



United States
Department of
Agriculture

At-Risk Species

Draft Assessment Supplemental Report Wayne National Forest



Forest
Service

Wayne National
Forest

Forest Plan
Revision

June 2019

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The federally endangered running buffalo clover (*Trifolium stoloniferum*).
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Federally Listed Plants

Introduction

There are 6 federally listed plants currently known to occur in Ohio (ODNR 2018). Eastern prairie fringed orchid (*Platanthera leucophaea*) and lakeside daisy (*Tetraneuris herbacea*) occur in glaciated Ohio with no suitable habitat for either species occurring in the Western Allegheny Plateau Ecoregion where the Wayne National Forest is located. Running buffalo clover (*Trifolium stoloniferum*) is the only federally listed plant that has been documented in the Wayne National Forest. The remaining three—northern monkshood (*Aconitum noveboracense*), small whorled pogonia (*Isotria medeoloides*), and Virginia spiraea (*Spiraea virginiana*)—occur in the Western Allegheny Plateau and could potentially grow in the Wayne National Forest. This report will discuss in further detail these four known or potential species.

Running Buffalo Clover

Running buffalo clover is a perennial herb in the pea family (Fabaceae) that has been documented in 6 states (Gleason and Cronquist 1991; ODNR 2007). Bison [historically mischaracterized as “buffalo”] and elk were very important to the ecology of the species by creating habitat along the various trails they created traveling to grasslands and salt licks (Campbell et al. 1988; Gardner in prep). The elimination of these two species from their range in the 18th and 19th centuries caused running buffalo clover to disappear, and at one point thought to be extinct. After its re-discovery in West Virginia in 1983, the species was added to the Federal list as endangered in 1987. Populations have been rediscovered in all six states of its former range, and it was newly discovered in Pennsylvania in May 2017 (Steve Grund pers. comm. 2017). There are 152 extant populations as of February 2018 (Jennifer Finfera pers. comm. 2018).

In Ohio, there are 40 extant populations as of December 2018, with most occurring in Hamilton County and the second highest number in Jackson County near the former “Great Lick” outside of the City of Jackson (Gardner in prep). Since 2008, most of the new populations have been found in the Western Allegheny Plateau (ODNR 2018). Two sites have been discovered in the Wayne National Forest to date.

Habitat for this species is an open, woodland setting either on a terrace or lower slope, or on an upperslope or ridgetop. Canopy trees are often black walnut, American elm, common hackberry, white ash, and sugar maple (Gardner in prep). Most populations occur along pedestrian or game trails with a few along logging roads, off-highway vehicle trails, or livestock trails.

Plants with more direct sunlight during a portion of the day, produce more flowers than well-shaded plants. Reproduction is mostly from stolon tips. Plants can self-pollinate with pollinator help, and seed production is limited (Franklin 1998). With low seed set, running buffalo clover mostly spreads locally by stolons. Crawford et al. (1998) found genetic variation was greatest

between populations and that small populations of very few rooted crowns are equally important to conserve as large populations since they have significant genetic variability.

Popular Flats Site

In 2005, the first population of running buffalo clover in the Wayne National Forest was found in the Ironton Ranger District in Lawrence County. The site, “Popular Flats,” is located on a broad ridgetop where several ridges meet. The population has been monitored on an annual basis by Forest Service staff since its discovery (table 1). Management has included annual hand-pulling of Japanese stiltgrass (*Microstegium vimineum*) in the populations and spraying outside the vicinity. Tree-of-heaven (*Ailanthus altissima*) and other woody non-native invasive species are controlled annually. The canopy was thinned in the fall and winter of 2017 to allow more sunlight to reach the population to stimulate blooming. In 2018, there was a major increase in flowering stems.

Table 1. Monitoring data for running buffalo clover for the “Popular Flats” site

Monitoring Year	# of Rooted Crowns (Plants)
2005	34
2013	260
2014	145
2015	101
2016	45
2017	36
2018	45

Creola Site

The “Creola” site was discovered in 2013 in the Athens Unit in Vinton County. This site is located on a sandy terrace along a small permanent stream. Monitoring has been conducted on an annual basis since its discovery, and is summarized in table 2. The population has steadily increased in six years and is now one of the largest in Ohio. Management has included annual hand-pulling of Japanese stiltgrass and pruning woody vegetation.

