstone rockhouses and ledges of the RRG.

In 1988, the U.S. Fish and Wildlife Service (USFWS) listed the species as federally threatened due to its extremely narrow range and the many threats it faced. The heavy use of rock-shelters by hikers, campers, and rock climbers resulted in several types of potentially irreparable damage to WHG populations:

- Trampling can damage the current year's growth, seeds, and the underground rhizomes
- Visitors damaging rockhouse and WHG populations by dumping garbage, camping and building fires in rockhouses
- Digging by archaeological looters. Approximately half of RRG rockhouses were once inhabited by Native Americans. As looters dig up artifacts, they also dig up WHG.
- Rockhouse soils were mined for saltpeter (potassium nitrate) in the past. It is possible that some WHG occurrences were extirpated as a result of these activities.
- Logging adjacent to WHG habitat will increase light intensity, decrease water availability, and accelerate the spread of invasive species capable of outcompeting WHG.

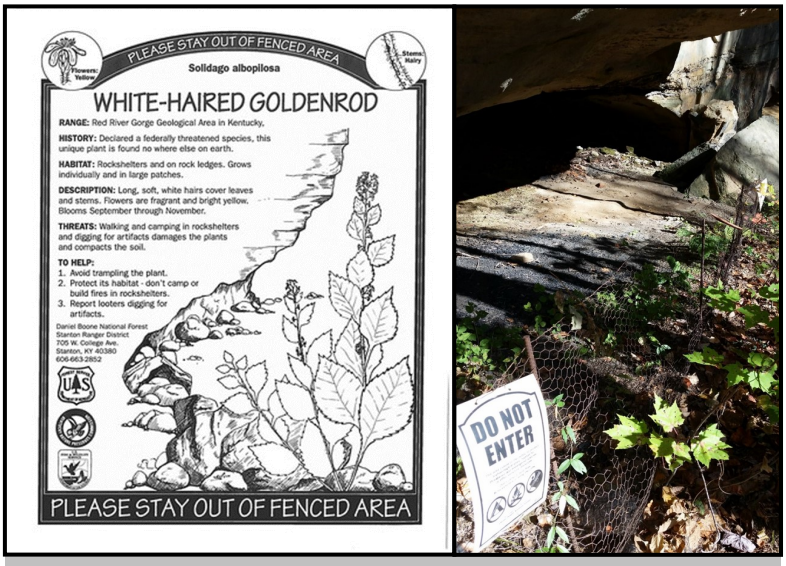


Gray's Arch in Red River Gorge, location of several White-haired goldenrod populations.

Rare Plant and Community Conservation

In 1993, USFWS published the Recovery Plan for WHG, which delineated reasonable actions that were believed to be required to recover and/or protect this listed species. The goal of the recovery plan is to get WHG to a point where it no longer needs federal protection and can be delisted. The USFS partnered with OKNP to implement the major points for WHG recovery outlined in the Recovery Plan .

To address visitor trampling, the USFS diverted trails away from rockhouses, established RRG rockhouses as no camping and no campfire areas, and constructed fences around WHG populations that were posted with educational signs. OKNP helped create signs for the fences, as well as other educational signs and materials that were posted around the RRG and on the web. To discourage archeological looting, the USFS was aided by federal Archaeological Resources Protection Act legislation to prosecute rockhouse looters. Forested habitat adjacent to WHG rockhouses were designated as areas protected from logging. Efforts were made to identify WHG on private lands, and work with those landowners to ensure protection of those populations.



White-haired goldenrod populations were fenced and posted with signs about its conservation to educate the public and protect WHG from trampling.

Extensive monitoring and reporting on the known WHG populations was conducted by OKNP and USFS, and supplemented with searches for new populations. Many of these searches were successful, with more than 20 new occurrences being discovered by 2016. To better understand the life history and ecological requirements of WHG, research was conducted on habitat requirements, reproduction, threats and impacts, genetic variability and more.

Population measures of White-haired goldenrod at the start of the recovery period (1993) and its delisting (2016).

Year	1993	2016
Number of WHG Occurrences	90	117
Number of WHG Stems	45,000	174,000

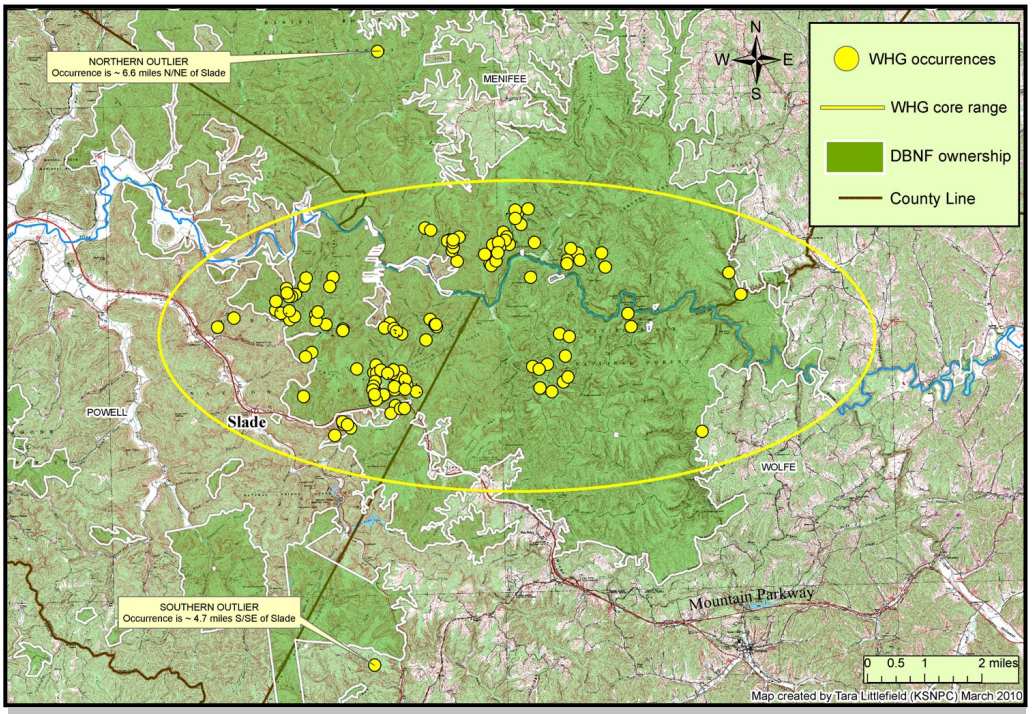
By 2016, these protective actions had improved WHG populations enough that USFWS was able to delist the species. Due to OKNP and USFS efforts, the number of known populations and the total number of stems had increased substantially. Data over a 10-year period demonstrated that enough WHG populations had successful reproduction, stable or increasing population trends, and proper protective measures to justify federally delisting according to the recovery plan.

Rare Plant and Community Conservation

Examples of White-haired goldenrod habitat, rockhouses and arches of the Red River Gorge.

Following the delisting decision, OKNP was tasked with conducting post-delisting monitoring for a 5 year period to ensure that the recovery of WHG remained secure, and this monitoring reached its final year in 2021. OKNP monitored WHG for recreational impacts, population trends, associated species, and miscellaneous threats, as well as created a visual database of WHG through photo monitoring. Of the populations visited during the post-delisting monitoring, approximately 70% had stable or increasing trends. For the decreasing populations, the cause of decline can be attributed to recreational impact, fungal rust, heavy accumulation of leaf litter, or competition with other vegetation.

Despite this species showing stability and resilience to ongoing recreational impact, there are still several unknowns that could affect the conservation status of WHG in the future. Its narrow range makes the species vulnerable to potential catastrophic phenomena, such as disease, extreme weather, and insect infestations. In addition, the popularity of the Red River Gorge area and the numerous, well-established but unofficial user defined trails throughout the area enable anyone access to the majority of WHG sites.



Range of White-haired goldenrod (*Solidago albopilosa*).

Rare Plant and Community Conservation

Nearly half of the populations visited in the post-delisting period had recreational impacts rated "medium" or higher, and these impacts will continue to be an ongoing and unpredictable threat to WHG sites. Fungal rust also continues to be observed on WHG populations, particularly those in high recreation impact areas. 70% of WHG were found to be affected by fungal rust at low levels. To what degree the fungal rust may be negatively impacting WHG populations is not currently well understood, and no obvious correlations can be drawn from data collected during the monitoring period, although any future monitoring efforts should continue to document rust levels at WHG sites. Finally, the impending decline and death of Eastern hemlock trees (*Tsuga canadensis*) in the forest ecosystem community may have negative effects to WHG.

Recreational impact ranks of White-haired goldenrod populations surveyed during the post delisting monitoring period

White-Haired Goldenrod Recreational Impact Ranks	
Recreational Impact Rank	Percent of populations
High	15%
Medium High	6%
Medium	22%
Medium Low	18%
Low	38%
No Data	1%

To address these ongoing concerns, OKNP in partnership with the USFS is creating a volunteer-based program to continue monitoring the most vulnerable WHG populations, the Adopt A Rockhouse Program. Citizen scientist volunteers will be trained in the same protocols used during the post-delisting monitoring, enabling them to evaluate rockhouse habitat condition and assess population trends. This data will be reported to OKNP and USFS, who will follow-up with any necessary management actions needed to ensure population viability. OKNP is excited to collaborate with the public in this important conservation effort, and we look forward to engaging with citizen scientists to increase public awareness of this rare Kentucky-endemic wildflower.

Rockhouses of the RRG will be surveyed by citizen scientists in the Adopt a Rockhouse Program.

Rare Plant and Community Conservation

Federally Listed Plants

Price's Potato Bean, Lessons From Monitoring Assist in the Road to Recovery:

Maturing legume of Price's potato bean on a State Nature Preserve in Livingston County during fruit/seed collection.

Over a decade of partnering with the US Forest Service, at Land Between the Lakes (LBL), on conservation of the federally threatened Price's potato bean (*Apios priceana*) has yielded important lessons for effective management to restore population health. Our joint annual monitoring of populations at LBL has demonstrated that partial mechanical removal of trees and shrubs leads to healthier plants, more successful reproduction, and more seedling recruitment. Some populations at LBL have increased ten-fold or more since 2010! Lessons from this collaboration are being applied by OKNP to a population on a State Nature Preserve and has already coincided with increases in the population and fruit production.

Efforts are also underway to collect seeds for both ex-situ propagation and in-situ seed augmentation at known populations into adjacent habitats. After several years of low to no fruit production, seeds were successfully collected in 2021 from the population on a State Nature Preserve in Livingston County. Those seeds are being grown by a partnering plant nursery for introduction projects in the near future. More urgent seed collection is being conducted at the site of the exciting 125-year rediscovery of Price's potato bean in Warren County. This new site is small and occurs on private land in a utility right-of-way susceptible to herbicide spraying, so it is essential to collect seeds to preserve the genetic diversity of this northeastern-most population. Ongoing monitoring of existing populations remains a priority, but OKNP is prioritizing conservation actions that may lead to successful recovery of this rare plant in Kentucky.

Dormant season mechanical thinning at a State Nature Preserve (left) attempting to expose Price's potato bean to more sunlight that increases plant vigor and flower production like an LBL population (right), where the plant has dramatically increased in number of plants and flowers

Rare Plant and Community Conservation

Braun's Rockcress:

Braun's rockcress clinging to the mossy surface of a limestone boulder.

OKNP staff led a multi-faceted strategy to monitor and manage populations of the federally threatened Braun's rockcress (*Borodinia perstellata*) in the rocky hills of the Kentucky River Valley surrounding Frankfort. Efforts in the past few years have sought to accomplish several primary goals, such as revisiting all known populations, continuing intensive monitoring and invasive species removal at four protected sites on State Nature Preserves and KHLCF sites, conducting intensive site assessments at all populations, and standardizing data collection protocols.

Intensive annual monitoring of Braun's rockcress at State Nature Preserves and KHLCF sites yields more accurate and consistent data about the populations at those sites. Increased staff used during those surveys also allows us to more effectively hand-pull invasive species like garlic mustard (*Alliaria petiolata*) and bush honeysuckle (*Lonicera maackii*) during counting of the rockcress. Annual treatment at these protected sites has had noticeable success in maintaining rockcress populations and overall native plant diversity.

New Survey123 data collection forms used on mobile devices have streamlined surveys and allowed easier collection of site data, such as full species lists. Thirty populations were revisited for monitoring and intensive site assessments, along with documenting several new populations. More intensive site assessments have illuminated some interesting patterns of diversity and provided data to explain long-held assumptions. For example, all of the best rockcress populations grow at sites with 70-100+ native species of trees, shrubs, vines and herbs, with low invasive cover, and other rare or conservative species. This information is useful for current management on preserves and for range-wide recovery efforts.

Invasive species are the greatest threat to Braun's rockcress. Garlic mustard infestations (left) are annually targeted for hand-pulling on State Nature Preserves and KHLCF sites in Franklin County to reduce competition for rockcress and maintain high native plant diversity in these rich forest habitats.

Rare Plant and Community Conservation

Kentucky Glade Cress:

The Kentucky gladecress (*Leavenworthia exigua var. laciniata*) is a federally threatened small winter annual with delicate white flowers. There are only two counties in the world that the Kentucky gladecress occurs: Bullitt and Jefferson. It is found in dolomite glades, a natural community characterized by its thin soils, exposed limestone bedrock, and sparse vegetation. The gladecress uses the edges and thin soils of the exposed bedrock to grow. Gladecress often occurs with other rare species, such as the Eggleston's violet (*Viola egglestonii*), Crawe's sedge (*Carex craweii*) and Great Plains ladies'-tresses (*Spiranthes magnicamporum*). With so many rare species occurring in these glades, OKNP works to protect not only the gladecress, but the dolomite glade community as a whole.

One distinct feature of the Kentucky gladecress is the notched petals.

This species is considered threatened by the US Fish and Wildlife Service and is significantly impacted by ongoing habitat loss from development and non-native species encroachment. The Office of Kentucky Nature Preserves works with partners to conduct yearly surveys on the gladecress both on public and private land. Private land surveys over the last two years have focused on populations that have not been visited in the 20 years or more. This has lead to rediscovery of populations that were previously thought to be extirpated.

Restored glade where seeds were spread to increase Kentucky gladecress at McNeely Lake Park.

Public land surveys have included work with Louisville Metro Parks at McNeely Lake Park. There has been extensive habitat restoration work to open, expand, and remove invasive species from the existing glades at McNeely Lake Park. In addition to these restoration efforts, in 2020 seed was collected from various roadside gladecress populations. These seeds were then used to augment the existing gladecress populations at McNeely. OKNP will continue working with partners to ensure the conservation of the gladecress in coming years.

Rare Plant and Community Conservation

Globe Bladderpod:

A variety of conservation strategies were employed by OKNP to work towards recovery of the federally threatened globe bladderpod (*Physaria globosa*). Methods including translocations and seedbanking, installation of vegetation monitoring plots, monitoring of existing populations, and surveys for new populations in the Kentucky River Palisades. A cooperative project with land managers at Cove Springs Park, a KHLCF natural area in Frankfort, has successfully established an introduced population of bladderpod. Another goal of gathering more rigorous quantitative site data was accomplished through establishing permanent monitoring plots at this KHLCF site, one state nature preserve, and one private land site, providing crucial information about the plant in our collaborative effort with U.S. Fish and Wildlife Service (USFWS), Tennessee Division of Natural Areas (TDNA) and Missouri Botanical Garden (MOBOT).

Globe bladderpod with its bright yellow flowers and globe-shaped fruits.

In 2021, OKNP botanists surveyed dozens of locations in the historic range of bladderpod along the Kentucky River Palisades. No new populations were discovered, but numerous introduction sites were identified on protected lands and mapped for future introduction projects. Lastly, OKNP collaborated with botanists from the Missouri Botanical Garden on several projects, such as seedbanking of Kentucky's bladderpod populations and collecting leaf samples for genetics studies on the species.

Vegetation monitoring plot at a bladderpod site. The metal poles permanently mark a spot and survey tapes were laid out in a large rectangle inside of which data were collected.

OKNP botanists surveyed the steep, rocky slopes of the Kentucky River Palisades in search of new populations of bladderpod.

Rare Plant and Community Conservation

American Chaffseed:

Surveys for American chaffseed targeted areas with existing open, grass-dominated sites like pine savanna restorations (left) and powerlines (right) with other rare grassland species.

American chaffseed (*Schwalbea americana*) is a federally endangered plant, last seen in Kentucky in 1935 from sandstone knobs of McCreary County. It disappeared, like many of Kentucky's historic pine savanna systems, before botanists could ever rigorously document its habitat. OKNP's efforts to re-discover the species have focused on open, grassland habitats with high fire frequency in the Cumberland Plateau, like grassland remnants in powerlines and roadsides, recently burned pine -oak woodlands, dry pine ridges, and cliff-top sandstone barrens and glades. All of these natural communities harbor outstanding amounts of rare species and native biodiversity, so surveys provided opportunities to collect additional data, refine existing understanding of these natural communities, and map new areas of conservation priority. The state endangered tenlobe false foxglove (*Agalinis decemloba*), another rare parasitic annual wildflower, was systematically updated during this process and provided crucial data to the USFWS for its status survey of the plant for federal listing.

Tenlobe false foxglove (*Agalinis decemloba*)

Though visits to the original locations of chaffseed failed to reveal any extant populations, OKNP botanists targeted the four highest quality grasslands known in the region due to their density of rare species and high plant diversity. Using those sites as blueprints, similar sites were investigated and resulted in the mapping of four additional high quality grasslands. Though doubling the number of occurrences of the Cumberland Plateau shortleaf pine savanna to eight sites, the investigation revealed that only 56 acres of high quality habitat remain and all occur in powerlines and roadsides. Inventories from the eight sites refined criteria of the highest quality grasslands from the region and will serve as baseline examples for future evaluation of site quality and success of pine savanna restoration.

Rare Plant and Community Conservation

Rare Plants of the Wild Riverscour

Cumberland Riverscour is a globally rare natural community of flood maintained grasslands and shrublands occurring along rivers of the Cumberland Plateau, famous for their high biodiversity and density of rare species. Occurrences of this community are known from four Kentucky Wild Rivers in southeast Kentucky: the Rockcastle River, Cumberland River, Big South Fork, and Little South Fork. OKNP recently surveyed these communities as part of status surveys administered by USFWS for one federally threatened species, Virginia spiraea (*Spiraea virginiana*), and three at-risk species, beautiful Barbara's buttons (*Marshallia pulchra*), Rockcastle aster (*Eurbyia saxicastellii*) and Tennessee pondweed (*Potamogeton tennesseensis*). The latter three were assessed in partnership with TDNA to collect data assisting decisions about the federal listing.

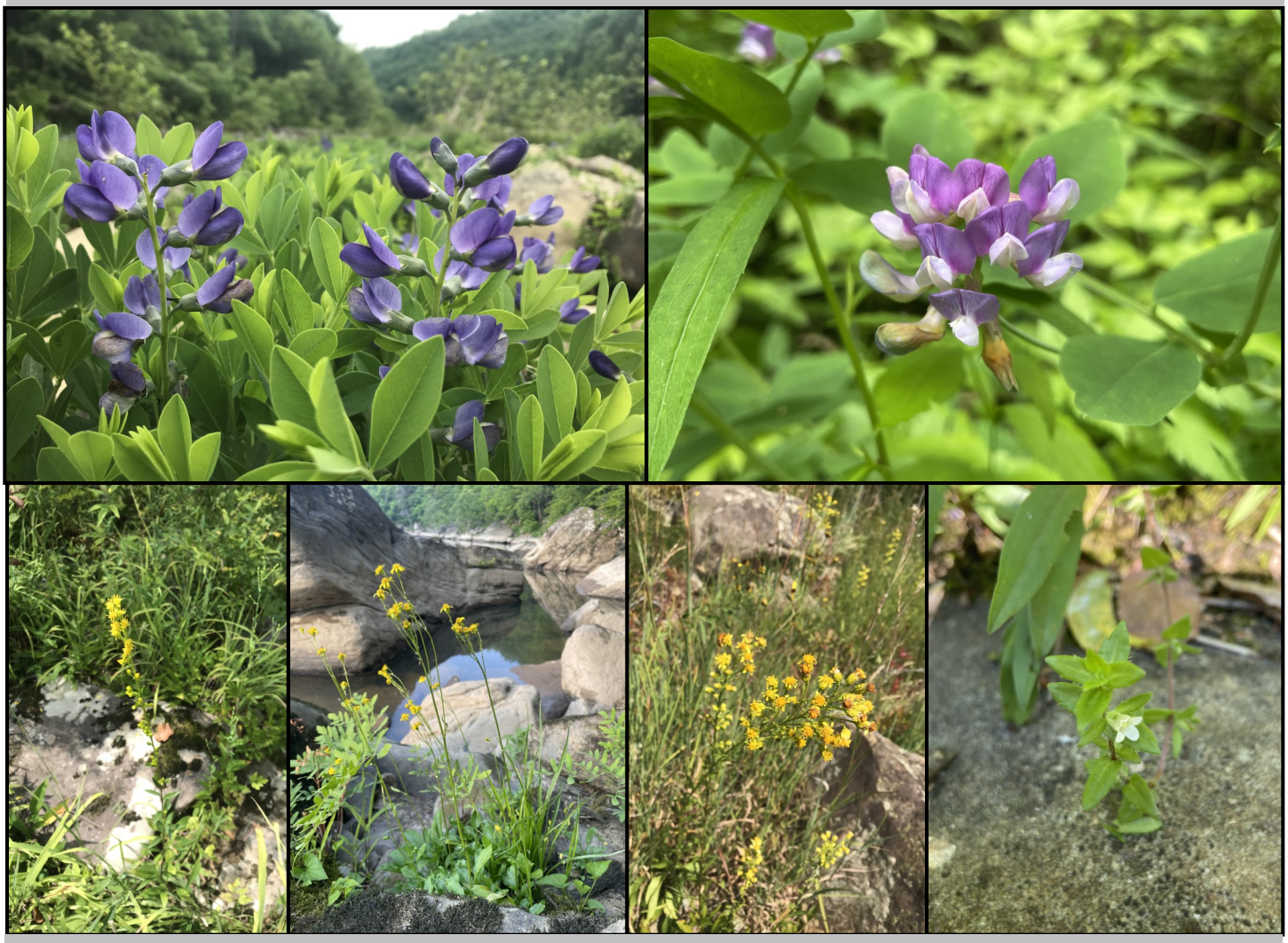
At-risk plants prioritized for surveys in 2019-2022: beautiful Barbara's buttons (*Marshallia pulchra*; left), Rockcastle aster (*Eurybia saxicastellii*; center), and Tennessee pondweed (*Potamogeton tennesseensis*; right).

Population data of those plants were collected along with threat data like invasive species presence, which assists in forming inter-agency plans for targeted treatment to maintain the habitats. It also provided the opportunity to improve datasets for the 35 rare species in these habitats and update their conservation ranks. Attempts to find habitat for at-risk species in the Cumberland River led to the first-ever record of Rockcastle aster from that river, just downstream from Cumberland Falls. This data is important for conservation in the Commonwealth, but also assists regional conservation efforts like that of the southeastern riverscour working group. In an effort to improve scientific knowledge of these systems, OKNP participated in this working group of experts across the Southeast to officially define the riverscour community type, more accurately describe community variation across the southeast, and discuss the biogeography of rare plants of southeastern riverscour. Future results of this working group will produce several publications in scientific journals.