Table 2. Monitoring data for running buffalo clover for the “Creola Site” in Vinton County

Monitoring Year	# of Rooted Crowns (Plants)
2013	64
2014	89
2015	185
2016	252
2017	489
2018	576

A management agreement between the Wayne National Forest, U.S. Fish and Wildlife Service, and Ohio Department of Natural Resources is nearly complete which will help ensure the long-

term viability of the two sites, as well as any newly discovered sites in the Wayne National Forest.

Based on the number of new populations being discovered in southeastern Ohio, it is likely that more populations of running buffalo clover occurs within the Wayne National Forest than currently known. Surveys of current and proposed trails for this species are conducted by Forest Service botanists and trained seasonal staff to avoid potential negative impacts.

Northern Monkshood

Northern monkshood (*Aconitum noveboracense*) is a perennial herb that occurs in four states: Iowa, New York, Ohio, and Wisconsin (Gardner 2016). It was added to the Federal list as threatened in 1983. There are about 115 occurrences range wide (Mabry et al. 2009). Ohio has three known sites, two of which were discovered in northeast Ohio in the late 1800s (Spooner 1981). A third site was reported from Hocking County in 1981 (Cusick 1983). Cusick thought it to be the closely related *A. uncinatum*. This determination was questioned by local botanists, and in 1993 *Aconitum* expert Dr. James Hardin determined the Hocking Hills population to be *A. noveboracense* (Hardin 1993). No other occurrences have been located in Ohio since this discovery.

Its habitat is cool, mesic sandstone ravines and rock shelters near an intermediate or permanent stream. The northern Ohio sites occur on Sharon Conglomerate Sandstone, and the Hocking Hills site on Black Hand Sandstone.

Northern monkshood's geographical range is most likely determined in Ohio. Ohio Natural Heritage Program has conducted surveys for this species in areas with the best potential habitat without successfully locating new sites. The Hocking Hills Region is the best possible area in Ohio for the discovery of new populations, with none located at this time (ODNR 2007).

In the Wayne National Forest, the closest suitable habitat is in the Ironton District where there are some 20 to 40 ft. sandstone ravines that includes Sharon Conglomerate Sandstone. Over the 40 plus years of the Ohio Natural Heritage Program, botanists have visited these areas with assistance of Forest Service botanists without successfully locating any populations. Forest Service botanists have assisted in monitoring northern wild monkshood to see the plant and its habitat. Although it cannot be said for certain the species does not occur in the Wayne National Forest, it is highly unlikely it will be found based on low potential for suitable habitat.

Small Whorled Pogonia

Small whorled pogonia (*Isotria medeoloides*) is an orchid that has an eastern North America distribution and reaches its western limit in Illinois and historically in Missouri (Gardner 2016). Only two sites have ever been recorded in Ohio; one was discovered in 1985 and the other in 1998 (ODNR 2018). It grows on sandstone-based soils in mid to late successional, mesic forests with an open understory. This habitat is not uncommon in the Wayne National Forest. Because it grows in a general habitat, small whorled pogonia has a probability of occurring in the Wayne National Forest. Its non-specific habitat makes it difficult for botanists to focus survey effort.

This dilemma was the catalyst to create a predictive habitat model to aid in the survey effort. The first model was created in 1993 for New Hampshire and Maine (Sperduto 1993). Recently, the West Virginia Division of Natural Resources developed a predictive habitat model for this species to determine the best habitat conditions for West Virginia and other states with known occurrences (P.J. Harmon pers. comm. 2018). This model predicted the upland forests in the Marietta Unit to have the best potential habitat for the species in the Wayne National Forest. The two known Ohio locations occur in very poor habitat conditions according to the model, so the model is not foolproof. The Scioto County site was a single plant and occurred in a mature oak-maple woods with black gum and flowering dogwood. The Hocking County site occurs in a mature second-growth hemlock-hardwood forest with an open understory and well-drained soils.

Small whorled pogonia can be easily missed in the field for its short stature of less than a foot tall. It also closely resembles Indian cucumber-root (*Medeola virginiana*) and large whorled pogonia (*Isotria verticillata*). Only a well-trained observer would notice this species in the field when it is vegetative.

The plant can be dormant underground for several years. Based on the monitoring data of the only extant site in Ohio, it often comes up vegetative, if at all (Jenny Finfera pers. comm.).

This species has the potential for growing in the Wayne National Forest, especially in the Marietta Unit.