Riverscour habitat in the Cumberland Plateau Wild Rivers.

Rare Plant and Community Conservation

OKNP botanists fording the Big South Fork to monitor beautiful Barbara's buttons.



Several rare species with updated data from at-risk species status surveys (clockwise from the top left): tall blue wild indigo (*Baptisia australis*), marsh pea (*Lathyrus palustris*), shaggy hedge hyssop (*Sophronanthe pilosa*), black warrior goldenrod (*Solidago arenicola*), balsam ragwort (*Packera paupercula* var. *paupercula*), and piedmont wand goldenrod (*Solidago austrina*).

Rare Plant and Natural Community Conservation

Kentucky Orchid Restoration Program

Orchids are one of the most charismatic and diverse groups of plants in the world. With their beauty and unique adaptations to pollinators and fungi, it's no wonder they can captivate any audience. North America is home to more than 200 orchid species, and more than half are endangered or threatened somewhere in their native range. There are 43 species of orchids known from Kentucky, with 30 of those species being of conservation concern. Of those 30, 18 are federal or state listed, and an additional 12 orchid species are either globally rare or declining in the state. OKNP has been involved with monitoring, management, and protection of our rarest orchids for decades.

Kentucky ladyslipper (*Cypripedium kentuckiense*) (left), globally rare, state endangered. OKNP and USFS staff (top right) work collaboratively on conserving several of Kentucky's rarest orchids. Orchid roots (bottom right) are also being collected in order to extract the associated mycrhoizzal fungi. The fungi is then studied, banked, and used in future propagation and restoration efforts

In an effort to expand our orchid conservation work, in partnership with the North American Orchid Conservation Center (NAOCC), we have been working with researchers on seed banking, genetic analysis, and mycorrhizal research/banking of Kentucky's rarest orchids. Beginning in 2019, we have worked on conservation efforts for several rare orchids including the Kentucky lady slipper (*Cypripedium kentuckiense*), white fringeless orchid (*Platanthera integrilabia*), rose pogonia (*Pogonia ophioglossoides*) and small white lady slipper (*Cypripedium candidum*). We have also partnered with Atlanta Botanical Garden to propagate these orchids with the goal of restoring them into suitable habitat in natural areas across Kentucky.

Platanthera species and conservation. OKNP has worked extensively on *Platanthera integrilabia* (top right) and *P. cristata* (bottom right). When restoring wetland habitat, numerous species of orchids increase in population size and vigor.

The state endangered small white lady slipper (*Cypripedium candidum*) has been a focus for recent management and propagation/seed banking efforts. It grows in limestone cedar glades in only 2 locations in Kentucky.

Rose pogonia (*Pogonia ophioglossoides*), state endangered.

Rare Plant and Natural Community Conservation

Roadside Pollinator Habitat Program

Swamp leather-flower (*Clematis crispa)* found on a roadside in Hickman County.

Roadsides are increasingly recognized by ecologists and land managers for their significant conservation value. Roadsides can provide important habitat for many pollinating insects, including at-risk species like the monarch butterfly and the federally endangered rusty patched bumble bee. In addition to pollinator habitat, roadsides can support native grassland communities that include rare plant species.

Grasslands were once much more widespread in Kentucky with estimates of prairie extent ranging from 2.3 to 2.8 million acres at the time of European American settlement. Today, nearly all of Kentucky's native grasslands have been converted to agriculture production or slowly transitioned into forests due to growth of woody vegetation. Historically, widespread use of fire by Native Americans and grazing by large herds of bison, and other ungulates, suppressed woody vegetation and maintained large areas of prairie and other native grassland types. Kentucky's remaining grasslands are now rare and often consist of isolated remnants. Roadsides are maintained in an open condition by regular mowing and as a result they sometimes contain remnants of these original grassland communities.

In partnership with the Kentucky Transportation Cabinet (KYTC), OKNP botanists have been surveying roadside right-of-ways along Kentucky's state maintained roads to identify and document high-quality pollinator habitat and native grassland communities. Our surveys include grassland quality assessments and a pollinator habitat scorecard, developed by the Monarch Joint Venture, which provides a numerical score for potential pollinator habitat. These tools helps us quantify and prioritize roadsides for conservation action.

OKNP botanist visiting a high quality roadside.

Initiated in 2020, the statewide inventory will be completed over the course of 5 years. So far we have completed surveys of 70 counties and nearly 20,000 miles of roads across the Commonwealth. Our survey teams have documented over 40 high-quality conservation sites that provide excellent habitat for pollinating insects. Many of these sites support rare plants including Appalachian rosinweed (*Silphium wasiotense*), swamp leather-flower (*Clematis crispa*), small sundrops (*Oenothera perennis*), wood lily (*Lilium philadelphicum*), and cream wild indigo (*Baptisia leucophaea*).

In line with the goals outlined in the Kentucky Pollinator Protection Plan (2019), this information is shared with our partners and used to develop best management practices that will improve management of these important habitats.

Rare Plant and Natural Community Conservation

Kentucky Forest Biodiversity Assessment Program

Since 2019, OKNP botanists and ecologists have been conducting surveys in forested natural communities across the state for the Kentucky Forest Biodiversity Assessment Program (KFBAP). This long term monitoring program assesses the biodiversity of Kentucky's forested landscapes, surveying 20% of counties per year in order to have a complete state inventory within 5 years. Three years of the program have been completed, resulting in the documentation and mapping of high quality natural communities, discovery of new populations of several species of listed plants, and a better understanding of the effects of natural and human disturbance on Kentucky's forests.

High quality forest in Lee County, Kentucky. These habitats are essential to the conservation of many rare and threatened species.

Over a hundred forest blocks have been surveyed across the Commonwealth, providing high quality habitat where botanists have identified 60 occurrences of species of conservation concern. There were several populations of state endangered and threatened plants observed, including white rattlesnake-root (*Nabalus albus*), American chesnut (*Castanea dentata*), steele's Joe-Pye weed (*Eutrochium steelei*), Appalachian sedge (*Carex appalachica*), grape honeysucke (*Lonicera reticulata*), downy arrowood (*Viburnum rafinesquianum*), and white walnut (*Juglans cinerea*).

Kentucky's rich forests are home to several harvestable and medicinal species, which are in decline across North America due to increasing popularity and decreasing suitable habitat. To identify the species most sensitive to harvest, OKNP utilizes the United Plant Savers (UPS) Species At-Risk List. United Plant Savers is a non-profit organization that has a mission to protect native medical plants and their native habitats to ensure an abundant renewable supply of medicinal plants for future generations. UPS analyzes a species' vulnerability to harvesting based on its life history, habitat type, abundance and range, as well as the effects of harvest and impact of commercial demand. Over 90% of Kentucky forests surveyed in the KFBAP contained at least one UPS at-risk species, with thirty different UPS at-risk species being documented over all.

American ginseng, is listed as a Special Concern-Commercially Exploited species that relies on Kentucky's high quality forests to thrive.

One UPS at-risk species, American ginseng (*Panax quinquefolius*), is of particular concern in Kentucky. American ginseng is a widespread species that has been harvested for medicinal use for centuries. In the U.S., Kentucky ranks first in the amount of American ginseng harvested for export. Despite having a large range with many occurrences, NatureServe determined American ginseng to be Globally Vulnerable (G3) to extinction in 2005. A G3 species is at moderate risk of extinction or elimination

Rare Plant and Natural Community Conservation

due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors. This conservation rank (G3) was calculated by using a standard methodology that accounts for numerous factors, including rarity, threats, and population trends. Threats to American ginseng include unsustainable harvest, deer browse, weather extremes, invasive species, climate change, timber harvest, habitat loss/development, and genetic pollution.

American chestnut was once one of the most important forest trees in its range, but was almost destroyed in the first half of the 20th century by chestnut blight.

As a part of the Kentucky Rare Plant List revision, American ginseng was added to the state rare plant list as S-CE (Special concern-commercially exploited). Though the plant is widespread in Kentucky, over 75% of known populations are at an elevated risk of extirpation from ongoing threats. OKNP, partnered with the Kentucky Department of Agriculture (KDA), is working with both private and public landowners to ensure sustainability of American ginseng in the Commonwealth.

The forests of Kentucky are susceptible to many natural and human disturbances that can lead to the degradation and extirpation of these ecosystems. OKNP found that the most common disturbances include non-native invasive plant species (NNIS), logging, animal disturbance, and habitat loss due human development. Kentucky forests are most threatened by NNIS, with NNIS being present at more than 80% of forests surveyed in the KFBAP. NNIS are introduced, non-native plants that begin to spread or expand their range from the site of their original introduction and have the potential to cause harm to the environment. Three NNIS species were present at approximately half of the forests surveyed: multiflora rose (*Rosa multiflora*), Japanese stiltgrass (*Microstegium vimineum*), and Japanese honeysuckle (*Lonicera japonica*). The Kentucky Invasive Plant Council lists these species as Severe Threats, defined as an exotic plant species which possess characteristics of invasive species and spread easily into native plant communities and displace native vegetation. OKNP combats NNIS through treatment, removal, and management of NNIS across Kentucky's State Nature Preserves and KHLCF properties, NNIS removal work days with partners, and efforts to educate the public on these threats and possible solutions.

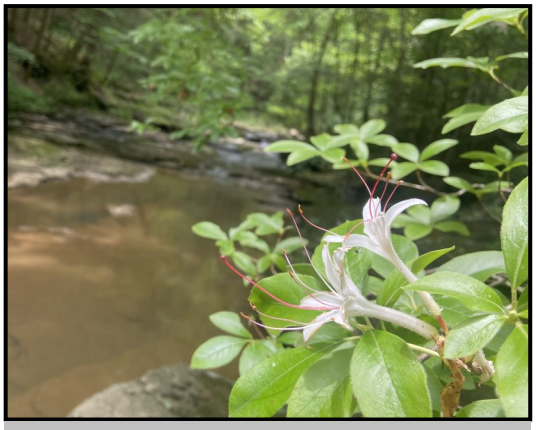
Non-native Invasive Species Japanese stiltgrass displacing native herbaceous plant species of the forest, post selective logging.

The KFBAP will continue to evaluate Kentucky's forest until a statewide inventory is complete in 2023. The data from this program will inform conservation and management decisions in forested systems for OKNP for the foreseeable future.

Rare Plant and Natural Community Conservation

National Forest Inventory Projects

In partnership with the U.S. Forest Service (USFS), OKNP botanists have been conducting natural community surveys and floristic inventories throughout much of the Daniel Boone National Forest (DBNF). From 2019 through 2021 we focused our efforts in the Red Bird District where we surveyed over 3,800 acres of rugged forests. We observed over 450 plant species and documented new populations of many rare plant species including Appalachian rosinweed (*Silphium wasiotense*), white walnut (*Juglans cinerea*), American black currant (*Ribes americanum*), Southern barren strawberry (*Waldsteinia doniana*), gorge goldenrod (Solidago faucibus), and downy goldenrod (*Solidago puberula*).



Sweet azalea (*Rhododendron arborescens*) along a stream in the Jellico Mountains.

Southern barren strawberry (*Waldsteinia doniana*), a rare Southern Appalachian species in the DBNF Red Bird District.

In 2022 our efforts shifted to the Jellico Mountains area in the Stearns District of DBNF. So far we have surveyed over 700 acres and collected information on forest communities, rare plants, non-native invasive species, and potential landslide risks. We have documented interesting populations of several uncommon species including yellowwood (*Cladrastris kentuckea*) trees, yellow lady-slipper orchids (*Cypripedium pubescens*), and early blue violets (*Viola subsinuata*). Our work in the Jellico Mountains will continue in 2023.

Additionally, OKNP has been documenting rare plants and natural community remnants on roadsides throughout the DNBF in partnership with both the USFS and KYTC. Rare grassland plants such as the wood lily (*Lilium philadelphicum*), Pine Barrens aster (*Symphyotrichum concolor*), and skeleton grass (*Gymnopogon ambiguous*) can be found along these roadsides. These plants make up important pollinator habitat for species like the monarch butterfly and native bees. Information gathered during these surveys is shared with our partners to inform management and conservation decisions.

A rich Appalachian mesophytic forest in the Jellico Mountains.

Rare Plant and Natural Community Conservation

Biological Inventory of Wendell H. Ford Regional Training Center

WHFRTC staff is enhancing wildlife habitat on site by seeding native warm-season grasses such as sideoats grama (*Bouteloua curtipendula*, foreground) and big bluestem (*Andropogon gerardii*, background).

The Wendell H. Ford Regional Training Center (WHFRTC) is an 11,000 acre military training ground in Muhlenberg County, and serves as the main training center for the Kentucky National Guard. Most of the site was surface mined for coal from the 1950's to the 1980's, and reclaimed mined areas now serve as forest or grassland habitat for a wide variety of wildlife.

OKNP staff performed an initial biological inventory at WHFRTC in 1995, which provided the Center's land managers with a map of natural communities on the site, as well as a list of plant and animal species present. In 2022, OKNP botanists and entomologists began field surveys for a two-year biological inventory update for WHFRTC. This project will provide updated information to revise an integrated natural resource management plan for the Center. This plan will help land management staff address the needs of the natural areas on site to enhance pollinator and wildlife habitat, control invasive species, identify any rare species present, and identify areas of high floristic biodiversity and restoration potential.

WHFRTC restored grassland habitat, with pollinator-friendly plant species such as black-eyed Susan (*Rudbeckia hirta)*.

Great spangled fritillary (*Speyeria cybele*) on the native Field Thistle (*Cirsium discolor*).

American wisteria (*Wisteria frutescens*), a native wisteria of swampy woods.

Monarch (*Danaus plexippus*) on hollow Joe-Pye weed (*Eutrochium fistulosum*).

Rare Plant and Natural Community Conservation

Monitoring and Inventory on Highest Quality State Nature Preserves
Updated botanical inventories conducted on State Nature Preserves:

In an effort to update our rare plant and natural community records throughout the Kentucky State Nature Preserves system, we have focused on inventories of preserves that have not been systematically updated for more than 20 years. OKNP inventoried several grassland preserves and pine mountain preserves over the past several years, including Crooked Creek State Nature Preserve, Hi Lewis State Nature Preserve, Bad Branch State Nature Preserve, Mt Victory State Nature Preserve, Eastview SNP, Obion Creek SNP, and Flat Rock Glade SNP. This information is updated in the heritage database and preserve management plans and is critical for guiding our land management to ensure we are protecting our rare species and communities.

Indian paintbrush (*Castilleja coccinea*), state endangered.

Small white ladyslipper (*Cypripedium candidum*), globally rare, state endangered.

Long-term vegetation monitoring plots established on State Nature Preserves and Natural Areas :

In order to more effectively manage the rare plants and communities on state nature preserves, OKNP botanists, ecologists, and land managers have been installing long-term vegetation monitoring plots on our state nature preserves and natural areas. This allows us to track how rare plants and communities respond to different management techniques, such as seasonality of prescribed fire, canopy and midstory removal techniques as well as changes in annual or seasonal temperature and precipitation. This unique partnership among botanists, ecologists and land managers allows our management to be adaptive as we work toward the goal of restoring rare plants and natural communities throughout the state. The focus over the past several years has been on setting up monitoring plots in grassland communities as well as resampling grassland plots in post burn units. Over 150 long-term monitoring plots were installed on over a dozen state nature preserves and natural areas.

OKNP staff collecting data from quantitative plots in one of the high quality mountain bogs on Pine Mountain.

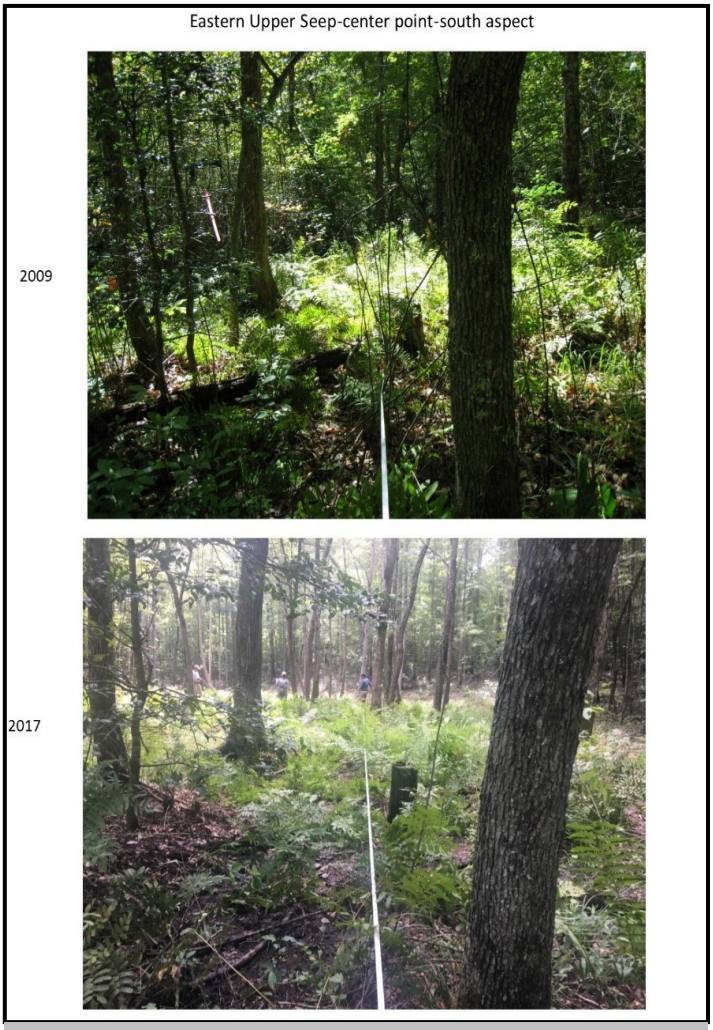
Rare Plant and Natural Community Conservation

White Fringeless Orchid Recovery and Wetland Restoration in Kentucky
Monitoring, Management, Research and Recovery Efforts:

As the federally listed plant recovery leads for Kentucky, in partnership with USFWS, OKNP biologists and land managers have been working on white fringeless orchid (*Platanthera integrilabia,* WFO) monitoring, management, research and recovery efforts since the 1990's. We conduct annual monitoring and 5-year reviews of orchid populations on private and public lands, survey for new populations, work with partners on seed banking and mycorrhizal research, work with UK researchers on hydrological restoration of habitat, monitor and manage our own populations on SNP and USFS lands, and have worked to protect privately owned populations through land acquisition and conservation actions.

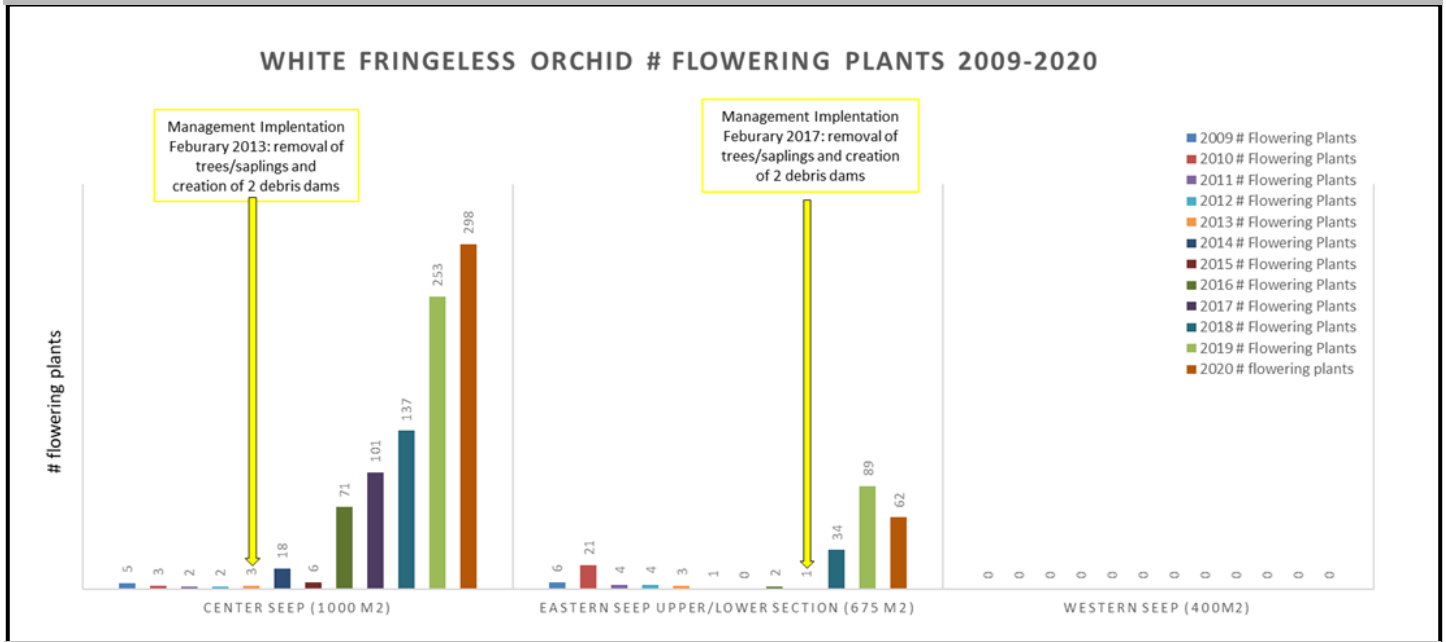
To restore WFO populations, it is necessary to restore the associated natural communities, the Cumberland plateau acid seep (G3) and Cumberland Mountain streamside bogs (G3). Restoring these habitats not only increases WFO populations, but numerous other rare and conservative plants and animals recover along the way. OKNP biologists study all the parts of the wetlands, including orchids, mushrooms, trees, shrubs, herbaceous plants, lichens, bryophytes, butterflies, moths, flies, wasps, salamanders, snakes, mammals, lizards, spiders, soils, and hydrology. Studying the community in this way helps us gain a better picture of the associated community of WFO and in turn helps to conserve WFO into the future.

OKNP works with UK hydrologists to install debris dams (pictured above), remove canopy, and restore hydrology for orchid recovery.