Virginia Spiraea

Virginia spiraea (*Spiraea virginiana*) is a clonal shrub that occurs on scoured banks of high gradient flow streams from northern Alabama to southern Ohio (NatureServe 2018). It requires severe flood events to scour the creek banks to uproot competitive woody vegetation without uprooting the shrub itself. Reproduction is primarily asexual from rhizomes. Seed production is rare and no seedlings have been observed in nature (Brzyski and Culley 2013; NatureServe 2018). The introduced Japanese spiraea (*Spiraea japonica*), which is increasing in Ohio, may hybridize with Virginia spiraea (Theresa Culley pers. comm.).

Virginia spiraea was discovered in Ohio in 1991 along the main stem of Scioto Brush Creek in Scioto County. All six Ohio populations occur along about 12 miles stretch of Scioto Brush Creek in Scioto County, which is about 16 miles away from the closest parcel of the Wayne National Forest. Stine (1993) conducted the most thorough survey for appropriate habitat in southeastern Ohio, including Wayne National Forest. He failed to find any new populations or appropriate habitat. Gardner and Moser (2007) and Gardner (2016) conducted surveys of a few specific streams near Scioto Brush Creek. These surveys failed to find any new populations outside of the mainstem of Scioto Brush Creek. Forest Service botanists have visited the only protected site in Ohio to see the species in its natural habitat to aid with locating the species in the Wayne.

With such specific habitat needs, Virginia spiraea appears limited to Scioto Brush Creek. Because of its low fecundity and narrow habitat requirements, it is highly unlikely this species will be found within boundaries of the Wayne National Forest.

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Federally Listed Wildlife

Introduction

In accordance with the 2012 National Forest System Land Management Planning Rule (2012 Planning Rule) and further guidance from the Forest Service Land Management Planning Handbook (FSH), at-risk species are identified within the forest plan revision process, relevant to the plan area and planning process. These species include federally listed threatened and endangered species, species proposed for federal listing, candidate species for federal listing, and species of conservation concern.

The preliminary list of potential species of conservation concern will be shared and described in the near future, but is not currently available since it is still under development. The list of potential species of conservation concern will continue to be refined during the assessment process. A final identification of species of conservation will be made during the plan development phase.

Because species of conservation concern will be addressed separately, this section's sole purpose is to identify threatened and endangered species within or relevant to the Wayne National Forest, designated by the U.S. Fish and Wildlife Service (FWS). Within the plan area, there are currently no relevant candidate or proposed species for federal listing.

Although the 2006 Wayne Forest Plan contained direction relevant to threatened and endangered species recovery, one of the current challenges in recovering federally listed species is that many of the impacts that affect populations may come from outside National Forest System lands, such as White Nose Syndrome—a disease affecting local mine-hibernating bats. Due to this off-site disease, the single known hibernaculum in the Wayne has recently shown no further occurrence of federally listed bats, but summer foraging and breeding habitat do occur in the national forest (USDA 2017). This example typifies the inherent difficulties in managing for species recovery, where only certain needs may be practically addressed at any point in time, while the ability to address other needs may be elusive.

Eight federally endangered (E) or threatened (T) wildlife species are known to occur in, adjacent to, or near the Wayne National Forest. These include two small mammals, one terrestrial invertebrate and five freshwater mussels, and are listed as follows, with federal designation in bold text:

- Small Mammals
 - ◆ Northern long-eared bat (*Myotis septentrionalis*), **Threatened**
 - ◆ Indiana bat (*Myotis sodalis*), **Endangered**
- Terrestrial Invertebrate
 - ◆ American burying beetle (*Nicrophorus americanus*), **Endangered**
- Freshwater Mussels

- ◆ Snuffbox (*Epioblasma triquetra*), **Endangered**
- ◆ Rayed bean (*Villosa fabalis*), **Endangered**
- ◆ Sheepnose (*Plethobasus cyphus*), **Endangered**
- ◆ Fanshell (*Cyprogenia stegaria*), **Endangered**
- ◆ Pink mucket pearly mussel (*Lampsilis abrupta*), **Endangered**

Small Mammals

As shown above, the Wayne National Forest manages for two federally listed mammals, both of which are bats. As with all other federally listed species, Forest Service management is meant to conserve or enhance recovery habitat and promote population growth.