A decade of changes at a white fringeless orchid population on our SNP. As the canopy was opened and debris dams were installed, the community quality and orchid populations recovered

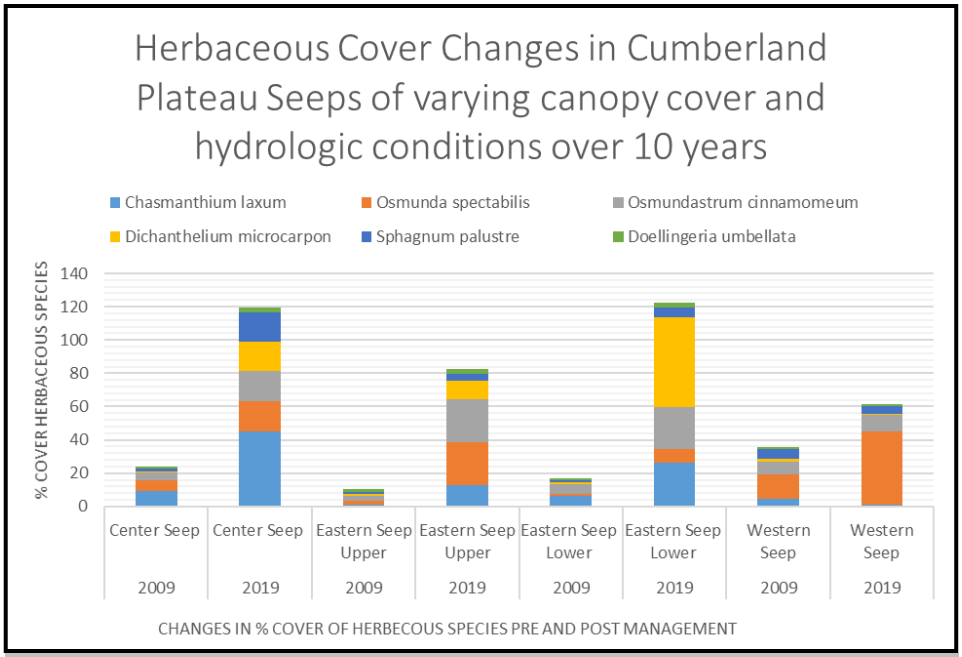
Rare Plant and Natural Community Conservation



Once debris dams were installed and canopy was reduced, white fringeless orchid flowering plants increased dramatically

Recovery and Management on State Nature Preserves:

OKNP has been monitoring, managing, and restoring populations of the federally listed white fringeless orchid on our state nature preserves for several decades. These state nature preserves were discovered by OKNP ecologists in the 1990's through the Kentucky Natural Areas Inventory program and then targeted for acquisition through our KHCLF program in 1998. From initial discovery to land acquisition, to monitoring and management, our biologists and managers have stewarded WFO populations and seep communities and are committed to the recovery of these species and habitats. Since 2009, we have partnered with University of Kentucky on hydrological restoration of our seeps by creating canopy gaps and stalled debris dams. This method has proven successful to restore the hydrology, orchids and overall biodiversity and serves as a model for white fringeless orchid restoration across the southeast.



OKNP botanists and ecologists have documented vegetation changes in the WFO seeps after targeted management and hydrological restoration. Expanding on these vegetation community studies at additional sites will help us tease out the various wetland communities that are associated with WFO-seeps, bogs and seepage slopes.

Rare Plant and Natural Community Conservation

Partnerships with the Daniel Boone National Forest and University of Kentucky:

In 2019, we expanded our management and recovery efforts to include two additional populations that occur within power lines in the Daniel Boone National Forest. These seeps are more open and require annual periodic management in partnership with the utility companies and the DBNF in order for the populations to persist. We are experimenting with management and studying WFO response to inform site management plans within these utilities. Research and studying management effects of woody removal and fire is ongoing.

Populations of white fringeless orchid that occur in power line utilities can thrive under proper management

OKNP Receives National Grant to Expand White Fringeless Orchid and Seep Restoration Projects to Include Daniel Boone National Forest Populations (2022-2027):

In 2022, OKNP was awarded a competitive national federal grant expanding our efforts to restore all the populations of WFO on public lands over the next 5 years! This grant will use the same monitoring methods for orchids, vegetation, and hydrology as well as management techniques that we have used on our state SNP restoration sites. While every wetland is somewhat unique, various methods of canopy removal and debris dams should produce similar results of recovery and population stability. To expand on research, we are also increasing studies on mycorrhizal symbionts, soil characteristics, pollinators and chemical composition of nectar and fragrance. Researchers, biologists and managers have worked to document various species in the wetland communities prior to management over the past year.

WFO and seep community monitoring and research crew 2022 consisted of botanists, ecologists, hydrologists, mycologists, entomologists, zoologists and land managers from OKNP, USFS, UK, and the Kentucky Lepidoptera Society.

Rare Plant and Natural Community Conservation

Mycorrhizal Fungi Research in the Seeps and Bogs:

Orchids are associated with specific mycorrhizal fungi in the soil that are crucial for orchid seed germination. OKNP has partnered with UK, Illinois college and NAOCC to study WFO's associated fungi and expand our knowledge of these important fungal species for use in future restoration projects.

Seedbanking and Propagation of WFO:

We are also partnering with the Atlanta Botanical Garden, Illinois College, and North American Orchid Conservation Center on seedbanking WFO seeds for adding conservation insurance, as well as propagating several populations of WFO for use in restoration projects in the future, stay tuned!

A spicebush swallowtail (*Papilio troilus*) with pollinia (a compact pollen packet) on its eye, visiting an orange fringed orchid (*Platanthera cilliaris*). When a pollinator visits an orchid to take nectar, sticky pads (viscidium) on the end of the pollinia will stick to the insect and be carried to other orchids. Pollinia are produced by many orchids and milkweeds and ensure effective pollination. Seedlings of WFO are being grown by Atlanta Botanical Garden (top left).

Pollinator Research in the Seeps and Bogs:

Few studies have documented pollinators in forested seep habitats. In 2022, OKNP biologists began preliminary monitoring studies to investigate pollinator communities in seeps using malaise and black light traps as well as visual surveys.

Pollinators and other associated insects of WFO. OKNP has documented numerous insects that pollinate ((spicebush swallowtail (*Papilio troilus*)) , nectar (green metallic bee (*Augochlroa pura*)) or utilize WFO for their life cycle (crab spiders).

Rare Plant and Natural Community Conservation

Rare Plant Propagation, Seed Banking, and Reintroductions

OKNP works closely with several conservation partners on *ex situ* conservation strategies that provide further insurance to protect declining rare plants. Collaborative activities include seed banking, genetic research, rare plant propagation, translocation, and reintroduction of rare plant populations. We are working on the propagation of over 30 species with various partners, including Missouri Botanical Garden, Cincinnati Zoo, Atlanta Botanical Garden, Dropseed Nursery, Ironweed Nursery, University of Kentucky, and the Kentucky Plant Conservation Alliance.

Wood Lily:

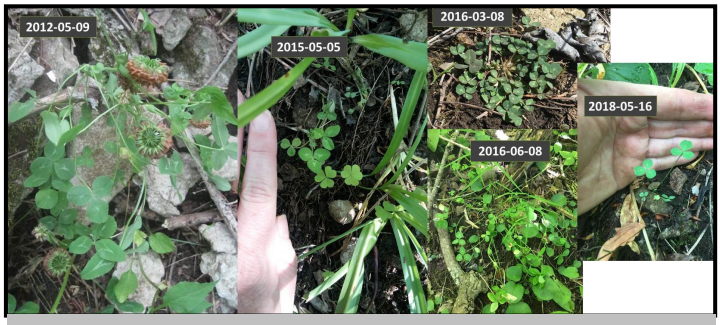
Wood lily (*Lilium philadelphicum*), state endangered.

OKNP and partners have been working on a project to protect, connect, and restore populations of the wood lily (*Lilium phildelphicum*), and associated pine barrens and woodland habitat over the past decade in Kentucky. The wood lily, while globally secure and wide ranging, is state endangered in Kentucky, despite once being more common. This charismatic plant of Cumberland plateau grassland and woodlands (barrens) has declined by over 90% in the past 40 years due to habitat loss, lack of fire, mowing, and herbivory. The wood lily, along with numerous other plants it grows with, make up critical pollinator habitat for species such as the monarch butterfly and native bees. We are working with partners to bring this plant and its habitat back from the brink of extinction by coordinating and implementing monitoring, management and restoration efforts. We are excited to announce that the wood lily has finally come full circle as a plant conservation alliance project from monitoring, collaboration, seed collection, site preparation and management, to now translocation back in managed pine barrens habitat in the Cumberland plateau. In the fall of 2021, 5 years after we began the project to protect the remaining populations and to propagate them for future introductions, the first transplantations finally began. A team from OKNP and the Kentucky Plant Conservation Alliance volunteers transplanted wood lily bulbs into new several sites in Powell, Pulaski and Rockcastle counties that are being managed and restored to the pine barrens woodland community.

OKNP worked with partners to propagate wood lily for introductions to restored habitat.

Rare Plant and Natural Community Conservation

Kentucky Clover:



Long term monitoring of Kentucky clover conducted by OKNP staff.

Big news for native clover conservation in the Bluegrass State. Several years of conservation collaboration has resulted in the first transplants of the globally rare Kentucky clover (*Trifolium kentuckiense*) back into the Bluegrass woodlands in late 2021. This endangered clover was discovered (2010) and described (2013) recently and was known from only two privately owned limestone woodlands in the Inner Bluegrass of Kentucky. Since its discovery, the Kentucky clover had disappeared from both sites despite annual monitoring and management efforts conducted by Office of Kentucky Nature Preserves botanist Tara Littlefield and KDFWR biologist Joe Lacefield. Luckily, seed collection and propagation efforts were successful due to our collaborative efforts with Valerie Pence, Kristine Lindsey, and Mairead Kennedy from the Cincinnati Zoo CREWs plant program, among many other partners, and the first batch of Kentucky clover plants was transferred to OKNP in order to transplant into high quality, managed limestone woodlands.

Clover Power! OKNP staff work collaboratively to transplant Kentucky clovers into our natural areas.

Mairead Kennedy and Valerie Pence present propagated Kentucky clover plants at the Cincinnati Zoo CREWs plant program.

After several years of managing transplant sites for removal of invasive species such as bush honeysuckle (*Lonicera maackii*), OKNP staff and partners transplanted 75 Kentucky clover plants back into the original Franklin County site as well as transplanted new populations into 3 additional protected high-quality natural areas in Franklin County. OKNP botanists and partners will be monitoring the success of these transplants over the next several years and conducting quantitative studies on how best to manage for this rare clover and its unique limestone woodland habitat. The power of partnership is key to conserving rare plants and the collaborative approach of the Kentucky Plant Conservation Alliance has made these recovery efforts possible.

Rare Plant and Community Conservation

Plant Conservation Alliance: Kentucky and Beyond

"Collaborative conservation of rare plants and natural communities in Kentucky and the greater region"

State representatives from the Southeastern Plant Conservation Alliance work together on range wide rare plant conservation across state borders.

The Kentucky Plant Conservation Alliance (KYPCA) is a public-private partnership of state and federal agencies, land managers, academic researchers, botanical gardens, conservation horticulturists, non-profits, conservation groups, private sector/consultants, community scientists, and volunteers committed to protecting native plants and natural communities of conservation concern with a central goal of preventing plant extinctions. The Office of Kentucky Nature Preserves (OKNP) and Kentucky Native Plant Society (KNPS) both recognized the need for a greater focus on rare plants and formed this alliance in 2016 in order to facilitate collaboration amongst existing conservation groups in the state by providing a framework to bring together the botanical community on focused priority plant conservation projects across the Commonwealth. Priority projects are coordinated primarily by botanists and conservation staff at OKNP and collaborative meetings/field days/work days, outreach and volunteer building has been organized primarily by KNPS. The KYPCA is also linked with national, regional, and state alliance initiatives, like the Georgia Plant Conservation Alliance, that help us learn how to most effectively build plant conservation in Kentucky. We seek to prevent plant extinctions and preserve natural heritage for future generations by better leveraging resources of existing partnerships, as well as building new partnerships to expand the collective capability of plant conservation in Kentucky.

The KYPCA connects to partners by coordinating rare plant and community focused meetings and symposiums; coordinating workshops and field work days; providing updates to the KNPS monthly Ladyslipper newsletter and the OKNP quarterly newsletter; through OKNP, KYPCA, and KNPS social media pages; and through our websites www.kypca.knps.org and www.eec.ky.gov/Nature-Preserves.

Rare Plant and Community Conservation

Using iNaturalist to Conserve Rare Plants

OKNP's rare plant database is composed of data from numerous sources: herbarium specimens, botanical field surveys conducted by OKNP staff, and information collected by various conservation partners. This data is used to assess species' conservation statuses, create distribution maps and models, and to assist agencies, researchers, and private organizations in conservation planning and land management. Increasingly over the last few years, citizen scientists have also contributed to this database through observations made on the website iNaturalist.org.

iNaturalist is a social network of naturalists, citizen scientists, and biologists built on the concept of mapping and sharing observations of biodiversity across the globe.

iNaturalist is a citizen science website designed to map and share observations of organisms. Users photograph a plant, animal, or fungus, and upload the photo along with location information and to the website, where other users can assist in helping to identify the organism. The botanical community on iNaturalist has been growing steadily in Kentucky for the last few years, and numerous rare plants have documented by community scientists on this platform. Observations made on iNaturalist have provided OKNP with important data such as confirmation of extant rare plant populations, relocation of historic plant records, as well as significant range extensions and new county records. The following are some of the most notable observations made by members of the iNaturalist community in Kentucky, which have significantly informed OKNP's rare plant database:

Southern twayblade (*Neottia bifolia*), State Endangered. Photo by iNaturalist user @thomashulsey.

Price's potato bean (*Apios priceana*), federally threatened. Photo by iNaturalist user @kentuckycourtenay.

- In 2018 an iNaturalist user uploaded images of Southern twayblade (*Neottia bifolia*) that they had photographed several years prior at in Edmonson County. This diminutive and easily overlooked native orchid is endangered in Kentucky and was previously only known to occur in Hickman County.

Rare Plant and Community Conservation

- A population of Price's potato bean (*Apios priceana*) was discovered on private property in Warren County by a landowner in 2020. This federally threatened species is known from just a few counties in western Kentucky, and was historically known from Warren County, but had not been seen there since botanist Sadie Price discovered the species in the 1800's.

- In 2021, a flowering patch of nettleleaf sage (*Salvia urticifolia*) was observed by an iNaturalist user on a quiet country road in Christian County. This state endangered species has been recorded in just a few counties in southern Kentucky, but most existing records are several decades old. This observation was a new county record, and is now the westernmost known location for the species in Kentucky.

Nettleleaf sage (*Salvia urticifolia*), state endangered. Photo by iNaturalist user @annaneeley.

As the iNaturalist userbase and the broader botanical community continues to grow in Kentucky, OKNP expects discoveries from community members like these to become more frequent. Importantly, many such findings have been made not by expert botanists, but by nature enthusiasts of widely varying skill levels who simply enjoy exploring and learning about the natural world around them. iNaturalist serves as a very effective conduit to connect OKNP with the community, and helps to facilitate sharing of important rare plant observations and discoveries. To that end, OKNP created an iNaturalist project which collects and displays all plant observations made in Kentucky that have been identified as a state listed species, which helps botanists review and confirm rare plant observations. To view this project and see the many rare plant observations made by Kentuckians, visit the Kentucky Plants of Conservation Concern Project on iNaturalist.

From left: Swamp leatherflower (*Clematis crispa*), state endangered, by iNaturalist user @gagebarnes; Kentucky glade cress (*Leavenworthia exigua* var. *laciniata*), state endangered, by @debunkshy; and Appalachian rosinweed (*Silphium wasiotense*), state threatened, by @dave_logsdon.

Kentucky's Lichen Inventory and Monitoring Program

In order to better understand the richness of Kentucky flora, OKNP is working to bridge the gap in biodiversity knowledge by developing a lichen inventory and monitoring program. Lichens are organisms composed of a symbiotic relationship between algae and fungi, in which the algae produces food via photosynthesis and the fungi provides protection and structure. Prior to the creation of a lichen program, there was a significant lack of data on Kentucky's lichens due to lack of local experts, scant specimen collections, and very few scientific publications focused on lichens; a checklist of the lichens of Kentucky has never been published. The few areas that had been properly surveyed for lichens were mostly limited to large recreation-based public lands. There are very few states that have lichen programs, making OKNP's program uniquely valuable to the conservation of lichens as one of the first to track the group state wide.

Lichen plot to monitor the prescribed fire effects on a limestone slope glade lichen communities at a state nature preserve.

OKNP biologists, partnered with Dr. Allen Risk of Morehead State University, have conducted state nature preserves lichen inventories, installed monitoring plots, and reviewed herbarium specimens and citizen science observations, to create Kentucky's first state lichen list. As a part of the Rare Plant List revision, lichens were given conservation ranks and mapped within the NatureServe Biotics5 Rare Plant Database. Of the flora covered by OKNP, lichens are the least studied and most poorly known group, so the OKNP lichen program has a special utility in gathering baseline data for better understanding.

Dr. Allen Risk (above) and OKNP lichenologist Kendall McDonald (below) survey a sandstone outcrop at a state nature preserve.

Burred horsehair lichen (Bryoria furcellata), state endangered.

Kentucky's Lichen Inventory and Monitoring Program

Lichens face many threats across the globe due to their sensitivity to pollutants, long life spans, habitat specifications and long regeneration times. They are most threatened by air pollution; many regions of North America are low in lichen biodiversity due to air contaminants that have caused sensitive species to die off, resulting in only species tolerant of air contaminants to remain. Habitat loss due to logging, urbanization, and climate change have compounded the effects of air pollution on lichens. Many lichen species depend on the substrate continuity, habitat variety and optimal microclimates only available in old growth forests, which have mostly disappeared throughout the Commonwealth. Recreational activities such as rock climbing can negatively effect lichen communities, due to the constant abrasion lichens receive along climbing routes. This is of particular interest for lichens of the Red River Gorge, as the area is commonly known as one of the best climbing destinations in the world and receives hundreds of thousands of visitors per year. The invasive emerald ash borer is not only a major threat to the ash trees in Kentucky, but also to the rare lichens that colonize the bark of these trees. Since lichens that grow on living plant tissue, such as bark, cannot survive in the long term on decaying wood, it is inferred that lichens growing on dead ash trees and tree fall will eventually die also.

Examples of Kentucky rare lichens, left to right: rimmed shingles lichen (*Fuscopannaria leucosticta*), dispersed firedot lichen (*Squamulea subsoluta*), tentacle lichen (*Lempholemma cladodes*), scattered rock-posy lichen (*Rhizoplaca subdiscrepans*) and green specklebelly lichen (*Crocodia aurata*)

OKNP was able to add over 60 species to the list of known Kentucky lichens, for a total of 680 species. Several lichens qualified as state species of conservation concern and will be tracked in OKNP's Rare Plant Database: 44 endangered, 39 threatened, 20 special concern, 137 watchlist and 140 historical species. Several interesting species of conservation concern were added to the flora, such as the limestone loving species, fissured stippleback lichen (*Dermatocarpon dolomiticum*) and tentacle lichen (*Lempholemma cladodes*) found on the rare dolomite glade communities in western Kentucky. There are some species that are greatly threatened by hiker trampling, such as dispersed firedot lichen (*Squamulea subsoluta*) and rock-posy lichen (*Rhizoplaca subdiscrepans*), which only remain on the edges and vertical surfaces of sandstone outcrops they once likely dominated. In higher quality protected sites in eastern Kentucky, a disturbance sensitive species was documented on mature trees, rimmed shingles lichen (*Fuscopannaria leucostica*). In Pine Mountain, the second known state population of burred horsehair lichen (*Bryoria furcellata*) was discovered, one of Kentucky's most sensitive and rare lichens.

Kentucky's Lichen Inventory and Monitoring Program

Lea's bog lichen (*Phaeophyscia leana*), IUCN endangered and state endangered.

Two Kentucky species of lichens are listed on The IUCN Red List of Threatened Species as Endangered, oak spore lichen (*Sporodophoron americanum*) and Lea's bog lichen (*Phaeophyscia leana*). Oak spore lichen is endemic to eastern North America, the majority of known occurrences are located in the southern Appalachian Mountains, with scattered sites in the Ozarks and Piedmont in the southeastern U.S. Lea's bog lichen is narrowly endemic to areas associated with the Ohio River and its associated waterways in Alabama, Illinois, Indiana, Kentucky, Ohio and Tennessee. The species has a narrow ecology in that it occurs at a specific height on the trunks of trees, just above the high-water mark of frequent inundation, within the floodplain and where there is little competition from other lichens. One species believed to be historical in the state, green specklebelly lichen (*Crocodia aurata*), was rediscovered via a citizen scientist observation on iNaturalist. Many observations of the green specklebelly lichen have been documented by OKNP biologists since, but all occurrences have occurred on fallen ash trees that have succumbed to the emerald ash borer.

OKNP will use the knowledge gleaned from this program to make conservation decisions on OKNP and KHLCF lands, provide conservation guidance for organizations throughout Kentucky, and provide rare species data for environmental planning. The addition of the lichen program compliments OKNP's rare species database by providing a more holistic view of ecosystem health alongside vascular and non-vascular plants, aquatic animals, terrestrial animals, and natural communities. For example, as a part of the Kentucky fire monitoring program, lichen monitoring plots were established on three state nature preserves to capture the effects of prescribed fire on lichens of limestone glade communities. Education and outreach programs such as guided hikes, printed materials, webinars and workshops are provided to OKNP staff, partners and the public to raise awareness of lichens, their threats and future conservation.

OKNP lichenologist leads lichen workshop in the Bluegrass.

Aquatic Zoology Conservation

Kentucky Creekshell Distribution, Status, and Genetic Assessment Study

The Kentucky creekshell project is a collaboration with the USFWS, KDFWR, and Virginia Tech University. The Kentucky creekshell (*Leaunio ortmanni*) was once considered endemic to the Green River drainage and restricted solely within Kentucky, however, recent genetic data suggested the species was more widespread and occurs in the Cumberland River, and within the Green River in Tennessee. The main goals of the project are to delineate the distribution of the freshwater mussel, determine its status, assess the genetic structure of the various populations, and to augment populations with juvenile mussels reared from females obtained in the wild from those populations. The multi-year project is nearing completion but several highpoints are noteworthy:

Female (above) and male (below) Kentucky creekshell (*Leaunio ortmanni*), Green River.

- Over 100 surveys have been conducted, with at least two individuals encountered and tissue samples obtained from each of the six populations in the Green River drainage and from associate populations in the Cumberland River drainage.
- Multiple new locations for the species and rediscovery of a couple populations not encountered for many years were made.
- Brood stock and augmentation of the Nolin River and Russell Creek populations have been established from gravid females discovered in those systems, with over 3,000 and 700 juveniles released, respectively.

Biologists Monte McGregor (KDFWR) and Mike Compton (OKNP) release hundreds of Kentucky creekshell juveniles into a stream in 2021.

Juvenile mussels released in 2021 found 10 months later in 2022. Growth ranged 5-8 mm.

Aquatic Zoology Conservation

Although good discoveries have been made, nearly all surveys yielded very few individuals or no individuals at all, suggesting the distribution and abundance of the species has decreased substantially from historical records. The project will continue throughout 2022 and conclude in 2023. Ultimately, the information gathered from the study will be used to determine if the species warrants federal protection and to guide conservation measures that would enhance its persistence.

Green River Dam Removal Project

The removal of lock and dams #5 (LD5) and #6 (LD6) on the Green River in central Kentucky represents the largest stream restoration project ever carried out in Kentucky. When both dams were fully functional, roughly 37 miles of the Green and Nolin rivers were impounded from Glenmore, Kentucky upstream into Mammoth Cave National Park (MCNP). The significance of the dam removals are paramount because the Green River is considered one of the most biologically diverse rivers in the temperate zone of the world and MCNP is recognized as a Bioreserve and World Heritage Site. The removal of the dams and the environmental monitoring is a collaboration of multiple entities that include the federal agencies USACOE, USFWS, and NPS and state agencies, Division of Water, Kentucky Fish and Wildlife, and Office of Kentucky Nature Preserves. OKNP coordinates and implements the monitoring of the Green River. The primary goal of the project is to restore the hydrology of the river back to free-flowing conditions. Monitoring was established to document the environmental and biological conditions prior to dam removal and to monitor the ecological response following the removal of the infrastructure.

Green River impounded upstream of LD5.

Intensive data gathering from approximately 75 km of river is ongoing for fish, mussels, macroinvertebrates, riparian zone, and instream habitat. In addition, OKNP has partnered with researchers at Austin Peay State University in Tennessee to obtain the initial genetic samples of select fish and mussel species for a long-term gene flow study. One of the primary goals of the study is to understand the genetic structure of the fish and mussels prior and post dam removal, and to determine if the infrastructures had an effect of the genetic makeup of the fish and mussels downstream and upstream of the dams.