Original listing circumstances differed between Indiana and northern long-eared bats. Though habitat changes certainly play an important role in the continued existence for each, it can be said that each species shares a more common and pervasive threat at present, white-nose syndrome—a deadly fungal disease that has decimated countless bat across the eastern United States. Because of how this disease affects both of the Wayne’s listed species (as well as other local bat species), in many cases, the trend data shown under one species’ section is relevant to both and for the same primary, recurring reason since 2011, when white-nose syndrome was locally confirmed. To avoid redundancy, certain tables and figures will be shown only once.

Indiana Bat

Background

The Indiana bat (*Myotis sodalis*), also referred to as the Indiana myotis, was listed as a federally endangered species in 1967 and is present in the Wayne National Forest year round. Critical habitat for the Indiana bat has been designated elsewhere, but is not designated within Ohio.

Though pre-white-nose syndrome in nature, more information about Indiana bat habitat needs and life history may be found in the *Biological Assessment for the Wayne National Forest Revised Land and Resource Management Plan*, prepared by the Forest Service in 2005, and the associated *Final Biological Opinion on the Wayne National Forest Land and Resource Management Plan*, prepared by the FWS in 2005.

Range

The range of the Indiana bat extends from the western Ozark region in eastern Oklahoma and Iowa, north and east to Michigan, New York, New England, and northern New Jersey, and south to northern Alabama and Arkansas. The species has disappeared from or greatly declined in most of its former range in the northeastern United States (Trombulak et al. 2001). The species winters and hibernates in caves and mines within this range.

Habitat and Behavior

Within the local range, Indiana bats may be found overwintering in suitable mine environments, as the geology of the Wayne National Forest does not support karst ecosystems, responsible for cave development.

The data that follow indicate that conditions for Indiana bat over-wintering may no longer be present within National Forest System lands. Multiple surveys confirm a lack of Indiana bat presence within the one previously occupied hibernaculum. As such, only summer habitat will be described further.

Across their range and locally, Indiana bats use trees as roosting and foraging sites during summer months. Summer habitat consists of wooded or semi-wooded areas, often along streams (Menzel et al. 2001; Menzel et al. 2005). Solitary females or small maternity colonies bear their offspring in hollow trees or under loose bark of living or dead trees (Humphrey et al. 1977; Garner and Gardner 1992). Humphrey et al. (1977) determined that dead trees are preferred roost sites and that trees standing in sunny openings are attractive because the air spaces and crevices under the bark are warmer. Though maternity roost sites have been reported mainly in riparian and floodplain forests (Humphrey et al. 1977; Garner and Gardner 1992), recent studies indicate that upland habitats are used by maternity colonies much more extensively than previously reported. Roosts were not found in forests with open canopies (10 to 30% canopy cover) or in old fields with less than or equal to 10% canopy cover. In eastern Tennessee and western North Carolina, several maternity colonies were in sun-exposed conifer snags, where roost sites were above the surrounding canopy (Britzke et al. 2003). In Illinois, Indiana bats used the same roost sites in successive summers. Recapture of the same individuals within traditional roost sites during subsequent summers suggests site fidelity (Garner and Gardner 1992; Gardner et al. 1996).

Despite some effort, no Indiana bat maternity roost trees have been discovered over time on the Wayne. Maternity roost identification leverages conservation efforts since females sometimes roost in larger groups of 100 or more and following late spring births, females provide sole care for pups until the non-volant young are capable of flight. Maternity roosts have also been shown to have high site fidelity, though roost trees are an ephemeral resource and multiple trees can be used within the same season, so maintenance of the surrounding habitat may contribute to continued use.

Multiple bachelor roost trees have been documented locally. As opposed to some documented coniferous tree usage in other parts of the Indiana bat's range, only deciduous tree species use has been documented on the Wayne, with some preference for American elm (*Ulmus americana*) and a variety of hickory species (*Carya* spp.). Male tree roost locations within mature forests vary across the landscape, some in close proximity to a hibernaculum, others not.

Roost tree species selection does not necessarily correspond to forest type preference. In other words, trees species usage does not mean that Indiana bats are only using areas that support that tree species, whether live or standing dead. This is important to note, as some roosting trees may be associated with upland areas. Typically, Indiana bats have been associated with foraging in more lowland areas, sometimes around water features, perhaps because of some openness and

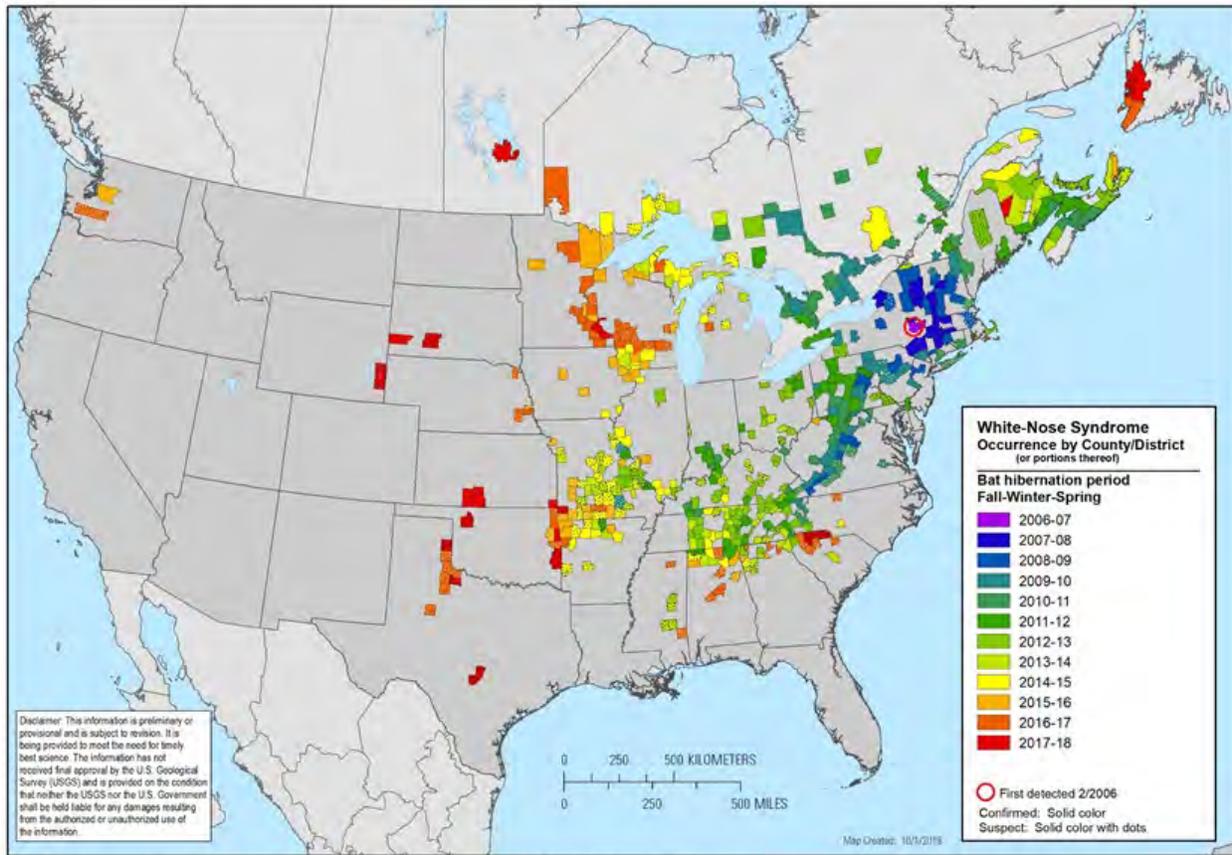
corridor availability. A relative lack of midstory seems preferable for the species (Rommé et al. 1995). The mesophication occurring across the Wayne National Forest may be problematic for Indiana bat feeding strategies, especially if foraging takes them into upland areas, where there is a clear association between moth abundance and oak presence.

Trends Since 2006

Some trends are driven by programmatic data gathering, associated with responsible wildlife management practices and furthered by guidance and agreements made during the last programmatic consultation with the FWS around forest plan revision. In some cases, this results in forest plan language that promotes specific conservation activities. Other trends result from reactive and opportunistic data gathering, developed and implemented with the intent of trying to understand more about what is happening with species across the landscape.

Bat inventory and monitoring has been conducted in the Wayne National Forest since 1997, when Indiana bats were first documented here. Certain forest-level survey efforts, such as the hibernaculum census, started in 2003 (USDA 2005).

Following the 2011 confirmation of WNS in the Ironton Ranger District (Figure 1), national-forest-wide survey efforts were accelerated, specifically annual (versus biennial) hibernaculum counts, biannual (versus annual) acoustic monitoring transects (driving routes), daytime emergence surveys and acoustic monitoring at the hibernaculum entrance, and mist net surveys.



Citation: White-nose syndrome occurrence map - by year (2018). Data Last Updated: 10/1/2018. Available at: <https://www.whitenosesyndrome.org/resources/map>.