Aquatic Zoology Conservation

Demolition crews prepare the site for the removal of lock and dam #5.

Data gathering and processing is ongoing, but the mussel component prior to the dam removal of lock and dam #5 is complete. Results of the mussel surveys from 2017-2021 indicated 37 species were encountered from the 61 historical species known within the study area. The data showed the mussel assemblages varied based on hydrology and were drastically influenced by the impoundment caused by the dams. Mussel assemblages were less diverse and comprised mostly of species that are tolerant of stagnant waters, while reaches not impacted by the dams and reaches below the dams showed a more diverse assemblage and were comprised of a mixture of pool tolerant species and free flowing species. Notably, six federally endangered mussels have been encountered and it is the hope that the removal of the dams will benefit these populations and the other native mussels.

The removal of lock and dam #5 is expected for 2023. Monitoring will continue after the removal over the next few years and OKNP staff are excited to see how the flora and fauna communities will respond to the river changing back to a more natural setting.

Status Review of the Relict Darter

The relict darter (*Etheostoma chienense*) is a federally endangered fish endemic to Kentucky and has one of the smallest ranges, only occurring within Bayou de Chien in western Kentucky. Over the last ten years OKNP biologists have partnered with USFWS to monitor and estimate the population size of the species. These efforts estimate 15,000 – 20,000 individuals occur within approximately 30 km of stream in the Bayou de Chien system. The surveys also indicated that the species appears to be stable, despite its narrow range. The species is currently under review by USFWS to determine if down-listing from endangered to threatened status is warranted and the recent work will be used to make a final determination.

Relict darter (*Etheostoma chienense*) female (above) and male (below).

Terrestrial Invertebrate Conservation

In 2022, OKNP entomologists conducted biological inventories of terrestrial invertebrates in Fayette, Hardin, Laurel, Muhlenburg, Powell, Pulaski, and Whitley counties. These surveys target native pollinators including bees, butterflies, and moths. Little is known about the diversity and conservation status of native bees in Kentucky, and there is no formal list of bee species for the state. Efforts to document native bees are ongoing and will allow such a list to be generated. Although moths and butterflies have been studied extensively in Kentucky, the composition of communities and stability of populations are dynamic. Ongoing monitoring of butterflies and moths ensures that appropriate responses to conservation concerns can be undertaken in a timely manner. Building and maintaining species lists for natural areas across the state allows us to assess biodiversity, monitor population trends, and set conservation priorities.

A Great spangled fritillary (*Speyeria cybele*) on a milkweed, Hardin County.

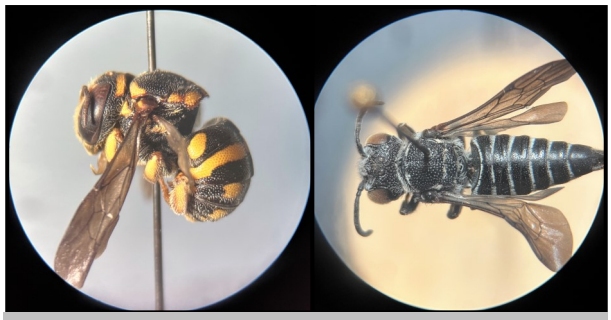
Pollinator Importance

A bumblebee (*Bombus sp.*) on an american snowbell (*Styrax americanus*) flower.

Pollinators perform a vital ecological function responsible for the majority of plant reproduction. Without pollinators, we wouldn't have many of the foods, beverages, medications, and fibers we use today. Because plants can't move to find mates, they can either self-pollinate or hope for a welcome visitor to transport their pollen to other individuals, thereby enhancing genetic diversity. While media buzz around the domesticated honey bee (*Apis mellifera*) has increased awareness of this important function and the decline of pollinators around the globe, this species isn't native to the United States. OKNP entomologists are instead focused on the conservation of our native insect pollinators. By focusing on native groups, we can better understand their intricate relationships with our native plants and how to conserve and protect them both.

Native Bee Inventories

Little is known about Kentucky's native bees, but OKNP entomologists are working to document our species all over the state. After collecting bees in the field, the second half of the work begins at the microscope. Like many insect groups, most bees cannot be identified in the field and must be taken back to the lab to compare the intricate, subtle differences among species that aren't usually visible to the naked eye. OKNP's bee inventory and monitoring efforts have resulted in several state and county records.



Microscope views of a Northern rotund-resin bee (*Anthidiellum notatum*) (left) and a cuckoo leaf-cutter bee (*Coelioxys modestus*) (right).

Terrestrial Invertebrate Conservation

Gritter Ridge SNP Lepidoptera Inventories

OKNP entomologists work with the Society of Kentucky Lepidopterists to inventory the moths and butterflies across the state. The Society has field trips throughout the year to document KY species. This year's field trip took place at Gritter Ridge SNP and over 400 moths and butterflies have been documented for this site alone, including species that are rare in the state such as the pine devil moth (*Citheronia sepulcralis*) (right).

Blacklighting at Gritter Ridge SNP, Powell County (left) and a pine devil moth (*Citheronia sepulcralis*) (right) identified during a blacklight moth survey at Gritter Ridge, Powell County.

Floracliff Butterfly Count and Moth Night

OKNP and Floracliff staff and volunteers scout for butterflies during the Central Bluegrass Butterfly Count, Fayette County.

OKNP entomologists collaborate with Floracliff Nature Sanctuary to inventory the moths and butterflies on the preserve. Every year in July, OKNP and Floracliff staff and volunteers participate in the Central Bluegrass Butterfly Count with the North American Butterfly Association and a nighttime blacklighting event for National Moth Week. These annual events provide important data for species distributions and relative population sizes. This data is used to monitor population changes in response to weather, climate, and habitat changes. These events also promote volunteer and community science. Volunteers and participants are encouraged to post photos of their observations to iNaturalist, which allows species observations to be mapped and shared for anyone to use.

A brown scoopwing (*Calledapteryx dryopterata*) identified during the 2022 Floracliff moth night—a first for the preserve.

Photo credit: Loran Gibson

Chillcott's moth (*Exoteleia chillcotti*) - a state record from Gritter Ridge SNP surveys; larvae of this moth feed inside pine needles (*Pinus* sp.).

Microscope view of Eastern prized epeolus (*Epeolus lectoides*) - a state record from bee inventory surveys.

Beautiful insects are all around us—this beautiful wood-nymph (*Eudryas grata*) was spotted in the parking lot of OKNP's office building.

Cave Research on OKNP Lands

Kentucky has 1000s of caves, some of them are located on OKNP lands. Caves provide specialized habitats for numerous animals, from bats to millipedes. Many of these species are extremely rare and often occur in only one particular cave. Surveys for these animals require special expertise and are difficult and sometimes dangerous work. As a result, most caves in the state have never been visited by a biologist and others have only been partially surveyed. Dr. Ben Tobin of the University of Kentucky is among the very few in Kentucky qualified and willing to do this important work. In the coming years, he and his students will survey several caves on OKNP lands for rare cave invertebrate species. OKNP is also working with researchers from the University of Alabama and North Carolina State University who are studying the effects of climate change on caves and ways to improve climate resilience. We expect that in the future, we may need to create a plan for monitoring sensitive species for climate-related declines; conduct long-term monitoring to quantify how temperature, humidity, or other environmental variables are changing over time in the caves that we manage; prioritize conservation of relatively cool and wet caves (or areas within caves) that serve as climate refugia; restore previously disturbed caves that could increase available habitat for climate-stressed species; and consider how forest removal or afforestation will affect cave climates and thus species living within the caves that we manage. We expect that the data generated from this project will allow us to make more informed decisions about how management actions could affect climate resilience in cave ecosystems in Kentucky.

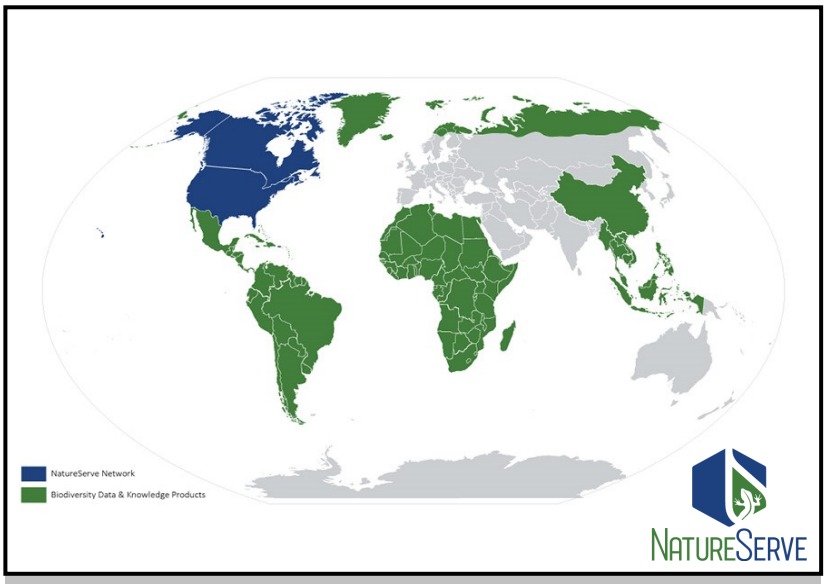
Dr. Matt Niemiller, University of

Southern cavefish (*Typhlichthys subterraneus*) (top) and Appalachian cave crayfish (*Orconectes australis packardi*) (bottom), both rare Kentucky species adapted to live in caves.

Data Management and GIS

The Kentucky Natural Heritage Database

To date, OKNP's natural heritage database contains an impressive **19,047** species and rare community occurrence records, and **24,248** species and rare community site specific records. A total of **2,316** species and community occurrence records were added or updated during the past year. OKNP tracks **1,193** species and ecological communities and monitors **204** more on a watch-list. OKNP's database also contains **784** high-quality site records, including caves, and **721** conservation lands records. Private sector industries, the military, and conservation groups all trust OKNP data to make important economic development, infrastructure investments, and land conservation decisions.



Geographic reach of the NatureServe Network

OKNP is the Commonwealth of Kentucky's state affiliate of NatureServe, an international network of over 60 natural heritage programs located in the United States and Canada. These programs gather, organize and distribute standardized, detailed information on biological diversity. By partnering with NatureServe, OKNP tracks the status of a species or natural habitat type at global, national, and state scales and assign objective and sound conservation ranks using standardized methodologies and data management software. OKNP data also provides the NatureServe Explorer website with accurate information on Kentucky species. This resource is used by educators and professionals all over the world, and can be accessed at https://explorer.natureserve.org/.

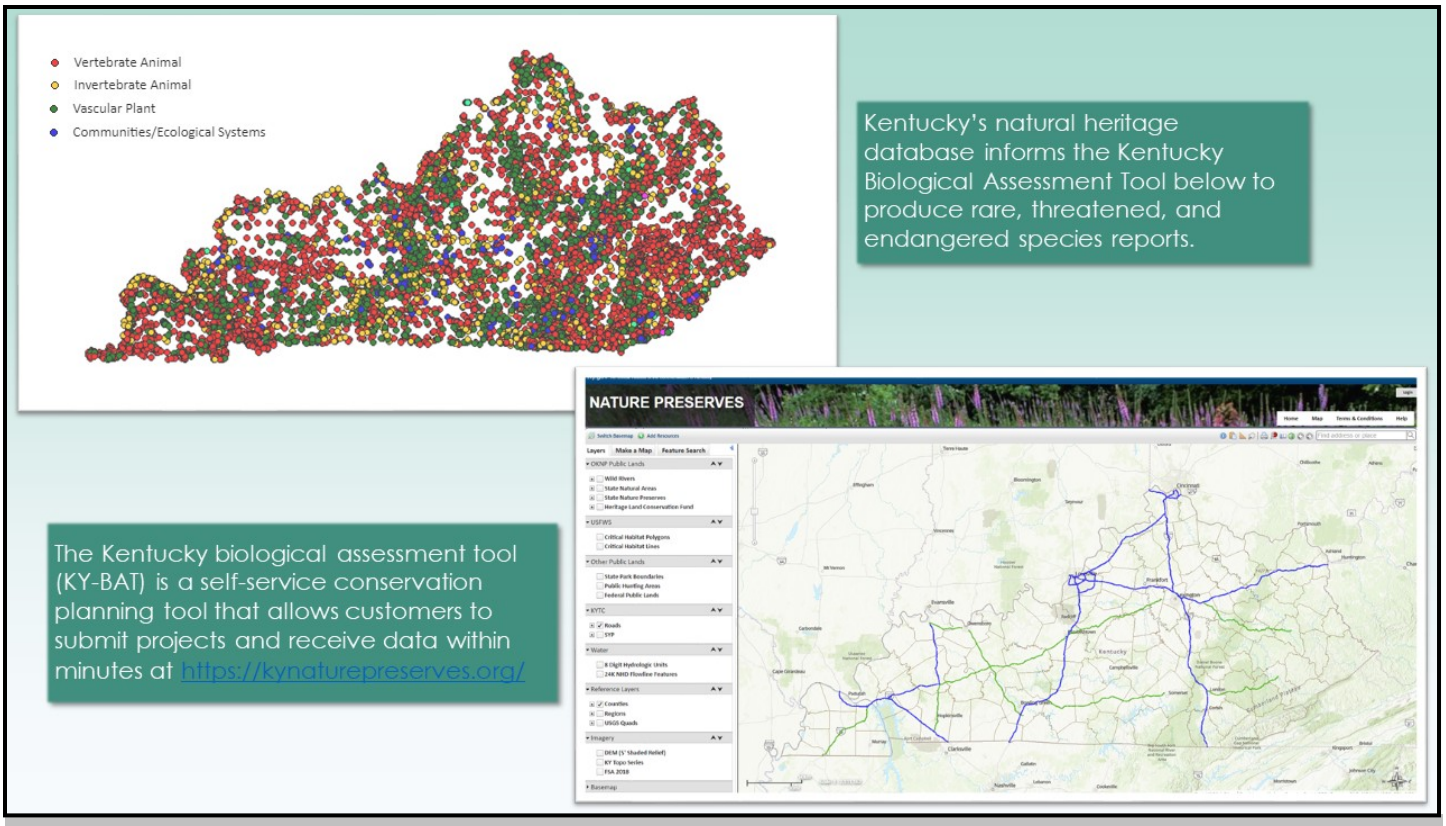
The Kentucky Department of Fish and Wildlife Resources collaborates with OKNP and uses natural heritage ranking standards and species occurrence data to inform and complement current efforts in developing the State Wildlife Action Plan. The Natural Resource Conservation Service uses OKNP data to determine what Farm Bill-funded practices are appropriate on farms throughout the Commonwealth. During the last year, OKNP data was used to run over **4,500** reports for over **3,000** different Farm Bill applicants.

OKNP's data enables land managers and developers, in both private and public sectors, to make decisions more efficiently and to benefit society and the economy by avoiding impacts on sensitive areas. OKNP provides information that facilitates ecologically sound development and infrastructure projects, like pipeline corridors, roads, communication towers, and municipal utility projects. During the last year, our data managers responded to more than **270** large-scale and site-specific data requests from private consultants, utilities, conservation groups, federal, state, and local government, forest management groups, land trusts, and researchers.

Data Management and GIS

The Kentucky Biological Assessment Tool

The Kentucky Biological Assessment Tool (KY-BAT), an environmental review tool developed by OKNP in cooperation with NatureServe, went live in 2018, and continues to provide real-time data access to the public. KY-BAT allows clients to submit projects and receive reports with information on rare species and communities, conservation lands, and other natural resources for a project area within minutes. By accessing KY-BAT at https://kynaturepreserves.org/, customers are provided with an efficient, 24/7 solution to a wide variety of environmental and developmental planning needs.



Natural Heritage Database and Biological Assessment Tool relationship

Using KY-BAT, OKNP improved the reporting process for surface coal mining permit and reclamation reviews at the Department for Natural Resources. During the last year alone, **40** different rare, threatened and endangered species reports have been generated by the Division of Abandoned Mine Lands, thereby saving time and money by accelerating reclamation project reviews.

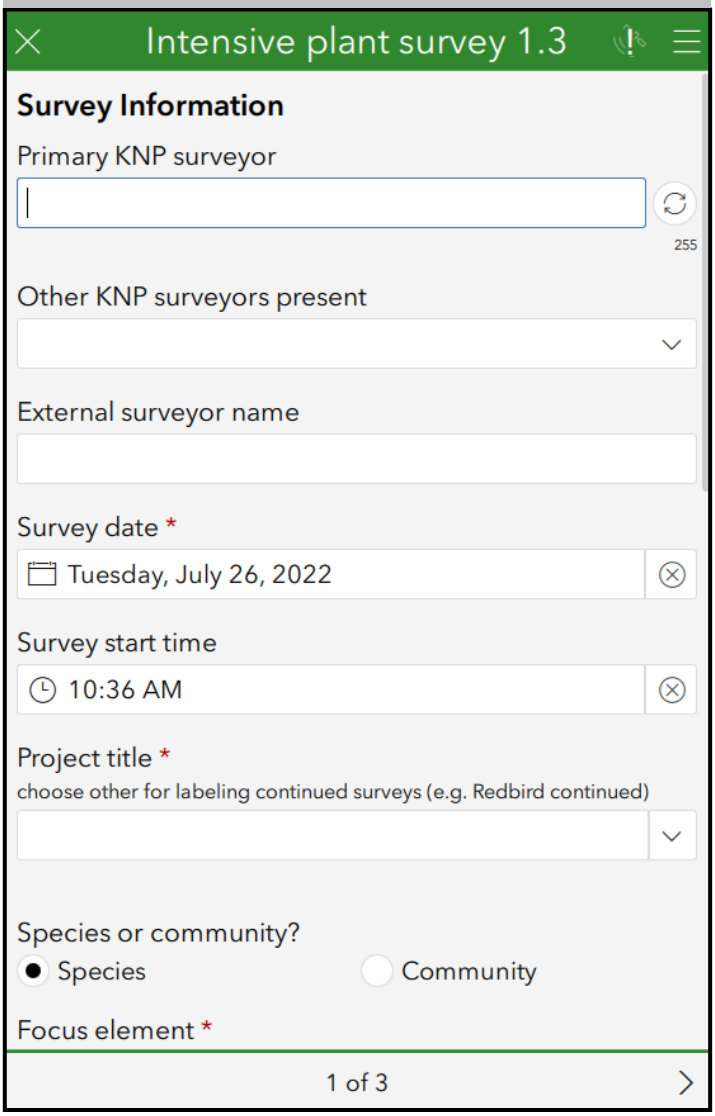
OKNP is a leader in the biological and environmental data field. OKNP biologists are recognized for their field experience and commitment to complete, accurate data. Data analysts respond to numerous large-scale and site-specific information requests which guide land-use planning, development, conservation efforts, and research. KY-BAT is the most accurate database of rare species, natural habitats, and conservation lands available in Kentucky and is updated regularly. It is the result of 40 years of research and on-the-ground inventories by OKNP biologists, plus a compilation of herbarium records, museum records, and data from other agencies and organizations.

Data Management and GIS

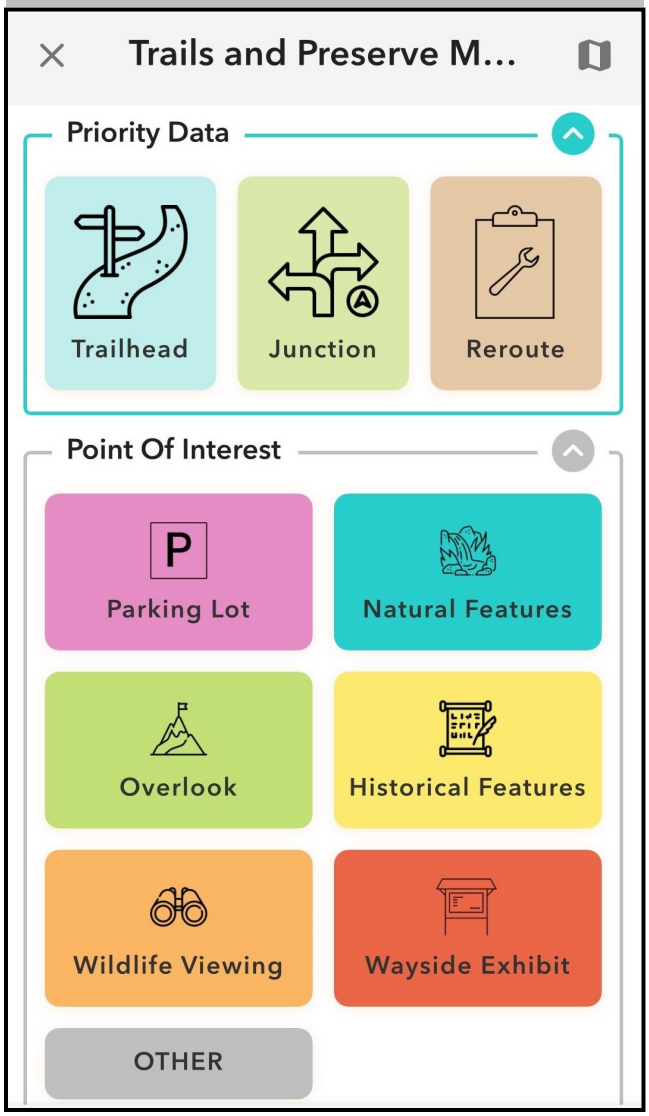
Innovative Workflows

During the last year, the Office of Kentucky Nature Preserves' data and Geographic Information Systems (GIS) team collaborated with botanists to streamline the inventory process in the field. By leveraging ESRI's Survey123 digital data collection form along with rare species data layers available in the field via Collector, botanists can now use their mobile devices to look up existing resources at a survey site, as well as auto-fill their botanical inventory digital form with known variables before completing their assessments. This workflow improves data consistency and reduces data entry time both in the field and in the office. The data and GIS team also collaborated with land managers and with the Division of Geographic Information to create a new and improved OKNP trails database. This database will be continuously managed to house data on the condition, accessibility and needs of OKNP's recreation trails, trailheads, structures, and junctions. Using ESRI Quick Capture, OKNP land managers collect reliable and detailed trail data, used to create better recreation opportunities and faster emergency responses for hikers on Kentucky's natural areas.