Figure 1. White-nose syndrome occurrence map by year across the United States and Canada, showing spread in all cardinal directions from initial detection in upstate New York, 2006

Perhaps the most telling trend data are contained in table 3, which show a suite of bat species identified and counted within the Wayne’s hibernaculum, including the Indiana bat and federally threatened northern long-eared bat. Data from 2018 (not shown) were similar to 2014 and 2016, in that there were no detections of Indiana or northern long-eared bats, with other species combined falling short of a double-digit total.

It is notable that in the year following white-nose syndrome confirmation, there is frequently an uptick in counts at white-nose syndrome-infected sites. This trend was confirmed at the Wayne’s hibernaculum as species moved from their historic microhabitat sites within the mine (sites which were either inaccessible or imperceptible) to atypical locations where they were more detectable during survey efforts. This behavioral response is typical of white-nose syndrome-infected bats, followed by a population crash the second year after white-nose syndrome confirmation.

Table 3. Mid-winter bat census results (individuals counted) since 2003 for a Lawrence County mine ("Woody") in the Ironton Ranger District

Year	<i>Myotis lucifugus</i>	<i>Myotis sodalis</i>	<i>Perimyotis subflavus</i>	<i>Eptesicus fuscus</i>	<i>Myotis septentrionalis</i>	Unidentified	Total Bats	Wayne Status
2003	299	208	38	5	0	13	563	No
2005	704	333	40	6	3	3	1,089	No
2007	1,344	224	99	6	11	0	1,684	No
2009	593	254	129	3	2	0	981	No
2011	916	276	134	3	1	4	1,334	No
2012	1,753	277	214	11	24	72	2,351	Yes
2013	213	16	132	5	14	0	380	Yes
2014	4	0	4	1	0	0	9	Yes
2016	0	0	2	3	0	0	5	Yes

Note: The "Woody" mine is an abandoned limestone mine. Also note the historic counts prior to white-nose syndrome were well above 1000. Cumulative species totals for the last two entries were less than 10 individuals apiece.

The pathogenic trend on multiple species was further underscored when acoustic transect data was reviewed over pre- and post-white-nose syndrome detection years, both at the state level and at the local level (USDA 2015).

A preliminary data analysis was conducted by our conservation partner(s), Jennifer Norris at the Ohio Department of Natural Resources, Division of Wildlife. She noted that statewide, from 2011 to 2014, a 47% decline in bat detection rate had occurred (i.e., the number of calls collected for a specified period and distance – minute per mile; Figure 2).

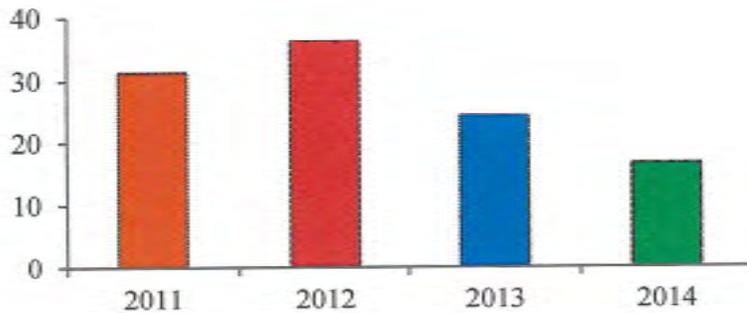


Figure 2. Acoustic bat detections per survey rate over four years of data collection for all routes in Ohio (2011 to 2014)

Note: The bars indicate the uptick in recordings during the year following white-nose syndrome detection and a marked decline in recordings during the two years that followed.

Additionally, data analysis for the early-summer acoustic monitoring surveys from the Wayne National Forest demonstrated variable, but overall declines, in bat detections in 2014 compared to previous years (table 4).

Table 4. Overall percent declines in numbers of bat calls detected from 2011 to 2014 on bat acoustic driving routes associated with the three units of the Wayne National Forest

Athens	Marietta	Ironton
-2% Hocking (1)	-80% Monroe	-57% Gallia
-46% Hocking (2)	-39% Washington	-52% Lawrence

Note: The individual route name is provided after the calculated decline. Even considering the outlying low decline percentage on the Hocking 1 route, average decline in bat detections across the Wayne compared to previous years was 46%.

Mid-summer mist net surveys were undertaken in 2014, across 65 sites on the Wayne, totaling 132 net nights. Net sites were chosen to match up closely with past mistnet sites, except on the Marietta Unit where some new sites were located and sampled to broaden the previous sampling coverage. This survey approach was used to facilitate a comparison of pre- and post-white-nose syndrome survey results.

Overall declines in captures of white-nose syndrome-affected bats and bat capture rates were observed, including northern long-eared bats (northern bat) (table 5). The sample size for post-white-nose syndrome (2014) effort is a lot smaller than pre-white-nose syndrome (1997 to 2008) survey effort, so this must be taken into account with any comparisons made between the two periods. No Indiana bats were captured during 2014 surveys; however, this was not unusual, due to the amount of effort generally required to catch one in the Wayne National Forest in summer. Relative abundance shifted between species, resulting in higher relative captures of big brown, red, and hoary bats in 2014. Within that year, red bats were the most commonly captured species across the Wayne National Forest.

Table 5. Relative abundance comparison by species, pre-white-nose-syndrome (WNS) from 1997-2008 and post-white-nose-syndrome (2014)

Species	pre-WNS	post-WNS
Little brown bat	14.5%	11.5%
Northern bat	31.2%	18.0%
Indiana bat	0.6%	0.0%
Tri-colored bat	9.6%	6.0%
Big brown bat	21.6%	28.1%
Red bat	21.1%	35.0%
Hoary bat	0.6%	1.4%
Silver-haired bat	0.2%	0.0%

Note: Percentages are based on data from summer bat surveys in the Wayne. The data highlights a decline in capture rates for the majority of bat species, including all Myotis.

Range-wide, Ohio’s Indiana bats have declined dramatically over the past decade, as evidenced by the FWS 2017 *Indiana Bat Population Status Update* (DOI 2018a). Although the species has been found in many more states, within the seventeen states that make up the majority of the species range, Ohio has shown the fourth-highest population decline since 2015 (-39.9%) and the sixth-highest loss in the seventeen state area since 2007. Ohio’s state neighbor to the south, West Virginia, which shares similar forest types, is second-highest in population decline since 2015 (-54.7%) and ranks third-highest in loss across the seventeen state area since 2007 (DOI 2018a).

In terms of how the Forest Service has responded to this relatively new pathogenic threat, it is fair to say that the Wayne National Forest has taken a monitoring and habitat-improvement based approach. With no endorsed direct treatment options available for white-nose syndrome within natural systems, the Wayne has defaulted to this strategy. The national forest continues to implement various management projects consistent with the 2006 Wayne Forest Plan guidance. The Wayne National Forest has continued to follow Indiana bat-specific standards for projects, regardless of perceived habitat limitations to species or lack thereof, in frequent consultation with the FWS.

Certain prescriptions for Management Areas in the 2006 Wayne Forest Plan were developed, in part, to provide habitat conditions beneficial for Indiana bats, especially within these areas: Diverse Continuous Forest, Diverse Continuous Forest with Off-Highway Vehicle Use, Historic Forest, and Historic Forest with Off-Highway Vehicle Use (see 2006 Wayne Forest Plan, appendix D). In accordance with the Conservation Plan for federally listed species (2006 Wayne Forest Plan, appendix D), the Wayne National Forest is responsible for a number of activities to conserve and protect Indiana bats and their habitat: provide administrative, technical, and project-specific information to FWS, conduct inventory, analysis, and monitoring in cooperation with partners, provide education and awareness training about biology and habitat requirements to key employees, require adherence to specific standards and guidelines for all projects, and as a measure of the progression of activities covered under the forest plan, monitor the cumulative acreage of specific management activities implemented under the forest plan along with Indiana bat populations and habitat use on the Wayne National Forest. In different ways, these specific recovery efforts have been executed in the last 13 years, but bat conservation efforts were also undertaken prior to the last forest plan revision.

Initial reasons for listing this species revolved primarily around disturbance and habitat alteration. As indicated above, the previous forest planning effort is a reflection of that, considering and incorporating many Indiana bat habitat requisites across the landscape. Perhaps it is no surprise that populations were shown to be locally stable in the years prior to white-nose syndrome. However, given that white-nose syndrome is now widely recognized as the leading threat to multiple bat species, including the Indiana bat, habitat availability has become marginalized as a non-limiting factor in recovery.

Northern Long-Eared Bat

Background

The northern long-eared bat was listed as threatened in April 2015. Unlike the Indiana bat, which had documented population declines long before discovery of white-nose syndrome, disease-based population declines were the primary factor cited for northern long-eared bat listing.