Botanical inventory Survey123 interface

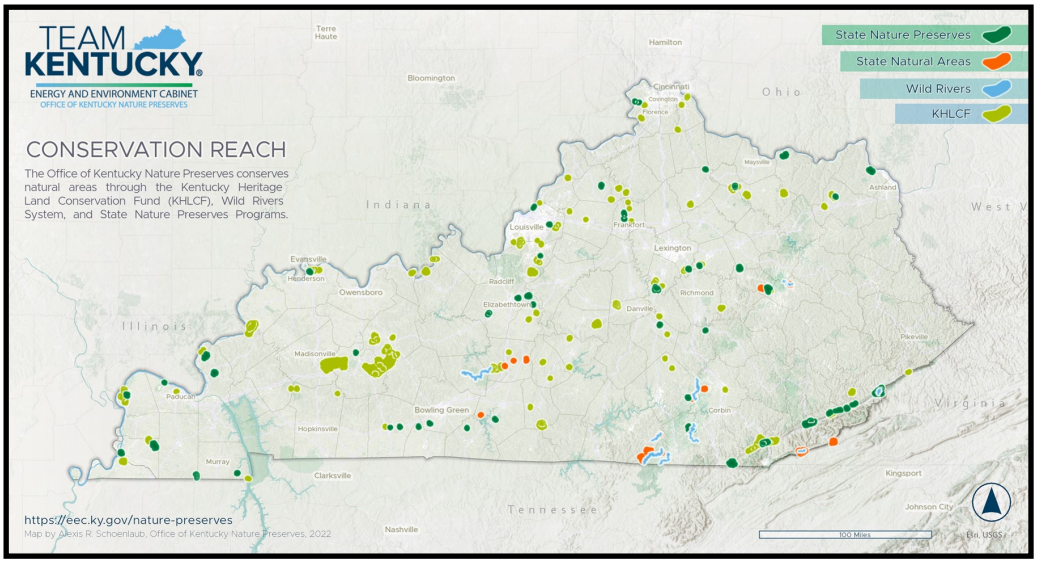


Trail data collection interface in Quick Capture



Linking Monitoring and Management on our State Nature Preserves

Conserving Rare Species on State Nature Preserves and State Natural Areas:



The Kentucky Nature Preserves Act of 1976 established the State Nature Preserve system to protect the best remaining examples of rare species populations and natural communities known in the state. These areas are some of the Commonwealth's most spectacular nature scenery and are particularly suited for environmental education and scientific research. Conserving these high quality areas often reduces the risk that species will become federally endangered, helps the recovery of currently listed species, or helps achieve recovery goals that bring species closer to their delisting. These high quality areas are legally "dedicated" as "State Nature Preserves".

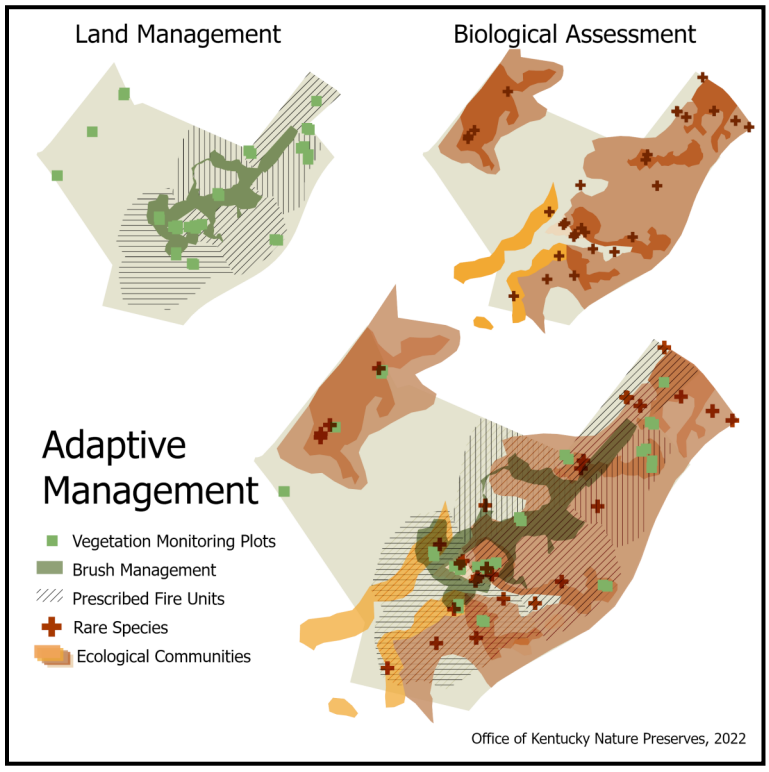
State Nature Preserves with less sensitive habitats are open to the public for hiking, wildlife viewing, and passive recreation on a system of hiking trails. Preserves that are more sensitive are closed to the public and focus on research and management of rare species and natural communities. It is a goal of OKNP to protect all of Kentucky's plants, animals and natural communities within our State Nature Preserve and state natural areas systems. Beyond land acquisition and protection of these rare species, OKNP is also tasked with managing habitat for these species to ensure populations remain stable and viable and where possible expand the available habitat.

Quantity of state listed endangered, threatened, or special concern species conserved in perpetuity on OKNP's State Nature Preserves and State Natural Areas.			
Tracked Group	Total State Listed Endangered, Threatened or Special Concern	Number of Species on State Nature Preserves and State Natural Areas	Percent of Total Listed Species
Vascular Plants	400	197	49%
Non-vascular Plants	67	17	25%
Animals	345	345	42%
Natural Communities	73	31	44%

Linking Monitoring and Management on our SNPs

Science Based Conservation of rare plants and natural communities:

OKNP biologists (botanists, ecologists, entomologists and zoologists) survey the state looking for rare plants, animals and high quality natural communities and work with various public and private landowners to monitor, assess and restore our rare species and remnant communities. OKNP land managers focus on managing our natural areas systems and developing site specific management plans to ensure that rare species are able to persist. One objective at OKNP is to collaboratively work together across disciplines, biologists and land managers, to measure success of management prescriptions and study the effects of practices on the rare species and communities we are tasked with conserving. The goal is to improve management decision making, and ultimately the overall success of recovering our rare species and remnant communities.



The monitoring/management effects program is primarily focused on our grassland communities (glades, barrens, prairies, wet meadows, bogs, and seeps). Over 65% of the rare species in Kentucky occur in grassland systems that are disturbance dependent, meaning they need some level of disturbance to persist. Historically, large grazing animals, wildfires, and flooding would provide the required disturbance to allow these species the opportunity to persist. Today, we have removed most of these natural disturbance events due to wildfire suppression for public protection, loss of free ranging large herbivores that grazed these areas, and implementation of mowing and land use practices that don't always follow ecological timelines or needs. Over the past decade, OKNP botanists and ecologists have worked with land managers to install over 200 long term monitoring plots across our highest quality grassland community management units within the nature preserves system, as well as on select partner managed lands such as the DBNF. We utilize standard scientific methodologies to collect and analyze data on community structure and composition, as well as rare and invasive species.

Linking Monitoring and Management on our SNPs

Science Based Conservation of rare plants and natural communities:

The monitoring program helps guide and refine our management techniques and ensures that our rarest species and remnant grasslands maintain healthy population levels and remain and/or improve on species richness, quality and overall biodiversity. Coordination between the biologist and land managers ensures that management actions can be tied to responses in monitoring and that decision making is based on site specific real time data. Better understanding of how management actions affect success of restoration and recovery efforts we can better inform decision on state nature preserves and provide guidance for managers across public and private lands throughout Kentucky and the broader region to ensure our natural heritage is conserved for future generations.

TEAM KENTUCKY®

ENERGY AND ENVIRONMENT CABINET

OFFICE OF KENTUCKY NATURE PRESERVES

OKNP Staff

TEAM KENTUCKY®

ENERGY AND ENVIRONMENT CABINET

OFFICE OF KENTUCKY NATURE PRESERVES

Director's Office

Sunni Carr
Executive Director

Stephanie Ellis
Purchasing Specialist

Judy Cunningham
Budget Specialist

Nour Salam
Database Analyst

Alexis Schoenlaub
Geoprocessing Specialist

Natural Areas and Recovery Branch

Josh Lillpop
Branch Manager

Kyle Napier
Pine Mountain Manager

Maddy Heredia
KHLCF and Outreach Manager

Ryan Fortenberry
Wild Rivers Manager

Doug Wilder
Trails Manager

Zach Beyer
Bluegrass Manager

Quinn Towery
Natural Areas Technician

Zach Lemmon
Natural Areas Technician

Other staff: Jess Slade- Previous Bluegrass Manager, Heather Drake- Green River Manager.

OKNP Staff

TEAM KENTUCKY®

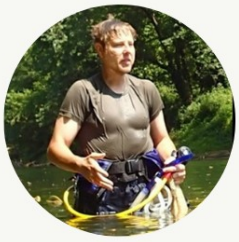
ENERGY AND ENVIRONMENT CABINET

OFFICE OF KENTUCKY NATURE PRESERVES

Biological Assessment and Plant Conservation Branch

Tara Littlefield
Branch Manager

Martina Hines
Environmental Scientist



Mike Compton
Aquatic Biologist

Devin Rodgers
Botanist

Kendall McDonald
Lichenologist

Shelby Fulton
Terrestrial Entomologist

Heidi Braunreiter
Botanist

Tony Romano
Botanist

Vanessa Voelker
Botanist

Rachel Cook
Botany Technician

Katy Cody
Entomology Technician

Sarah Kosieniak
Botany Technician

Other staff: Courtney Hayes- NRCS Environmental Scientist, Kayla Howard- Aquatics Technician.

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Allen	Carpenter Cave Conservation Area	14.35	Office of Kentucky Nature Preserves
Allen	Goodrum Cave State Nature Preserve	50.55	Office of Kentucky Nature Preserves
Ballard	Axe Lake Swamp State Nature Preserve	458.45	Office of Kentucky Nature Preserves
Ballard	Boatwright Wildlife Management Area	1,432.81	Kentucky Department of Fish and Wildlife Resources
Barren	Brigadoon State Nature Preserve	187.46	Office of Kentucky Nature Preserves
Barren	Mutters Cave State Natural Area	108.28	Office of Kentucky Nature Preserves
Bath, Fleming, Nicholas	Clay Wildlife Management Area	813.65	Kentucky Department of Fish and Wildlife Resources
Bell	Kentucky Ridge Forest Wildlife Management Area	3,504.51	Kentucky Department of Fish and Wildlife Resources; Kentucky Division of Forestry
Bell	Kentucky Ridge State Forest	288.24	Kentucky Division of Forestry
Bell	Pine Mountain State Park State Nature Preserve	979.84	Kentucky State Parks; Office of Kentucky Nature Preserves
Bell, Harlan, Letcher	Pine Mountain State Scenic Trail	2,108.70	Kentucky State Parks
Boone	Big Bone Lick State Historic Site	228.52	Kentucky State Parks
Boone	Boone County Cliffs State Nature Preserve	75.42	Boone County Parks and Recreation
Boone	Dinsmore Woods State Nature Preserve	104.52	Boone County Parks and Recreation; Office of Kentucky Nature Preserves
Boone	Gunpowder Creek Nature Park	125.91	Boone County Parks and Recreation
Boyle	Perryville Battlefield State Historic Site	511.95	Kentucky State Parks
Breckinridge	Breckinridge County Wildlife Education Area	25.19	Breckinridge County Fiscal Court
Breckinridge	Yellowbank Wildlife Management Area	1,331.15	Kentucky Department of Fish and Wildlife Resources
Bullitt	Apple Valley Glades State Nature Preserve	60.36	Office of Kentucky Nature Preserves
Bullitt	Knobs State Forest and Wildlife Management Area	2,035.93	Kentucky Department of Fish and Wildlife Resources; Kentucky Division of Forestry
Bullitt, Jefferson	Jefferson Memorial Forest	669.79	Louisville Metro Parks

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Bullitt, Jefferson,	The Parklands of Floyds Fork	332.85	21st Century Parks
Bullitt, Nelson	Bernheim Arboretum and Research Forest	591.91	Bernheim Arboretum and Research Forest
Caldwell, Christian, Hopkins	Pennyrile State Forest	200.62	Kentucky Division of Forestry
Calloway	Blood River Seeps State Nature Preserve	192.49	Office of Kentucky Nature Preserves
Calloway	Fort Donelson National Battlefield (Fort Heiman Unit)	179.80	U.S. National Park Service
Campbell	Hawthorne Crossing Conservation Area	137.88	Campbell County Conservation District
Campbell	St. Anne Woods and Wetlands Research and Education Center	146.49	Campbell County Conservation District
Campbell, Kenton	Morning View Natural Area	223.05	Kenton County Conservation District
Carlisle, Fulton, Hickman	Obion Creek Wildlife Management Area	1,637.89	Kentucky Department of Fish and Wildlife Resources
Carter	Bat Cave State Nature Preserve	135.85	Kentucky State Parks
Carter	Carter Caves State Resort Park	100.50	Kentucky State Parks
Carter	Cascade Caverns State Nature Preserve	20.58	Kentucky State Parks; Office of Kentucky Nature Preserves
Carter	Olive Hill Lake Conservation	214.83	City of Olive Hill
Carter	Tygarts State Forest	255.04	Kentucky Division of Forestry
Christian	Bob Overton Conservation Area	54.82	Office of Kentucky Nature Preserves
Clark	Civil War Fort at Boonesboro	25.38	Clark County Fiscal Court
Clark	Lower Howards Creek Heritage Park	168.66	Friends of Lower Howard's Creek
Clark	Lower Howards Creek State Nature Preserve	227.99	Office of Kentucky Nature Preserves; Friends of Lower Howard's Creek; Clark County Fiscal Court
Crittenden, Union	Big Rivers Wildlife Management Area and State Forest	6,730.58	Kentucky Department of Fish and Wildlife Resources; Kentucky Division of Forestry
Cumberland, Metcalfe	Marrowbone State Forest and Wildlife Management Area	1,955.63	Kentucky Department of Fish and Wildlife Resources; Kentucky Division of Forestry
Daviess	Adkisson Greenbelt Park	22.41	City of Owensboro, Facilities Maintenance Department
Daviess	Yellow Creek Park	1.43	Yellow Creek Park
Estill	Lily Mountain Nature Preserve	349.45	Estill County Conservation District

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Fayette, Madison	Floracliff Nature Sanctuary	348.63	Floracliff Nature Sanctuary; Office of Kentucky Nature Preserves
Fayette, Madison	Raven Run Nature Sanctuary	365.09	Lexington-Fayette Urban County Government Parks and Recreation
Fleming	Park Lake Mountain Nature Preserve	821.11	Fleming County Fiscal Court
Fleming, Nicholas, Robertson	Blue Licks Battlefield State Resort Park	866.71	Kentucky State Parks
Fleming, Robertson	Shorts Goldenrod State Nature Preserve	228.00	Office of Kentucky Nature Preserves
Franklin	Cove Spring Park	88.75	Frankfort Parks and Recreation Department
Franklin	Feindel Conservation Area	14.72	Office of Kentucky Nature Preserves
Franklin	Julian Savanna State Nature Preserve	42.43	Office of Kentucky Nature Preserves
Franklin	River Cliffs State Nature Preserve	210.20	Office of Kentucky Nature Preserves
Franklin	Rockcress Hills State Nature Preserve	84.17	Office of Kentucky Nature Preserves
Franklin	Swallowfield Conservation Area	72.20	Office of Kentucky Nature Preserves
Garrard, Jessamine	Tom Dorman State Nature Preserve	911.11	Office of Kentucky Nature Preserves
Garrard, Lincoln	Logan Hubble Park	122.94	Lincoln County Fiscal Court
Graves	Terrapin Creek State Nature Preserve	269.23	Office of Kentucky Nature Preserves
Grayson	Lone Oak Barrens State Nature Preserve	33.64	Office of Kentucky Nature Preserves
Green	Glenview Heritage Land	168.09	Green County Fiscal Court
Green	Wyatt Jefferies Woods Park	57.14	Green County Fiscal Court
Greenup	Jesse Stuart State Nature Preserve	710.73	Office of Kentucky Nature Preserves
Hancock	Jeffreys Cliff	239.56	Hancock County Fiscal Court
Hardin	Eastview Barrens State Nature Preserve	119.21	Office of Kentucky Nature Preserves
Hardin	Embry Lay Glade State Nature Preserve	19.19	Office of Kentucky Nature Preserves
Hardin	Jim Scudder State Nature Preserve	231.06	Office of Kentucky Nature Preserves
Hardin	Springhouse Barrens State Nature Preserve	54.08	Office of Kentucky Nature Preserves
Hardin	Vernon-Douglas State Nature Preserve	729.46	Office of Kentucky Nature Preserves

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Harlan	Blanton Forest State Nature Preserve	3,504.01	Office of Kentucky Nature Preserves
Harlan	E. Lucy Braun State Park State Nature Preserve	609.42	Office of Kentucky Nature Preserves
Harlan	James E. Bickford State Nature Preserve	347.80	Pine Mountain Settlement School; Office of Kentucky Nature Preserves
Harlan	Kentenia State Forest	762.99	Kentucky Division of Forestry
Harlan	Martin's Fork State Natural Area	1,600.64	Office of Kentucky Nature Preserves
Harlan	Stone Mountain Wildlife Management Area and State Natural Area	1,025.79	Kentucky Department of Fish and Wildlife Resources; Office of Kentucky Nature Preserves
Harlan, Letcher	Hi Lewis Pine Barrens State Nature Preserve	426.18	Office of Kentucky Nature Preserves
Harlan, Letcher	Kingdom Come State Park State Nature Preserve	235.77	Kentucky State Parks; Office of Kentucky Nature Preserves
Harrison	Griffith Woods Wildlife Management Area	391.35	Kentucky Department of Fish and Wildlife Resources
Harrison	Quiet Trails State Nature Preserve	177.24	Office of Kentucky Nature Preserves
Hart	Frenchmans Knob Preserve	65.87	Bacon Creek Historical Society
Hart	Green River State Natural Area (Boiling Springs)	121.37	Office of Kentucky Nature Preserves
Hart	Green River State Natural Area (Davis Bend)	165.52	Office of Kentucky Nature Preserves
Hart	Green River State Natural Area (Rush Island Bottoms)	139.25	Office of Kentucky Nature Preserves
Hart	Hidden River Cave	10.14	American Cave Conservation Association, Inc.
Hart	Upper Green River Biological Preserve	1,247.58	Western Kentucky University
Hart	Upper Green River Biological Preserve (Lawler Bend)	371.56	Western Kentucky University
Henderson	Green River State Forest	404.29	Kentucky Division of Forestry
Henderson	John James Audubon State Park	650.99	Kentucky State Parks
Henderson	John James Audubon State Park State Nature Preserve	338.31	Kentucky State Parks; Office of Kentucky Nature Preserves
Henry	Drennon Creek State Nature Preserve	328.96	Office of Kentucky Nature Preserves
Henry	Kentucky State University Environmental Education Center	294.68	Kentucky State University
Henry, Owen	Kentucky River Wildlife Management Area	533.26	Kentucky Department of Fish and Wildlife Resources

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Hickman	Obion Creek State Nature Preserve	1,598.97	Office of Kentucky Nature Preserves
Hickman	Three Ponds State Nature Preserve	528.25	Office of Kentucky Nature Preserves
Hopkins, Muhlenberg, Ohio	Peabody Wildlife Management Area	45,679.14	Kentucky Department of Fish and Wildlife Resources
Jefferson	Beargrass Creek State Nature Preserve	40.82	Office of Kentucky Nature Preserves
Jefferson	Blackacre State Nature Preserve	180.61	Office of Kentucky Nature Preserves
Jefferson	McNeely Lake Park	26.79	Louisville Metro Parks
Jefferson	Putney Pond and Woodlands	24.36	City of Prospect
Jefferson	Rolleigh Peterson Educational Forest	112.67	Kentucky Division of Forestry; Louisville Metro Parks
Jefferson	Six Mile Island State Nature Preserve	85.58	Office of Kentucky Nature Preserves
Jessamine	Camp Nelson National Monument	58.51	U.S. National Park Service
Jessamine	Jessamine Creek Gorge Nature Preserve	267.49	Jessamine County Fiscal Court
Larue	Abraham Lincoln Birthplace National Historic Park - Boyhood Home Unit	227.98	U.S. National Park Service
Larue	Larue County Environmental Center	215.90	Larue County Fiscal Court
Larue	Thompson Creek Glades State Nature Preserve	169.08	Office of Kentucky Nature Preserves
Laurel	Sinking Creek State Natural Area	301.00	Office of Kentucky Nature Preserves
Laurel	Whitley Branch Wetland Restoration Project	75.57	City of London
Letcher	Bad Branch State Nature Preserve	2,829.07	Office of Kentucky Nature Preserves
Letcher	Lilley Cornett Woods	543.03	Eastern Kentucky University
Lewis	Crooked Creek State Nature Preserve	728.53	Office of Kentucky Nature Preserves
Lincoln	Bouteloua Barrens State Nature Preserve	260.16	Office of Kentucky Nature Preserves
Lincoln	William Whitley House State Historic Site	81.32	Lincoln County Fiscal Court
Livingston	Livingston County Wildlife Management Area (Reynolds Tract)	873.13	Office of Kentucky Nature Preserves; Kentucky Department of Fish and Wildlife Resources
Livingston	Livingston County Wildlife Management Area and State Nature Preserve (Bissell Bluff SNP)	563.24	Office of Kentucky Nature Preserves; Kentucky Department of Fish and Wildlife Resources

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Livingston	Livingston County Wildlife Management Area and State Nature Preserve (Newman's Bluff SNP)	993.81	Office of Kentucky Nature Preserves; Kentucky Department of Fish and Wildlife Resources
Logan	Baker Natural Area	66.16	Logan County Conservation District
Logan	Logan County Glade State Nature Preserve	41.61	Office of Kentucky Nature Preserves
Logan	Raymond Athey Barrens State Nature Preserve	155.80	Office of Kentucky Nature Preserves
Marion	Marion County Wildlife Management Area and State Forest	1,293.14	Kentucky Department of Fish and Wildlife Resources; Kentucky Division of Forestry
McCracken	Metropolis Lake State Nature Preserve	123.18	Office of Kentucky Nature Preserves
McCracken	Perkins Creek Nature Preserve	80.56	City of Paducah
McCreary	Little South Fork State Natural Area (Tucker SNA)	23.05	Office of Kentucky Nature Preserves
McCreary	Rock Creek State Natural Area	89.92	Office of Kentucky Nature Preserves
McCreary, Wayne	Little South Fork State Natural Area (Burnett Branch SNA)	1,113.56	Office of Kentucky Nature Preserves
McCreary, Wayne	Little South Fork State Natural Area (Steele Hollow SNA)	2,191.02	Office of Kentucky Nature Preserves
McCreary, Whitley	Cumberland Falls State Park State Nature Preserve	1,266.41	Kentucky State Parks; Office of Kentucky Nature Preserves
McCreary, Whitley	Cumberland Falls State Resort Park	119.88	Kentucky State Parks
Menifee	Broke Leg Falls	15.85	Menifee County Fiscal Court
Metcalfe	Dry Fork Gorge	79.97	Metcalfe County
Monroe	Old Mulkey Meetinghouse State Historic Site	16.93	Kentucky State Parks
Muhlenberg	Cypress Creek State Nature Preserve	97.23	Office of Kentucky Nature Preserves
Nelson	Town Creek Greenway	13.22	Kentucky State Parks; City of Bardstown
Nicholas, Robertson	Blue Licks State Park State Nature Preserve	54.12	Kentucky State Parks
Ohio	Highview Hill	255.50	Ohio County Fiscal Court
Ohio	Ohio County Park Nature Area	115.45	Ohio County Fiscal Court
Oldham	Morgan Conservation Park	227.59	Oldham County Fiscal Court Director of Parks and Recreation
Powell	Natural Bridge State Park State Nature Preserve	1,238.55	Kentucky State Parks; Office of Kentucky Nature Preserves
Powell	Pilot Knob State Nature Preserve	742.13	Office of Kentucky Nature Preserves

Appendix I: OKNP Lands

County	MANAME	Acres	Managing Agency
Powell	Powell County Conservation Tracts	82.83	Powell County Fiscal Court
Powell, Wolfe	Natural Bridge State Resort Park	270.06	Kentucky State Parks
Powell, Wolfe	Red River State Natural Area	773.64	Office of Kentucky Nature Preserves
Pulaski	Buck Creek Nature Preserve	35.20	Pulaski County Fiscal Court
Pulaski	Dr. William H. Martin State Natural Area	459.20	Office of Kentucky Nature Preserves
Pulaski	Frances Johnson Palk State Nature Preserve	250.13	Office of Kentucky Nature Preserves
Pulaski	Hazeldell Meadow Preserve	44.03	Pulaski County Fiscal Court
Rockcastle	John B. Stephenson Memorial Forest State Nature Preserve	123.80	Berea College; Office of Kentucky Nature Preserves
Shelby	Clear Creek Park	27.02	Shelby County Fiscal Court
Shelby	Shelby Trails Park	75.79	The Shelby County Parks Foundation
Simpson	Flat Rock Glade State Nature Preserve	98.59	Office of Kentucky Nature Preserves
Taylor	Clay Hill Memorial Forest	153.61	Campbellsville University Division of Natural Science
Taylor	Tebbs Bend Nature and Recreation Area	172.14	Taylor County Fiscal Court
Warren	Chaney Lake State Nature Preserve	169.15	Office of Kentucky Nature Preserves
Warren	Crumps Cave Research and Education Preserve	2.01	Western Kentucky University Department of Biology
Warren	Lost River Cave Valley	2.02	Warren County
Warren	Woodburn Glade State Nature Preserve	19.86	Office of Kentucky Nature Preserves
Whitley	Archer-Benge State Nature Preserve	2,229.69	Office of Kentucky Nature Preserves

Appendix II: Registered Natural Areas

The Kentucky Natural Areas Registry enrolls high quality natural areas owned by private individuals or other organizations to encourage them to provide stewardship of significant natural sites. The voluntary registry recognizes landowners who partner with KNP to conserve ecologically significant property. Since 93 percent of Kentucky is in private ownership, private sector involvement in conservation is crucial. The registry is educational for many landowners, who may not be aware of special qualities of their land. As such, the use of registries can help prevent the inadvertent destruction of important sites.

A total of 77 landowners are enrolled in the registry program, encompassing 9,215.368 acres. They provide voluntary conservation for 46 state-listed species and 21 of our natural community types.

County	Registered Natural Area	Acres	Ownership	Significance
Adair	Rosson-Mayne Woods	178.62	Private	Mature Woods
Ballard	Axe Lake	760.42	Private	Wetland Community
Boone	Dinsmore Foundation	2.18	Private	Rare Species
Boyle	Central Kentucky Wildlife Refuge	389.73	Private	Southern Knobs Forest
Boyle	Harberson Station Cave	2.88	City of Perryville	Rare Species
Bullitt	Jefferson County Sports-men Club	12.61	Private	Rare Species
Bullitt	Jefferson Memorial Forest	2,471.89	Louisville Metro	Maturing Quality Forest
Bullitt	Rocky Run Glade	15.71	Private	Rare Species
Calloway	Panther Creek Swamp	126.57	TVA	Wetland, Rare Species
Carlisle	Back Slough/Laketon	45.10	Private	Wetland Community
Carter	Tierney Tygart	10.57	Private	Rare Species
Casey	Bradley Lewis Weddle	73.11	Private	Rare Species
Christian	Pennyrile State Forest (Clifty Creek)	74.93	KDF	Rare Species
Clark	Boone Creek	259.10	Private	Rare Species
Clark	Mt. Folly Farm	197.40	Private	Rare species
Clinton	Seventy-Six Falls	0.74	USACE	Rare Species
Crittenden	Goodman/Kissinger Sandstone Glade	7.23	Private	Glades
Edmonson	Whites Cave	2.50	NPS	Rare Species
Estill	Camp Burnamwood	472.13	Private	Upland Native Forest

Appendix II: Registered Natural Areas

County	Registered Natural Area	Acres	Ownership	Significance
Fayette	Ashland	18.31	Private	Rare Species
Fayette	Raven Run	477.83	LFUCG	Kentucky River Palisades
Fleming	Blue Licks Highways	58.88	KDOT	Rare Species
Franklin	Camp Pleasant Woods	68.55	Private	Rare Species
Franklin	Far Side Farm	29.76	Private	Rare Species
Franklin	Leeland Valley	35.21	Private	Rare Species
Franklin	Rockcress Woods (Bryan)	6.56	Private	Rare Species
Franklin	Rockcress Woods (Green)	19.57	Private	Rare Species
Franklin	Strohmeiers Hill	58.40	Private	Rare Species
Franklin	Tucker Creek	30.61	Private	Rare Species
Garrard	Terrapin Barrens	28.86	Private	Native Grassland
Grayson	Big Clifty Prairie	2.89	KDOT	Prairie Remnant
Hardin	Hayden Glade	4.70	Private	Glade Community
Hardin	Knights Barrens	355.71	Private	Barrens Community
Hart	Big Woods	293.10	NPS	Old-growth Woods
Hart	Riders Mill Cave	266.76	Private	Rare Species
Jefferson	Shippingport Island Rookery	8.02	USACE	Heron Rookery
Jefferson	Surrey Hills Woods	34.56	Private	Mature Forest
Jessamine	R.J. Corman	64.64	Private	Jessamine Creek Gorge Tributary
Larue	Crady Creek Hill Prairies (Clayton)	15.70	Private	Grassland Remnant
Larue	Crady Creek Hill Prairies (Ewing)	31.97	Private	Grassland Remnant
Letcher	Bad Branch (Crawford)	244.15	Private	Rare Species
Letcher	Bad Branch (Gatton)	116.93	Private	Rare Species
Letcher	Poor Fork Wetland	36.80	USFS	Rare Species
Livingston	Corley Farm	101.59	Private	Rare Species
Logan	Katie White Barrens (Luckett)	13.99	Private	Glades/Barrens Communities
Logan	Katie White Barrens (Webb)	13.23	Private	Glades/Barrens Communities
Logan	Log House Prairie	4.73	Private	Prairie Remnant
Lyon	Cannon Spring Woods	281.95	Dept of Army	Recovering Woods

Appendix II: Registered Natural Areas

County	Registered Natural Area	Acres	Ownership	Significance
Madison	Jeans Glade	6.07	Private	Rare Species
Marion	Tatum Cave	26.55	Private	Rare Species
Marshall	Bear Creek Rookery	77.06	TVA	Heron Rookery
McCracken	Bayou Creek Ridge	169.29	TVA	Old-growth Woods
McCracken	Metropolis Lake	1.68	TVA	Natural Lake
McLean	Floyd Woods	23.53	Private	Old-growth Woods
Metcalfe	Sulphur Creek Cave	6.59	Private	Rare Species
Muhlenberg	Cornett Woods	296.78	Private	Wetland Communities
Nelson	Abbey of Gethsemani	326.37	Private	Grassland Remnant
Nicholas	Abnee Goldenrod	1.69	Private	Rare Species
Nicholas	Kingsolver Goldenrod	2.32	KDFWR	Rare Species
Owsley	Morris Kentucky Lady Slipper	13.88	Private	Rare Species
Perry	Stillhouse Branch	100.77	USACE	Mature Forest
Pulaski	Blowing Cave	10.14	Private	Rare Species
Pulaski	Lake Cumberland - Cox Bend	9.26	USACE	Rare Species
Pulaski	Lake Cumberland - Fishing Creek	11.03	USACE	Rare Species
Pulaski	Lake Cumberland - Haynes Bend	9.43	USACE	Rare Species
Pulaski	Lake Cumberland - Martin Bend	23.31	USACE	Rare Species
Pulaski	Lake Cumberland - Wood-son Bend	36.19	USACE	Rare Species
Russell	Lake Cumberland - Rowena	82.93	USACE	Rare Species
Russell	Sundew Meadow	12.66	Private	Rare Species
Taylor	Blue Knob	29.33	Private	Glades, Barrens
Todd	North Elk Fork Woods	29.63	Private	Old-growth Woods
Todd	South Elk Fork Woods	26.77	Private	Old-growth Woods
Trigg	Lake Barkley Rookery	13.25	USACE	Heron Rookery
Warren	Greenhill Woods s	0.44	Private	Rare Species
Warren	Shanty Hollow Cave	2.69	Private	Rare Species
Wayne	Lake Cumberland - Roberts Bend	17.39	USACE	Rare Species
Whitley	Grove Powerline	20.95	Private	Pine Barren Remnant

Appendix III: Rare Plant List

This section contains the 2022 Kentucky Rare Plant List of vascular plants, bryophytes, and lichens that are endangered, threatened, special concern, commercially exploited, historic and extirpated plants. Each species contains a scientific name, common name, Kentucky status, Kentucky rank, and U.S. Status. The list is arranged alphabetically by scientific name in each status within each plant group. The U.S. status column indicates whether a taxon is listed as threatened or endangered by USFWS under the U.S. Endangered Species Act. The Kentucky conservation ranks are a NatureServe-standardized five point scale of conservation priority. Ranks are included because they were reviewed and updated during the process of revising the conservation statuses, which informed decisions about designating Kentucky's threatened and endangered taxa. Lastly, the ranks are another important metric for communicating about conservation priority among conservation professionals locally, regionally, and nationally.

State rank definitions as defined by NatureServe.

Conservation Rank*	Definition
S1	**Critically Imperiled**— At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2	**Imperiled**— At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3	**Vulnerable**— At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4	**Apparently Secure**— At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5	**Secure**— At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.
*Ranks can also be a range indicating uncertainty between two statuses and are written as S#S#. A "?" qualifier may also be used to indicate uncertainty about a rank. Historic (SH) and extirpated (SX) rank definitions were excluded because they closely match the definitions of Kentucky status under those names.	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Vascular Plants				
Acer spicatum	Mountain Maple	Endangered	S1S2	
Aconitum uncinatum	Blue Monkshood	Endangered	S1S2	
Agalinis auriculata	Earleaf False Foxglove	Endangered	S1	
Agalinis decemloba	Ten-lobed False Foxglove	Endangered	S1	At-risk
Amelanchier sanguinea	Roundleaf Serviceberry	Endangered	S1	
Amelanchier spicata	Running Serviceberry	Endangered	S1	
Amianthium muscitoxicum	Fly Poison	Endangered	S1	
Angelica atropurpurea	Great Angelica	Endangered	S1	
Angelica triquinata	Filmy Angelica	Endangered	S1S2	
Apios priceana	Price's Potato-bean	Endangered	S1	Threatened
Arabidopsis lyrata ssp. lyrata	Lyre-leaf Rockcress	Endangered	S1S2	
Arabis adpressipilis	Hairy Rockcress	Endangered	S1	
Arabis patens	Spreading Rockcress	Endangered	S1	
Baptisia aberrans	Eastern Prairie Blue Wild Indigo	Endangered	S1	
Berberis canadensis	American Barberry	Endangered	S1	
Bolboschoenus fluviatilis	River Bulrush	Endangered	S1S2	
Botrychium matricariifolium	Matricary Grape-fern	Endangered	S1	
Boykinia aconitifolia	Brook Saxifrage	Endangered	S1S2	
Calamagrostis insperata	Bent Reedgrass	Endangered	S1S2	
Calamovilfa arcuata	Cumberland sandgrass	Endangered	S1	
Callicarpa americana	American Beautyberry	Endangered	S1	
Calopogon tuberosus var. tuberosus	Grass-pink	Endangered	S1	
Carex aestivalis	Summer Sedge	Endangered	S1	
Carex buxbaumii	Brown Bog Sedge	Endangered	S1	
Carex crebriflora	Coastal Plain Sedge	Endangered	S2	
Carex fraseriana	Fraser's Sedge	Endangered	S1	
Carex howei	Prickly Bog Sedge	Endangered	S1S2	
Carex joorii	Cypress-swamp Sedge	Endangered	S1S2	
Carex juniperorum	Juniper Sedge	Endangered	S1S2	
Carex leptonervia	Finely-nerved Sedge	Endangered	S1	
Carex ouachitana	Ouachita Sedge	Endangered	S1	
Carex reniformis	Reniform Sedge	Endangered	S1	
Carex roanensis	Roan Mountain Sedge	Endangered	S1	
Carex straminea	Straw Sedge	Endangered	S1	
Carex venusta	Dark Green Sedge	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Castanea dentata	American Chestnut	Endangered	S1	
Castilleja coccinea	Scarlet Indian Paintbrush	Endangered	S1	
Cayaponia quinqueloba	Five-lobe Cucumber	Endangered	S1	
Ceanothus herbaceus	Prairie Redroot	Endangered	S1	
Cerastium velutinum var. velutinum	Starry Grasswort	Endangered	S1S2	
Chrysogonum virginianum var. brevistolon	Green-and-gold	Endangered	S1	
Cladium mariscoides	Smooth Sawgrass	Endangered	S1	
Collinsonia verticillata	Whorled Horse-balm	Endangered	S1	
Comptonia peregrina	Sweet-fern	Endangered	S1	
Conradina verticillata	Cumberland Rosemary	Endangered	S1	Threatened
Convallaria pseudomajalis	American Lily-of-the-valley	Endangered	S1	
Corallorhiza maculata var. maculata	Spotted Coralroot	Endangered	S1	
Crataegus marshallii	Parsley Hawthorn	Endangered	S1	
Crataegus spathulata	Little hip Hawthorn	Endangered	S1	
Crocanthemum canadense	Canada Frostweed	Endangered	S1	
Cypripedium candidum	Small White Lady's-slipper	Endangered	S1	
Cypripedium kentuckiense	Kentucky Lady's-slipper	Endangered	S1S2	
Deschampsia cespitosa	Tufted Hairgrass	Endangered	S1	
Desmodium ochroleucum	Cream Tick-trefoil	Endangered	S1	
Dichanthelium annulum	Ringed rosette grass	Endangered	S1	
Didiplis diandra	Water-purslane	Endangered	S1S2	
Drosera brevifolia	Dwarf Sundew	Endangered	S1	
Drosera intermedia	Spoon-leaved Sundew	Endangered	S1	
Eleocharis tuberculosa	Large-tubercled Spikerush	Endangered	S1	
Erigeron allisonii	Limestone prairie fleabane	Endangered	S1	
Eriophorum virginicum	Tawny Cotton-grass	Endangered	S1	
Eryngium integrifolium	Blue-flower Coyote-thistle	Endangered	S1	
Erysimum capitatum var. capitatum	Western Wallflower	Endangered	S1	
Eubotrys recurvus	Red-twig Doghobble	Endangered	S1	
Eurybia radula	Rough-leaved Aster	Endangered	S1	
Gaylussacia ursina	Bear Huckleberry	Endangered	S1	
Gentiana puberulenta	Prairie Gentian	Endangered	S1	
Glandularia canadensis	Rose Mock-vervain	Endangered	S1	
Glyceria acutiflora	Sharp-scaled Manna-grass	Endangered	S1S2	
Goodyera repens	Lesser rattlesnake-plantain	Endangered	S1	
Gratiola floridana	Florida Hedge Hyssop	Endangered	S1	
Gratiola quartermaniae	Quarterman's Hedge-hyssop	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Gymnopogon brevifolius	Shortleaf Skeleton-grass	Endangered	S1	
Helanthium tenellum	Dwarf Burhead	Endangered	S1	
Helianthus silphioides	Silphium Sunflower	Endangered	S1	
Hexastylis contracta	Southern Heartleaf	Endangered	S1S2	
Houstonia serpyllifolia	Michaux's Bluets	Endangered	S1	
Hydrocotyle americana	American Water-pennywort	Endangered	S1	
Hydrocotyle verticillata	Whorled Marsh-pennywort	Endangered	S1	
Hydrolea ovata	Ovate Fiddleleaf	Endangered	S1	
Hydrolea uniflora	One-flower Fiddleleaf	Endangered	S1	
Hydrophyllum virginianum var. atranthum	Appalachian Waterleaf	Endangered	S1S2	
Hylotelephium telephioides	Allegheny Stonecrop	Endangered	S1	
Hypericum gymnanthum	Claspingleaf St. John's-wort	Endangered	S1	
Iris fulva	Copper Iris	Endangered	S1	
Isoetes butleri	Butler's Quillwort	Endangered	S1	
Isoetes melanopoda ssp. melanopoda	Blackfoot Quillwort	Endangered	S1	
Juniperus communis var. de-pressa	Ground Juniper	Endangered	S1	
Koeleria macrantha	Prairie Junegrass	Endangered	S1	
Krigia occidentalis	Western Dwarf Dandelion	Endangered	S1	
Leavenworthia exigua var. laciniata	Kentucky Gladecress	Endangered	S1S2	Threatened
Lespedeza angustifolia	Narrowleaf Bush-clover	Endangered	S1	
Liatris cylindracea	Slender Blazingstar	Endangered	S2	
Lithospermum bejariense	Western False Gromwell	Endangered	S1	
Lobelia gattingeri	Gattinger's Lobelia	Endangered	S1	
Lonicera dioica var. orientalis	Wild Honeysuckle	Endangered	S1	
Ludwigia hirtella	Rafinesque's seedbox	Endangered	S1	
Lycopodiella appressa	Southern Bog Clubmoss	Endangered	S1	
Lycopodiella inundata	Northern Bog Clubmoss	Endangered	S1	
Lycopodium clavatum	Running Pine	Endangered	S1	
Lysimachia borealis	Northern Starflower	Endangered	S1	
Lysimachia radicans	Trailing Loosestrife	Endangered	S1	
Lysimachia terrestris	Swamp Candles	Endangered	S1	
Maianthemum stellatum	Starflower False Solomon's-seal	Endangered	S1	
Marshallia pulchra	Barbara's Buttons	Endangered	S1	
Melanthium virginicum	Virginia Bunchflower	Endangered	S1	
Micranthes micranthidifolia	Lettuce-leaf Saxifrage	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Mononeuria cumberlandensis	Cumberland Sandwort	Endangered	S1	Delisted
Muhlenbergia bushii	Bush's Muhly	Endangered	S1S2	
Myriopteris gracilis	Fee's Lipfern	Endangered	S1	
Nabalus asper	Rough Rattlesnake-root	Endangered	S1	
Nabalus barbatus	Barbed Rattlesnake-root	Endangered	S1	
Nabalus racemosus	Glaucous Rattlesnake-root	Endangered	S1	
Neottia bifolia	Southern Twayblade	Endangered	S1	
Nestronia umbellula	Conjurer's-nut	Endangered	S1	
Oenothera linifolia	Thread-leaf Sundrops	Endangered	S1S2	
Opuntia humifusa	Eastern Prickly-pear	Endangered	S1S2	
Parnassia asarifolia	Kidneyleaf Grass-of-parnassus	Endangered	S1	
Parnassia grandifolia	Large-leaved Grass-of-parnassus	Endangered	S1	
Paronychia argyrocoma	Silverling	Endangered	S1	
Paxistima canbyi	Canby's Mountain-lover	Endangered	S1	
Pediomelum tenuiflorum	Few-flowered Scurf-pea	Endangered	S1	
Phemeranthus calcaricus	Limestone Fameflower	Endangered	S1	
Phemeranthus teretifolius	Roundleaf Fameflower	Endangered	S1	
Philadelphus pubescens	Hoary Mock Orange	Endangered	S2	
Phlox bifida ssp. stellaria	Starry-cleft Phlox	Endangered	S2	
Physaria globosa	Globe Bladderpod	Endangered	S1	Endangered
Platanthera cristata	Yellow-crested Orchid	Endangered	S1	
Platanthera integrilabia	White Fringeless Orchid	Endangered	S1	Threatened
Platanthera psycodes	Small Purple-fringed Orchid	Endangered	S1	
Poa saltuensis	Drooping Bluegrass	Endangered	S1S2	
Poa wolfii	Wolf's Bluegrass	Endangered	S1	
Pogonia ophioglossoides	Rose Pogonia	Endangered	S1	
Polygaloides paucifolia	Gaywings	Endangered	S1	
Polymnia laevigata	Tennessee Leafcup	Endangered	S1S2	
Potamogeton amplifolius	Large-leaf Pondweed	Endangered	S1	
Potamogeton tennesseensis	Tennessee Pondweed	Endangered	S1	
Ptilimnium costatum	Eastern Mock Bishop's-weed	Endangered	S1	
Pycnanthemum curvipes	Stone Mountainmint	Endangered	S1	
Pycnanthemum muticum	Blunt Mountainmint	Endangered	S1	
Rhododendron canescens	Hoary Azalea	Endangered	S1	
Rhynchosia tomentosa	Hairy Snoutbean	Endangered	S1S2	
Rhynchospora gracilenta	Slender Beaksedge	Endangered	S1?	
Rhynchospora macrostachya	Tall Beaked-rush	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Ribes americanum	Eastern Black Currant	Endangered	S1	
Rubus canadensis	Smooth Blackberry	Endangered	S1	
Rudbeckia subtomentosa	Sweet Coneflower	Endangered	S1	
Ruellia pedunculata	Stalked Wild-petuna	Endangered	S1	
Sabatia brachiata	Narrow-leaf Pink	Endangered	S1	
Sabatia campanulata	Slender Marsh Pink	Endangered	S1	
Sabatia quadrangula	Four Angled Rose Gentian	Endangered	S1	
Sabulina fontinalis	Water Stitchwort	Endangered	S1S2	At-risk
Sagittaria platyphylla	Delta Arrowhead	Endangered	S1	
Sagittaria rigida	Sessile-fruited Arrowhead	Endangered	S1	
Salvia urticifolia	Nettle-leaf Sage	Endangered	S1	
Sambucus racemosa var. pubens	Red Elderberry	Endangered	S1S2	
Sanguisorba canadensis	Canada Burnet	Endangered	S1	
Schisandra glabra	Bay Starvine	Endangered	S1	
Schoenoplectiella hallii	Hall's Bulrush	Endangered	S1	
Scirpus expansus	Woodland Beakrush	Endangered	S1S2	
Silene nivea	Snowy Campion	Endangered	S1	
Silene ovata	Ovate Catchfly	Endangered	S1	
Silene regia	Royal Catchfly	Endangered	S1	
Solidago austrina	Southern Bog Goldenrod	Endangered	S1	
Solidago shortii	Short's Goldenrod	Endangered	S1	Endangered
Sparganium eurycarpum var. eurycarpum	Large Bur-reed	Endangered	S1	
Sphenopholis pensylvanica	Swamp Wedgescale	Endangered	S1	
Spiraea alba	Narrow-leaved Meadow-sweet	Endangered	S1	
Spiraea virginiana	Virginia Spiraea	Endangered	S1	Threatened
Spiranthes odorata	Sweetscent Ladies'-tresses	Endangered	S1	
Sporobolus heterolepis	Northern Dropseed	Endangered	S1	
Stachys aspera	rough-leaved hedge-nettle	Endangered	S1	
Streptopus lanceolatus var. lanceolatus	Rosy Twisted-stalk	Endangered	S1	
Styrax grandifolius	Bigleaf Snowbell	Endangered	S1S2	
Symphoricarpos albus var. albus	Snowberry	Endangered	S1	
Tephrosia spicata	Spiked Hoary-pea	Endangered	S1S2	
Thermopsis mollis	Soft-haired Thermopsis	Endangered	S1	
Thermopsis villosa	Aaron's-rod	Endangered	S1?	
Tomostima cuneifolia	Wedge-leaf Whitlow-grass	Endangered	S1	
Toxicodendron vernix	Poison Sumac	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Tragia urticifolia	Nettle-leaf Noseburn	Endangered	S1	
Trichophorum planifolium	Bashful Bulrush	Endangered	S1	
Trichostema setaceum	Narrowleaved Bluecurls	Endangered	S1	
Tridens chapmanii	Chapman's Tridens	Endangered	S1	
Trifolium kentuckiense	Kentucky Clover	Endangered	S1	
Trifolium reflexum	Buffalo Clover	Endangered	S1S2	
Trillium nivale	Snow Trillium	Endangered	S1	
Trillium pusillum var. ozarkanum	Ozark Least Trillium	Endangered	S1	
Trillium stamineum	Twisted Trillium	Endangered	S1	
Triplasis purpurea var. purpurea	Purple Sandgrass	Endangered	S1	
Utricularia macrorhiza	Greater Bladderwort	Endangered	S1	
Vaccinium erythrocarpum	Southern Mountain Cranberry	Endangered	S1	
Viburnum lantanoides	Alderleaved Viburnum	Endangered	S1	
Viburnum nudum	Possumhaw	Endangered	S1	
Vicia minutiflora	Smallflower Vetch	Endangered	S1	
Viola tripartita	Three-parted Violet	Endangered	S1	
Woodsia appalachiana	Appalachian Woodsia	Endangered	S1	
Xyris difformis	Carolina Yellow-eyed-grass	Endangered	S1	
Actaea rubifolia	Appalachian Bugbane	Threatened	S2	
Adiantum capillus-veneris	Southern Maidenhair-fern	Threatened	S2S3	
Aesculus pavia var. pavia	Red Buckeye	Threatened	S2	
Agrimonia gryposepala	Tall Hairy Groovebur	Threatened	S1S2	
Allium stellatum	Prairie Onion	Threatened	S1	
Aralia nudicaulis	Wild Sarsaparilla	Threatened	S2S3	
Arisaema quinatum	A Jack-in-the-pulpit	Threatened	S2	
Asclepias hirtella	Prairie milkweed	Threatened	S2	
Astragalus canadensis var. canadensis	Canadian Milk-vetch	Threatened	S2	
Avenella flexuosa	Crinkled Hairgrass	Threatened	S2	
Baptisia leucophaea var. leucophaea	Cream Wild Indigo	Threatened	S2	
Baptisia tinctoria	Yellow Wild Indigo	Threatened	S1S2	
Bartonia virginica	Yellow Screwstem	Threatened	S2	
Berchemia scandens	Supple-jack	Threatened	S1S2	
Borodinia perstellata	Braun's Rockcress	Threatened	S2	Endangered
Buchnera americana	Bluehearts	Threatened	S2	
Cabomba caroliniana	Carolina Fanwort	Threatened	S2	
Calamagrostis porteri	Porter's Reedgrass	Threatened	S2S3	
Carex alata	Broadwing Sedge	Threatened	S1S2	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Carex appalachica	Appalachian Sedge	Threatened	S2	
Carex decomposita	Epiphytic Sedge	Threatened	S2	
Carex gigantea	Large Sedge	Threatened	S2S3	
Carex longii	Greenish-white Sedge	Threatened	S2	
Carex seorsa	Weak Stellate Sedge	Threatened	S2	
Carex timida	Timid Sedge	Threatened	S2	
Carya aquatica	Water Hickory	Threatened	S2S3	
Castanea pumila	Allegheny Chinkapin	Threatened	S2	
Centrosema virginianum	Coastal Butterfly-pea	Threatened	S2S3	
Chrysosplenium americanum	American Golden-saxifrage	Threatened	S2	
Clematis catesbyana	Satin-curls	Threatened	S2	
Clematis crispa	Blue Jasmine Leather-flower	Threatened	S2	
Clematis glaucophylla	White-leaved Leather-flower	Threatened	S2	
Clematis versicolor	Pale Leatherflower	Threatened	S2S3	
Cypripedium parviflorum var. parviflorum	Small Yellow Lady's-slipper	Threatened	S2	
Dalea candida	White Prairie-clover	Threatened	S2	
Dalea purpurea	Purple Prairie-clover	Threatened	S2	
Delphinium carolinianum ssp. calciphilum	Carolina Larkspur	Threatened	S1S2	
Dichanthelium lucidum	Shining Rosette Grass	Threatened	S1?	
Echinochloa walteri	Walter's Barnyard Grass	Threatened	S1S2	
Echinodorus berteroi	Burhead	Threatened	S2	
Edrastima uniflora	Clustered Bluets	Threatened	S2?	
Elodea nuttallii	Western Waterweed	Threatened	S2	
Elymus svensonii	Svenson's Wildrye	Threatened	S2S3	
Eurybia hemispherica	Tennessee Aster	Threatened	S2	
Eurybia saxicastellii	Rockcastle Aster	Threatened	S2	At-risk
Fimbristylis puberula var. puberula	Hairy Fimbristylis	Threatened	S2	
Fuirena simplex var. aristulata	Western Umbrella Sedge	Threatened	S1	
Gentiana alba	Yellow Gentian	Threatened	S2	
Gleditsia aquatica	Water Locust	Threatened	S2	
Gratiola viscidula	Short's Hedgehyssop	Threatened	S2	
Gymnopogon ambiguus	Bearded Skeleton-grass	Threatened	S2	
Hedeoma hispida	Rough Pennyroyal	Threatened	S2	
Heteranthera dubia	Grassleaf Mud-plantain	Threatened	S2	
Heterotheca latifolia var. latifolia	Broad-leaf Golden-aster	Threatened	S2	
Hieracium longipilum	Hairy Hawkweed	Threatened	S2	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Hydrophyllum virginianum var. virginianum	Eastern Waterleaf	Threatened	S2	
Hypericum crux-andreae	St. Peter's-wort	Threatened	S2S3	
Iris brevicaulis	Zigzag Iris	Threatened	S2	
Juglans cinerea	White Walnut	Threatened	S2S3	
Lathyrus palustris	Vetchling Peavine	Threatened	S2	
Leavenworthia torulosa	Necklace Gladecress	Threatened	S2	
Lilium philadelphicum var. philadelphicum	Wood Lily	Threatened	S2S3	
Lilium superbum	Turk's Cap Lily	Threatened	S1S2	
Limnobium spongia	American Frog's-bit	Threatened	S2S3	
Liparis loeselii	Loesel's Twayblade	Threatened	S2	
Lithospermum parviflorum	Hairy False Gromwell	Threatened	S2	
Lobelia nuttallii	Nuttall's Lobelia	Threatened	S2	
Lonicera reticulata	Grape Honeysuckle	Threatened	S2	
Lysimachia minima	Chaffweed	Threatened	S2	
Maianthemum canadense	Wild Lily-of-the-valley	Threatened	S2	
Malvastrum hispidum	Hispid Falsemallow	Threatened	S2	
Matelea carolinensis	Carolina Anglepod	Threatened	S2	
Melampyrum lineare var. latifolium	American Cowwheat	Threatened	S2	
Melanthium parviflorum	Appalachian Bunchflower	Threatened	S2	
Melanthium woodii	Wood's Bunchflower	Threatened	S2	
Micranthes petiolaris	Michaux's Saxifrage	Threatened	S2	
Mononeuria glabra	Appalachian Sandwort	Threatened	S1S2	
Monotropsis odorata	Sweet Pinesap	Threatened	S2	
Muhlenbergia cuspidata	Plains Muhly	Threatened	S2	
Nabalus albus	White Rattlesnake-root	Threatened	S2	
Neottia smallii	Kidney-leaf Twayblade	Threatened	S2	
Oclemena acuminata	Whorled Aster	Threatened	S2S3	
Oenothera triloba	Stemless Evening-primrose	Threatened	S1S2	
Orontium aquaticum	Golden Club	Threatened	S2	
Packera paupercula var. paupercula	Balsam Ragweed	Threatened	S2	
Packera paupercula var. pseudotomentosa	Ozark ragwort	Threatened	S2	
Perideridia americana	Eastern Yampah	Threatened	S2	
Podostemum ceratophyllum	Threadfoot	Threatened	S2S3	
Polygala aquilonia	Crossleaf Milkwort	Threatened	S2	
Polygala polygama	Racemed Milkwort	Threatened	S2	
Pontederia cordata var. cordata	Pickerelweed	Threatened	S1S2	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Potamogeton illinoensis	Illinois Pondweed	Threatened	S2	
Potamogeton pulcher	Spotted Pondweed	Threatened	S2S3	
Ptilimnium capillaceum	Mock Bishop's-weed	Threatened	S1S2	
Ptilimnium nuttallii	Nuttall's Mock Bishop's-weed	Threatened	S2	
Pycnanthemum torreyi	Whorled Mountain-mint	Threatened	S2	
Quercus nigra	Water Oak	Threatened	S2	
Quercus texana	Nuttall's Oak	Threatened	S2S3	
Ripariosida hermaphrodita	Virginia Mallow	Threatened	S2	
Rorippa aquatica	Lakecress	Threatened	S1S2	
Sagittaria graminea	Grassleaf Arrowhead	Threatened	S2S3	
Schizachne purpurascens	Purple Oat	Threatened	S2	
Scutellaria saxatilis	Rock Skullcap	Threatened	S2	
Senecio suaveolens	Sweet-scented Indian-plantain	Threatened	S2S3	
Silphium laciniatum	Compassplant	Threatened	S2	
Silphium wasiotense	Appalachian Rosinweed	Threatened	S2	
Solidago albopilosa	White-haired Goldenrod	Threatened	S2	Delisted
Solidago roanensis	Roan Mountain Goldenrod	Threatened	S1S2	
Sophronanthe pilosa	Shaggy Hedgehyssop	Threatened	S2	
Spiranthes lucida	Shining Ladies'-tresses	Threatened	S2S3	
Spiranthes magnicamporum	Great Plains Ladies'-tresses	Threatened	S2	
Spiranthes ochroleuca	Yellow Nodding Ladies'-tresses	Threatened	S2	
Sporobolus clandestinus	Rough Dropseed	Threatened	S2S3	
Stenanthium gramineum var. gramineum	Eastern Featherbells	Threatened	S3	
Symphyotrichum concolor var. concolor	Eastern Silvery Aster	Threatened	S2	
Symphyotrichum priceae	White Heath Aster	Threatened	S2	
Symphyotrichum puniceum var. puniceum	Swamp Aster	Threatened	S2S3	
Taxus canadensis	Canadian Yew	Threatened	S2S3	
Thaspium pinnatifidum	Cutleaf Meadow-parsnip	Threatened	S2S3	
Thuja occidentalis	Northern White Cedar	Threatened	S2S3	
Trifolium stoloniferum	Running Buffalo Clover	Threatened	S2S3	Delisted
Trillidium undulatum	Painted Trillium	Threatened	S2	
Viburnum molle	Kentucky Arrow-wood	Threatened	S2	
Viburnum rafinesqueanum	Downy Arrowwood	Threatened	S2	
Viola walteri	Walter's Violet	Threatened	S2	
Vitis labrusca	Northern Fox Grape	Threatened	S2S3	
Vitis rupestris	Sand Grape	Threatened	S2	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Zizaniopsis miliacea	Southern Wild Rice	Threatened	S1S2	
Ageratina lucy-brauniae	Lucy Braun's White Snake-root	Special Concern	S3	
Asclepias purpurascens	Purple Milkweed	Special Concern	S3	
Aureolaria patula	Spreading False Foxglove	Special Concern	S3	
Baptisia australis	Tall Blue Wild Indigo	Special Concern	S2S3	
Bouteloua curtipendula var. curtipendula	Side-oats Grama	Special Concern	S3?	
Capnoides sempervirens	Rock Harlequin	Special Concern	S3	
Carex austrocaroliniana	Tarheel Sedge	Special Concern	S2	
Carex corrugata	Prune-fruit sedge	Special Concern	S3?	
Carex crawei	Crawe's Sedge	Special Concern	S3	
Carex rugosperma	Umbel-like Sedge	Special Concern	S3?	
Carex stipata var. maxima	Stalkgrain Sedge	Special Concern	S3?	
Carex superata	Limestone Forest Sedge	Special Concern	S2S3	
Chelone obliqua var. speciosa	Rose Turtlehead	Special Concern	S3	
Circaea alpina ssp. alpina	Small Enchanter's Night-shade	Special Concern	S3	
Clinopodium glabellum	Savory	Special Concern	S2	
Coleataenia longifolia ssp. longifolia	long-leaved panic grass	Special Concern	S3	
Coreopsis pubescens var. pubescens	Star Tickseed	Special Concern	S2S3	
Crepidomanes intricatum	A Filmy Fern	Special Concern	S3	
Cypripedium parviflorum var. pubescens	Large Yellow Lady's-slipper	Special Concern	S3	
Decodon verticillatus	Hairy Swamp Loosestrife	Special Concern	S3	
Dichanthelium angustifolium	Narrow-Leaved Witchgrass	Special Concern	S3	
Dichanthelium tenue	White-margin Panic Grass	Special Concern	S3	
Dicliptera brachiata	Wild Mudwort	Special Concern	S2S3	
Draba ramosissima	Branching Whitlow Grass	Special Concern	S3	
Dryopteris carthusiana	Spinulose Wood Fern	Special Concern	S3	
Dulichium arundinaceum var. arundinaceum	Three-way Sedge	Special Concern	S3	
Erythronium rostratum	Yellow Troutlily	Special Concern	S3	
Euphorbia mercurialina	Mercury Spurge	Special Concern	S3	
Eutrochium steelei	Steele's Joe-pye-weed	Special Concern	S3	
Fimbristylis perpusilla	Harper's fimbry	Special Concern	S1?	
Floerkea proserpinacoides	False Mermaid-weed	Special Concern	S3	
Forestiera ligustrina	Upland Privet	Special Concern	S3	
Glyceria arkansana	Arkansas Manna-grass	Special Concern	S2S3	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Grindelia lanceolata	Narrow-leaf Gumweed	Special Concern	S1?	
Halesia tetraptera	Common Silverbell	Special Concern	S3	
Helianthus eggertii	Eggert's Sunflower	Special Concern	S3	Delisted
Heteranthera limosa	Blue Mud-plantain	Special Concern	S2S3	
Hydrocotyle ranunculoides	Floating Pennywort	Special Concern	S3	
Hypericum canadense	Canadian St. John's-wort	Special Concern	S3	
Juncus articulatus	Jointed Rush	Special Concern	S2S3	
Juncus filipendulus	Ringseed Rush	Special Concern	S3	
Lathyrus venosus	Smooth Veiny Peavine	Special Concern	S2S3	
Lespedeza capitata	Round-head Bush-clover	Special Concern	S3	
Lonicera dioica var. dioica	Limber Honeysuckle	Special Concern	S3?	
Malus ioensis	Iowa Crabapple	Special Concern	S2?	
Melanthera nivea	Snow Squarestem	Special Concern	S3?	
Muhlenbergia glabrifloris	Hair Grass	Special Concern	S3	
Myriophyllum heterophyllum	Broadleaf Water-milfoil	Special Concern	S3?	
Najas gracillima	Thread-like Naiad	Special Concern	S2S3	
Nemophila aphylla	Small-flower Baby-blue-eyes	Special Concern	S3	
Orbexilum onobrychis	French-grass	Special Concern	S3	
Paspalum boscianum	Bull Paspalum	Special Concern	S2S3	
Patis racemosa	Black-fruit Mountain-ricegrass	Special Concern	S3?	
Phacelia ranunculacea	Blue Scorpion-weed	Special Concern	S3	
Phlox subulata	Moss Phlox	Special Concern	S3	
Polygonum tenue	Slender Knotweed	Special Concern	S3	
Primula frenchii	French's Shooting Star	Special Concern	S3	
Prosartes maculata	Nodding Mandarin	Special Concern	S3	
Ranunculus ambigens	Waterplantain Spearwort	Special Concern	S3	
Ranunculus harveyi	Harvey's buttercup	Special Concern	S3	
Ranunculus longirostris	Longbeak Buttercup	Special Concern	S3?	
Scutellaria serrata	Showy Skullcap	Special Concern	S3	
Silphium pinnatifidum	Tansy Rosinweed	Special Concern	S3	
Solidago arenicola	Southern Racemose Goldenrod	Special Concern	S3	
Solidago buckleyi	Buckley's Goldenrod	Special Concern	S3	
Solidago curtisii	Curtis' Goldenrod	Special Concern	S3	
Solidago faucibus	Gorge Goldenrod	Special Concern	S3	
Solidago patula	Roundleaf Goldenrod	Special Concern	S3	
Solidago puberula	Downy Goldenrod	Special Concern	S2S3	
Solidago racemosa	Rand's Goldenrod	Special Concern	S3	
Stellaria longifolia	Longleaf Stitchwort	Special Concern	S2S3	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Symphyotrichum pratense	Barrens Silky Aster	Special Concern	S3	
Ulmus serotina	September Elm	Special Concern	S3	
Vallisneria americana	Eelgrass	Special Concern	S2S3	
Vandenboschia boschiana	Appalachian Filmy Fern	Special Concern	S3	
Viola egglestonii	Eggleston's Violet	Special Concern	S3	
Viola glaberrima	Threepart Violet	Special Concern	S2S3	
Wolffiella gladiata	Sword Bogmat	Special Concern	S3	
Xyris torta	Twisted Yellow-eyed-grass	Special Concern	S2S3	
Panax quinquefolius	American Ginseng	Commercially Exploited	S3	
Abdra aprica	Open-ground Whitlow-grass	Historic	SH	
Adlumia fungosa	Allegheny-vine	Historic	SH	
Agalinis skinneriana	Pale False Foxglove	Historic	SH	
Arabis pycnocarpa	slender rockcress	Historic	SH	
Aristida ramosissima	Branched Three-awn Grass	Historic	SH	
Borodinia missouriensis	Missouri Rockcress	Historic	SH	
Calamagrostis canadensis var. macouniana	Blue-joint Reedgrass	Historic	SH	
Carex comosa	Bristly Sedge	Historic	SH	
Carex hystericina	Porcupine Sedge	Historic	SH	
Carex pellita	Woolly Sedge	Historic	SH	
Crocanthemum bicknellii	Plains Frostweed	Historic	SH	
Cyperus lupulinus var. macilentus	Great Plains Flatsedge	Historic	SH	
Cyperus plukenetii	Plukenet's Cyperus	Historic	SH	
Eriogonum harperi	Harper's Wild Fleabane	Historic	SH	
Eupatorium semiserratum	Small-flower Thoroughwort	Historic	SH	
Eutrochium maculatum var. maculatum	Spotted Joe-pye Weed	Historic	SH	
Gentiana andrewsii var. andrewsii	Closed Gentian	Historic	SH	
Heracleum lanatum	Cow-parsnip	Historic	SH	
Heteranthera rotundifolia	roundleaf mud-plantain	Historic	SH	
Hypericum nudiflorum	early St. Johnswort	Historic	SH	
Juncus elliottii	Bog Rush	Historic	SH	
Lithospermum molle	Soft-hairy False-gromwell	Historic	SH	
Magnolia pyramidata	Pyramid Magnolia	Historic	SH	
Melampyrum lineare var. pectinatum	American Cow-wheat	Historic	SH	
Micranthes forbesii	Swamp Saxifrage	Historic	SH	
Mirabilis albida	Pale Umbrella-wort	Historic	SH	
Myriophyllum pinnatum	Cutleaf Water-milfoil	Historic	SH	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Myriopteris alabamensis	Alabama Lipfern	Historic	SH	
Myzorrhiza ludoviciana	Louisiana Broomrape	Historic	SH	
Oenothera serrulata	Yellow Evening Primrose	Historic	SH	
Oxalis macrantha	Price's Yellow Wood Sorrel	Historic	SH	
Paysonia lescurii	Lescur's Bladderpod	Historic	SH	
Phlox bifida ssp. bifida	Cleft Phlox	Historic	SH	
Polygala nuttallii	Nuttall's Milkwort	Historic	SH	
Potamogeton epihydrus	Nuttall Pondweed	Historic	SH	
Pseudognaphalium micradenium	Small Rabbit-tobacco	Historic	SH	
Pycnanthemum albescens	Whiteleaf Mountainmint	Historic	SH	
Quercus ilicifolia	Scrub Oak	Historic	SH	
Salix amygdaloides	Peach-leaved Willow	Historic	SH	
Salix discolor	Pussy Willow	Historic	SH	
Sceptridium oneidense	Blunt-lobe Grape-fern	Historic	SH	
Schoenoplectus heterochaetus	Slender Bulrush	Historic	SH	
Schwalbea americana	Chaffseed	Historic	SH	Endangered
Scleria muehlenbergii	Pitted Nut-rush	Historic	SH	
Smilax biltmoreana	Biltmore Carrionflower	Historic	SH	
Solidago squarrosa	Squarrose Goldenrod	Historic	SH	
Torreyochloa pallida	Pale Manna Grass	Historic	SH	
Utricularia cornuta	Horned Bladderwort	Historic	SH	
Veronica americana	American Speedwell	Historic	SH	
Zizania palustris var. interior	Indian Wild Rice	Historic	SH	
Anemonastrum canadense	Canada Anemone	Extirpated	SX	
Argyrochosma dealbata	Powdery Cloakfern	Extirpated	SX	
Callirhoe alcaeoides	Clustered Poppy-mallow	Extirpated	SX	
Caltha palustris var. palustris	Marsh Marigold	Extirpated	SX	
Carex vesicaria	Inflated Sedge	Extirpated	SX	
Cypripedium reginae	Showy Lady's-slipper	Extirpated	SX	
Dactylorhiza viridis	Long-bract Green Orchis	Extirpated	SX	
Dryopteris ludoviciana	Southern Shield Wood Fern	Extirpated	SX	
Lysimachia fraseri	Fraser's Loosestrife	Extirpated	SX	
Monarda punctata var. villicaulis	Spotted bee-balm	Extirpated	SX	
Orbexilum stipulatum	Stipuled Scurf-pea	Extirpated	SX	
Pedicularis lanceolata	Swamp Lousewort	Extirpated	SX	
Physostegia intermedia	Slender Dragon-head	Extirpated	SX	
Plantago cordata	Heart-leaved Plantain	Extirpated	SX	
Polytaenia nuttallii	Nuttall's Prairie Parsley	Extirpated	SX	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Pyrola americana	American Wintergreen	Extirpated	SX	
Scirpus microcarpus	Small-fruit Bulrush	Extirpated	SX	
Xerophyllum asphodeloides	Eastern Turkeybeard	Extirpated	SX	
Bryophytes				
Anastrophyllum michauxii	Michaux's Notchwort	Endangered	S1	
Brachelyma subulatum	Moss	Endangered	S1	
Calypogeia peruviana	Liverwort	Endangered	S1	
Cryphaea nervosa	Thread Cedar Moss	Endangered	S1	
Dichelyma capillaceum	Hairlike Claw Moss	Endangered	S1	
Didymodon rigidulus	Rigid Beard Moss	Endangered	S1	
Drepanolejeunea appalachiana	Appalachian Threadwort	Endangered	S1	
Entodon brevisetus	Short-stalk Shiny Moss	Endangered	S1	
Herzogiella turfacea	Flat Stump Moss	Endangered	S1	
Imbribryum miniatum	Red Thread Moss	Endangered	S1	
Lejeunea lamacerina ssp. gemminata	Liverwort	Endangered	S1	
Lepidozia reptans	Creeping Fingerwort	Endangered	S1	
Marsupella paroica	Dull Rustwort	Endangered	S1	
Orthotrichum diaphanum	White-tipped Bristle Moss	Endangered	S1	
Plagiochila caduciloba	Gorge Leafy Liverwort	Endangered	S1	
Plagiochila undata	Liverwort	Endangered	S1	
Polytrichum piliferum	Bristly Haircap Moss	Endangered	S1	
Porella japonica ssp. appalachiana	Liverwort	Endangered	S1	
Ptilidium pulcherrimum	Naugehyde Liverwort	Endangered	S1	
Ptychostomum cryophilum	Roundleaf Bryum	Endangered	S1	
Radula quadrata	Liverwort	Endangered	S1	
Schistidium atrofuscum	Black Mountain Bloom Moss	Endangered	S1	
Sciuro-hypnum populeum	Matted Ragged Moss	Endangered	S1	
Sphagnum centrale	Central Peatmoss	Endangered	S1	
Sphagnum cuspidatum	Toothed Peatmoss	Endangered	S1	
Sphagnum macrophyllum	Largeleaf Peatmoss	Endangered	S1	
Sphagnum magellanicum	Magellan's Peatmoss	Endangered	S1	
Sphagnum trinitense	Trinidad Peatmoss	Endangered	S1	
Tortula acaulon	Cuspidate Earth Moss	Endangered	S1	
Tortula norvegica	Norway Screw Moss	Endangered	S1	
Zygodon viridissimus	Green Yoke Moss	Endangered	S2	
Abietinella abietina	Wiry Fern Moss	Threatened	S2	
Anomodon viticulosus	Long-tail Moss	Threatened	S2	
Blepharostoma trichophyllum	Hairy Threadwort	Threatened	S3	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Callicladium haldanianum	Beautiful Branch Moss	Threatened	S2	
Campylopus pilifer	Stiff Swan-neck Moss	Threatened	S2	
Cephaloziella spinicaulis	Liverwort	Threatened	S2	
Cheilolejeunea conchifolia	Liverwort	Threatened	S2	
Cleistocarpidium palustre	Marsh Pygmy Moss	Threatened	S2	
Dichodontium pellucidum	Translucent Fork Moss	Threatened	S2	
Dicranodontium asperulum	Orange Bow Moss	Threatened	S2	
Drepanocladus polygamus	Polygamous Hook Moss	Threatened	S2	
Encalypta procera	Slender Candlesnuffer Moss	Threatened	S2	
Ephemerum cohaerens	Clustered Earth Moss	Threatened	S2	
Herbertus aduncus	Bent Scissorleaf Liverwort	Threatened	S2	
Herpetineuron toccoae	Coiled Moss	Threatened	S2	
Lejeunea blomquistii	Blomquist Leafy Liverwort	Threatened	S3	
Metzgeria leptoneura	Liverwort	Threatened	S2	
Nardia lescurii	Liverwort	Threatened	S2	
Neckera besseri	Besser's Neckera Moss	Threatened	S2	
Neckera pennata	Feathery Neckera Moss	Threatened	S2	
Oncophorus rauei	Rau's Spur Moss	Threatened	S2	
Porella wataugensis	Watauga Porella	Threatened	S3	
Radula tenax	Liverwort	Threatened	S2	
Sphagnum quinquefarium	Five-ranked Bogmoss	Threatened	S2	
Sphagnum rubellum	Red Peatmoss	Threatened	S2	
Telaranea nematodes	Liverwort	Threatened	S2	
Timmia megapolitana	Warrior Moss	Threatened	S2	
Anomodon rugelii	Rugel's Anomodon Moss	Special Concern	S3	
Atrichum cylindricum	Cylindrical Smoothcap Moss	Special Concern	S3	
Bruchia flexuosa	Bending Bruch's Moss	Special Concern	S3	
Campylostelium saxicola	Sandstone Swan-neck Moss	Special Concern	S3	
Conardia compacta	Coast Creeping Moss	Special Concern	S3	
Douinia ovata	Liverwort	Special Concern	S3	
Entodon sullivantii	Sullivant's Silk Moss	Special Concern	S3	
Frullania plana	Liverwort	Special Concern	S3	
Heterophyllium affine	Moss	Special Concern	S3	
Jochenia pallescens	Stump Pit Moss	Special Concern	S3	
Leucodon brachypus	Bracted Squirrel-tail Moss	Special Concern	S3	
Microlejeunea globosa	Cardot's Pouncewort	Special Concern	S3	
Plagiochila echinata	Liverwort	Special Concern	S3	
Plagiochila sullivantii	Sullivant's Leafy Liverwort	Special Concern	S3	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Plagiothecium laetum	Bright Silk Moss	Special Concern	S3	
Tortella tortuosa	Frizzled Crisp Moss	Special Concern	S3	
Paraleucobryum longifolium	Longleaf Notchleaf Moss	Historic	SH	
Ptilium crista-castrensis	Knight's Plume Moss	Historic	SH	
Lichens				
Ahtiana aurescens	Eastern Candlewax Lichen	Endangered	S1	
Anzia colpodes	Black Foam Lichen	Endangered	S1	
Arthopyrenia tenuis	American Strigula Lichen	Endangered	S1	
Bacidia circumspecta	Cautious Dot Lichen	Endangered	S1	
Biatora chrysantha	Moss Tops	Endangered	S1	
Biatora longispora	Orange Crush Lichen	Endangered	S1	
Brianaria bauschiana	Bausch's Dot Lichen	Endangered	S1	
Bryoria furcellata	Burred Horsehair Lichen	Endangered	S1	
Buellia abstracta	Abstract Button Lichen	Endangered	S1	
Bulbothrix scortella	Bulbil Botooms	Endangered	S1	
Cladonia merochlorophaea	Gritty Pixie-cup Lichen	Endangered	S1	
Cladonia stygia	Black-footed Reindeer Lichen	Endangered	S1	
Cresponea flava	Lemon Fissure Cookies	Endangered	S1	
Cresponea premnea var. saxicola	Crespo's Lichen	Endangered	S1	
Dactylospora pertusariicola	Dactylospora Lichen	Endangered	S1	
Dermatocarpon dolomiticum	Fissured Stippleback Lichen	Endangered	S1	
Etayoa trypethelii	Ungulate Lichen	Endangered	S1	
Fuscopannaria sorediata	Pregnant Pause Lichen	Endangered	S1	
Graphis endoxantha	Fluted Script Lichen	Endangered	S1	
Gyalecta jenensis	Rock Dimple Lichen	Endangered	S1	
Hypotrachyna oostingii	Oosting's Loop Lichen	Endangered	S1	
Hypotrachyna showmanii	Ray's Square Britches	Endangered	S1	
Hypotrachyna taylorensis	Taylor's Loop Lichen	Endangered	S1	
Jamesiella anastomosans	Little James Lichen	Endangered	S1	
Lecanora glabrata	Lackluster Disk Lichen	Endangered	S1	
Lecidea nylanderi	Nylander's Tile Lichen	Endangered	S1	
Leproplaca chrysodeta	Leprose Lichen	Endangered	S1	
Melanelia culbersonii	Culberson's Black-parmelia	Endangered	S1	
Pannaria conoplea	Mealy-rimmed Shingle Lichen	Endangered	S1	
Pannaria tavaresii	Coral-rimmed Shingle Lichen	Endangered	S1	
Parmeliella appalachensis	Appalachian Bedroll	Endangered	S1	
Parmeliella triptophylla	Black-bordered Shingle Lichen	Endangered	S1	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Parmotrema diffractaicum	Diffracting Ruffle Lichen	Endangered	S1	
Parmotrema eurysacum	Scatter-Rag Lichen	Endangered	S1	
Parmotrema hypoleucinum	Southern Powdered Ruffle Lichen	Endangered	S1	
Parmotrema mellissii	Melliss' Ruffle Lichen	Endangered	S1	
Parmotrema simulans	False Camper's Cracklings	Endangered	S1	
Peltigera degenii	Lustrous Pelt Lichen	Endangered	S1	
Peltigera evansiana	Peppered Pelt Lichen	Endangered	S1	
Pertusaria tetrathalamia	Four-Spore and Seven Xanthones Ago	Endangered	S1	
Phaeophyscia leana	Lea's Bog Lichen	Endangered	S1	
Physcia halei	Granite Rosette Lichen	Endangered	S1	
Physcia pseudospeciosa	Celebration Day Lichen	Endangered	S1	
Sporodophoron americanum	Oak Spore Lichen	Endangered	S1	
Bagliettoa marmorea	Pink Pit Lichen	Threatened	S2	
Buellia dispersa	Windrose Lichen	Threatened	S2	
Cetrelia chicitae	Chicita's Seastorm Lichen	Threatened	S2	
Cladonia ravenelii	Ravenel's Cup Lichen	Threatened	S2	
Constrictolumina lyrata	Constricted Lichen	Threatened	S2	
Crocodia aurata	Green Specklebelly Lichen	Threatened	S2	
Dibaeis absoluta	Pink Dot Lichen	Threatened	S2	
Dirinaria frostii	Frosty Medallion Lichen	Threatened	S2	
Endocarpon petrolepideum	Rock Shingle Lichen	Threatened	S2	
Flavopunctelia flaventior	Speckled Greenshield Lichen	Threatened	S2	
Flavopunctelia soredica	Powder-edged Speckled Greenshield	Threatened	S2	
Fuscopannaria leucosticta	Rimmed Shingles Lichen	Threatened	S2	
Gomphillus americanus	Frazzled Dot Lichen	Threatened	S2	
Heterodermia crocea	Orange-bellied Fringe Lichen	Threatened	S2	
Heterodermia leucomelos	Elegant Fringe Lichen	Threatened	S2	
Hypogymnia physodes	Monk's-hood Lichen	Threatened	S2	
Hypotrachyna laevigata	Loop Lichen	Threatened	S2	
Hypotrachyna pustulifera	Mountain Loop Lichen	Threatened	S2	
Inoderma byssaceum	Comma Lichen	Threatened	S2	
Ionaspis alba	Dry Eyes Lichen	Threatened	S2	
Ionaspis lacustris	Rusty Brook Lichen	Threatened	S2	
Lasallia pensylvanica	Pennsylvania Toadskin Lichen	Threatened	S2	
Lecidea erythrophaea	Tile Lichen	Threatened	S2	
Lempholemma cladodes	Tentacle Lichen	Threatened	S2	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Lepra commutata	Dust Lichen	Threatened	S2	
Leproplaca cirrochroa	A Firedot Lichen	Threatened	S2	
Lobaria pulmonaria	Lungwort	Threatened	S2	
Menegazzia subsimilis	Tree Flute Lichen	Threatened	S2	
Myelochroa metarevoluta	Highball Lichen	Threatened	S2	
Phaeophyscia insignis	Sign Shadow Lichen	Threatened	S2	
Physcia clementei	Clement's Rosette Lichen	Threatened	S2	
Protoparmeliopsis muralis	Stonewall Rim Lichen	Threatened	S2	
Pseudevernia consocians	Common Antler Lichen	Threatened	S2	
Punctelia appalachensis	Appalachian Speckled Shield Lichen	Threatened	S2	
Rhizoplaca subdiscrepans	Scattered Rock-posy Lichen	Threatened	S2	
Sanguinotrema wightii	Red Crystal Lichen	Threatened	S2	
Sticta carolinensis	Carolina Moon Lichen	Threatened	S2	
Synalissa ramulosa	Eyed Rockgorgon Lichen	Threatened	S2	
Thyrea confusa	Jelly Strap Lichen	Threatened	S2	
Anaptychia palmulata	Shaggy-fringe Lichen	Special Concern	S3	
Canoparmelia caroliniana	Carolina Shield Lichen	Special Concern	S3	
Cetrelia olivetorum	Upside Seastorm Lichen	Special Concern	S3	
Diplotomma alboatrum	White Two-Faced Lichen	Special Concern	S3	
Dirina massiliensis	A Sheltered Life	Special Concern	S3	
Enchylium conglomeratum	Dotted Jelly Lichen	Special Concern	S3	
Heterodermia appalachensis	Appalachian Fringe Lichen	Special Concern	S3	
Heterodermia echinata	Flowering Fringe Lichen	Special Concern	S3	
Hypotrachyna imbricatula	Great Horned Square Britches	Special Concern	S3	
Normandina pulchella	Elf-ear Lichen	Special Concern	S3	
Ochrolechia yasudae	Coral Saucer Lichen	Special Concern	S3	
Parmotrema stuppeum	Powder-edged Ruffle Lichen	Special Concern	S3	
Peltigera elisabethae	Concentric Pelt Lichen	Special Concern	S3	
Peltigera phyllidiosa	Considerably Pleated Pelt	Special Concern	S3	
Psora pseudorussellii	Bordered Scale Lichen	Special Concern	S3	
Pycnothelia papillaria	Nipple Lichen	Special Concern	S3	
Ricasolia quercizans	Smooth Lungwort	Special Concern	S3	
Squamulea subsoluta	Dispersed Firedot Lichen	Special Concern	S3	
Sticta beauvoisii	Fingered Moon Lichen	Special Concern	S3	
Usnocetraria oakesiana	Yellow Ribbon Lichen	Special Concern	S3	
Acarospora chrysops	Golden Cobblestone Lichen	Historic	SH	
Acrocordia megalospora	Mega Spore Lichen	Historic	SH	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Alyxoria mougeotii	Rock Script	Historic	SH	
Anisomeridium biforme	Moonshiner's Flask Lichen	Historic	SH	
Arthonia diffusa	Diffuse Comma Lichen	Historic	SH	
Arthonia polymorpha	Poly Comma Lichen	Historic	SH	
Arthonia punctiformis	Punched Comma Lichen	Historic	SH	
Bacidia laurocerasi	Violet Dot Lichen	Historic	SH	
Bacidia rubella	Frosty-rimmed Dot Lichen	Historic	SH	
Bacidia suffusa	Dotted Lichen	Historic	SH	
Bacidina inundata	Flooded Dot Lichen	Historic	SH	
Baeomyces rufus	Brown Beret Lichen	Historic	SH	
Biatora printzenii	Printzen's Lichen	Historic	SH	
Caloplaca dakotensis	Dakota Firedot Lichen	Historic	SH	
Candelariella efflorescens	Powdery Goldspeck Lichen	Historic	SH	
Carbonicola anthracophila	Small Clam Lichen	Historic	SH	
Catapyrenium cinereum	Earth Lichen	Historic	SH	
Cetrelia cetrarioides	Downside Seastorm Lichen	Historic	SH	
Chaenotheca furfuracea	Sulphur Stubble Lichen	Historic	SH	
Cladonia botrytes	Wooden Soldiers Lichen	Historic	SH	
Cladonia conista	Neat Pixie Cup Lichen	Historic	SH	
Cladonia deformis	Lesser Sulphur-cup Lichen	Historic	SH	
Cladonia glauca	Glaucous Pixie Lichen	Historic	SH	
Cladonia gracilis ssp. turbinata	Bronzed Pixie Lichen	Historic	SH	
Cladonia leporina	Jester Lichen	Historic	SH	
Cladonia phyllophora	Felt Horn Lichen	Historic	SH	
Cladonia rei	Wand Lichen	Historic	SH	
Cladonia squamosa var. subsquamosa	Dragon Cladonia	Historic	SH	
Cladonia subradiata	Powdery Peg Lichen	Historic	SH	
Clauzadea metzleri	Clauzade's Lichen	Historic	SH	
Clypeococcum hypocenomycis	Scaly Parasite Lichen	Historic	SH	
Coccocarpia erythroxyli	Fruiting Shell Lichen	Historic	SH	
Coccocarpia pellita	Salted Lichen	Historic	SH	
Collema leptaleum	Crumpled Bat's Wing Lichen	Historic	SH	
Collema nigrescens	Blistered Jelly Lichen	Historic	SH	
Constrictolumina cinchonae	Lumin Lichen	Historic	SH	
Dermatocarpon americanum	American Stippleback Lichen	Historic	SH	
Diplolaeviopsis ranula	Pathogen Lichen	Historic	SH	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Endocarpon pusillum	Scaly Stippled Lichen	Historic	SH	
Endococcus propinquus	Endococuis Lichen	Historic	SH	
Fellhanera fallax	Leaf Lover Lichen	Historic	SH	
Fellhanera silicis	Leaf Dweller Lichen	Historic	SH	
Flavoplaca citrina	Mealy Firedot Lichen	Historic	SH	
Graphis elegans	Elegant Script Lichen	Historic	SH	
Graphis eulectra	Electra Script Lichen	Historic	SH	
Graphis intricata	Intricate Script Lichen	Historic	SH	
Graphis lineola	Linear Script Lichen	Historic	SH	
Graphis tenella	Tenacious Script Lichen	Historic	SH	
Herteliana schuyleriana	Who's on First Lichen	Historic	SH	
Heterodermia casarettiana	Casual Fringe Lichen	Historic	SH	
Heterodermia galactophylla	Branching Fringe Lichen	Historic	SH	
Hypotrachyna revoluta	Powdered Loop Lichen	Historic	SH	
Lasallia pustulata	Lasalle's Toadskin Lichen	Historic	SH	
Lecania erysibe	Bowl Cut Lichen	Historic	SH	
Lecania naegelii	Scurfy Lichen	Historic	SH	
Lecania perproxima	Host Lichen	Historic	SH	
Lecanora albella var. albella	Fogg Eyes	Historic	SH	
Lecanora carpinea	Sordid Lichen	Historic	SH	
Lecanora chlarotera	Lesser Dippy Dips	Historic	SH	
Lecanora frustulosa	Microbe Lichen	Historic	SH	
Lecanora miculata	No Place like Cone Lichen	Historic	SH	
Lecanora pseudistera	Cold Flow Lichen	Historic	SH	
Lecidea plebeja	The Commoner Crust	Historic	SH	
Lecidella elaeochroma	Olive Forever Lichen	Historic	SH	
Lepra waghornei	Waghorne's Pore Lichen	Historic	SH	
Leptogium saturninum	Bearded Jellyskin Lichen	Historic	SH	
Lichenostigma alpinum	Mosaic-Like Lichen	Historic	SH	
Lithothelium hyalosporum	Argo's Lichen	Historic	SH	
Lithothelium illotum	Pox Lichen	Historic	SH	
Melanelixia glabratula	a camouflage lichen	Historic	SH	
Melanelixia subargentifera	Whiskered Camouflage Lichen	Historic	SH	
Melanelixia subaurifera	Abraded Camouflage Lichen	Historic	SH	
Melanohalea exasperata	Warty Camouflage Lichen	Historic	SH	
Muellerella lichenicola	Sommerfelt's Lichen	Historic	SH	
Mycoporum compositum	High Lonesome Lichen	Historic	SH	
Mycoporum eschweileri	Cacti Lichen	Historic	SH	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Myriolecis hagenii	Hagen's Rim Lichen	Historic	SH	
Myriolecis sambuci	Boreal Rim Lichen	Historic	SH	
Myriospora smaragdula	Bird Poop Lichen	Historic	SH	
Nephroma laevigatum	Mustard Kidney Lichen	Historic	SH	
Opegrapha astraea	Bolded Script Lichen	Historic	SH	
Pannaria lurida ssp. lurida	Wrinkled Shingle Lichen	Historic	SH	
Pannaria rubiginosa	Brown-eyed Shingle Lichen	Historic	SH	
Parmelina coleae	Fringed Shield Lichen	Historic	SH	
Parmeliopsis hyperopta	Gray Starburst Lichen	Historic	SH	
Parmeliopsis subambigua	Green Starburst Lichen	Historic	SH	
Parmotrema commensuratum	Sizable Ruffle Lichen	Historic	SH	
Parmotrema haitiense	Evergreen Lichen	Historic	SH	
Parmotrema rampoddense	Long-whiskered Ruffle Lichen	Historic	SH	
Peltigera aphthosa	Common Freckle Pelt	Historic	SH	
Peltigera didactyla	Alternating Pelt Lichen	Historic	SH	
Peltigera neopolydactyla	Carpet Pelt Lichen	Historic	SH	
Pertusaria leioplaca	Stictic Lichen	Historic	SH	
Phaeophyscia kairamoi	Least Shadow Lichen	Historic	SH	
Physcia tribacia	Beaded Rosette Lichen	Historic	SH	
Placodium cerinum var. sideritis	Sideshow Fire Dot Lichen	Historic	SH	
Psilolechia lucida	Sulphur Dust Lichen	Historic	SH	
Psora russellii	Russell's Fishscale Lichen	Historic	SH	
Punctelia borreri	Blinking Speckleback Lichen	Historic	SH	
Pyrenodesmia variabilis	Variable Orange Lichen	Historic	SH	
Pyrenula balia	Poxed Lichen	Historic	SH	
Pyrenula cruenta	Coastal Plain Pyrenula	Historic	SH	
Pyrenula leucostoma	White-Eyed Angler	Historic	SH	
Pyrenula ravenelii	Ravenel's Pox Lichen	Historic	SH	
Ramalina calicaris	Cartilage Lichen	Historic	SH	
Ramalina farinacea	Dotted Ramalina Lichen	Historic	SH	
Ramboldia russula	Southern Crimson Dot Lichen	Historic	SH	
Rhizocarpon concentricum	Concentric Map Lichen	Historic	SH	
Rhizocarpon infernulum	Forrest Form Lichen	Historic	SH	
Rhizocarpon petraeum	Massalongo's Map Lichen	Historic	SH	
Rhizocarpon timdalii	Timdal's Map Lichen	Historic	SH	
Rinodina chrysidiata	Yellow-finger pepperpot	Historic	SH	
Rinodina pachysperma	Pepper-Spore Lichen	Historic	SH	
Rinodina papillata	Papillate Rinodina Lichen	Historic	SH	

Appendix III: Rare Plant List

Scientific Name	Common Name	KY Status	KY Rank	U.S. Status
Scytinium apalachense	Appalachian Jelly Lichen	Historic	SH	
Segestria leptalea	Small Wart Lichen	Historic	SH	
Skyttea radiatilis	Sky Lichen	Historic	SH	
Sticta fuliginosa	Peppered Moon Lichen	Historic	SH	
Thelidium decipiens	Deceptive Dots	Historic	SH	
Thelocarpon intermediellum	Yellow Snow Lichen	Historic	SH	
Thelopsis rubella	Curiouser and Curiouser Lichen	Historic	SH	
Trapelia stipitata	Stipitate Pebble Lichen	Historic	SH	
Trimmatothelopsis dispersa	Sandstone Lichen	Historic	SH	
Umbilicaria vellea	Grizzled Rocktripe Lichen	Historic	SH	
Usnea angulata	Angular Beard Lichen	Historic	SH	
Usnea endochrysea	Crystal Beard Lichen	Historic	SH	
Usnea halei	Hale's Beard Lichen	Historic	SH	
Usnea strigosa ssp. rubiginea	Chigger Thicket Beard	Historic	SH	
Usnea subfusca	Monster Eye's Beard	Historic	SH	
Usnea trichodea	Bony Beard Lichen	Historic	SH	
Usnea tristis	Tree Beard Lichen	Historic	SH	
Verrucaria muralis	Brick and Mortar Lichen	Historic	SH	
Verrucaria rupestris	White Ash Lichen	Historic	SH	
Verrucaria xyloxena	Short Lived Speck Lichen	Historic	SH	
Vulpicida viridis	Hidden Sunshine Lichen	Historic	SH	
Xanthocarpia crenulatella	Xanthone Lichen	Historic	SH	
Xanthoparmelia angustiphylla	Meagre Rock-shield Lichen	Historic	SH	
Xanthoparmelia hypomelaena	Ozark Rock-shield Lichen	Historic	SH	
Xanthoparmelia stenophylla	Palomino Rock-shield Lichen	Historic	SH	
Xanthoparmelia subramigera	Rock-Shield Lichen	Historic	SH	