More information on the northern long-eared bat may be found in the *USFS Region 9 Programmatic Biological Assessment*, developed following the northern long-eared bat listing proposal, or in the FWS Northern Long-eared Bat Final 4(d) Rule.

Range

The known range of the northern long-eared bat (*Myotis septentrionalis*) includes the eastern and north-central United States and much of southern Canada, but the species is most abundant, although relatively rare, in the northern part of this range, and frequently comprises less than 10% of the bat community. Recently, significant declines associated with rapidly spreading white-nose syndrome have occurred and some habitat has been lost, degraded, or fragmented, primarily through the disturbance of their hibernation sites and land development. Mortality caused by wind turbines is expected to increase range-wide, but are not projected in the Wayne.

The northern long-eared bat is not a long distance migrant, but portions of the population appear to move seasonally (NatureServe 2015). Therefore, its historic range was likely associated with the presence of hibernacula (i.e., karst features) and mining features more recently (post-1850). This species also appears to be philopatric, returning to the same summer ranges annually (Johnson et al. 2012; Norquay et al. 2013).

Habitat and Behavior

This bat is generally associated with mature forests composed of trees 100 years old or older. It relies on intact interior forest habitat, with low edge-to-interior ratios. Relevant late-successional forest features include a high percentage of old trees, uneven forest structure (resulting in multilayered vertical structure), single and multiple tree-fall gaps, standing snags, and woody debris. These late-successional forest characteristics may be favored for several reasons, including the large number of partially dead or decaying trees that the species uses for breeding, summer day roosting, and foraging.

However, the northern long-eared bat shows some diversity in habitat and roost selection. Beyond mature forested habitats, suitable summer habitat may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures, as well as managed, younger forests.

Hibernation occurs in caves, mines, and tunnels from late fall through early spring (Griffin 1940; Mumford and Cope 1964). There were once northern long-eared bats detected in the single known mine hibernaculum in the Wayne National Forest, until the arrival of white-nose syndrome.

Hibernators frequently roost in crevices, drill holes, and similar sites (Griffin 1940; Pearson 1962), but roosting in the open is not uncommon. Hibernation sites vary considerably among areas, depending upon their quality and availability. The principal requirements of a suitable hibernation site are winter-long, low temperatures above freezing, high humidity, and lack of disturbances such as natural floods and anthropogenic visitation (Hitchcock 1949; Barbour and Davis 1969). There appears to be a high degree of philopatry¹ in regard to over-wintering sites, returning to the same hibernation sites year after year.

Maternity roosts are warm sites that maximize the growth rate of young while providing protection from predation and the weather. Cool summer temperatures can slow juvenile growth,

¹ Philopatry is the tendency of an organism to stay in or habitually return to a particular area.

thereby reducing the fat accumulation period prior to hibernation, and ultimately increasing the risk of overwintering mortality in juveniles (McNab 1982). Small, highly fragmented, or young forests that provide limited areas of subcanopy foraging habitat may not be suitable for maternity roosts. Young forests may also lack appropriate nursery sites. A lack of suitable hibernation sites may prevent occupancy of areas that otherwise have adequate habitat (Kurta 1982).

Multiple roost trees have been detected in the Wayne National Forest. The majority of these trees fall within the oak group (*Quercus* spp.), but determining a local trend is difficult, given demonstrated tree species use and size. Roosting site characteristics and tree species vary by geographic location, from upland to lowland, but typically correspond with larger tree availability and general abundance of snags in the proximal roost area.

Trend Since Listing

Population declines for the northern long-eared bat are effectively documented in the trend data shown for Indiana bat. Because of the lack of conservation status that this species held prior to white-nose syndrome, information about the species was collected more incidentally, rather than deliberately. It may be considered relatively understudied, lacking the same body of knowledge that accompanied the Indiana bat and other listed bat species.

According to occupancy data developed during the northern long-eared bat listing proposal, before white-nose syndrome, at least one individual was likely to be caught during any summer mist net night on the Wayne, basically a 1:1 ratio. Following white-nose syndrome (through 2014 only), the odds of catching a northern long-eared bat dropped by ~75%; only one individual could be expected with every four mist net nights.

Prior to white-nose syndrome, northern long-eared bats were considered the most commonly captured species across the region, making up of 31% of all captures. At an overall abundance of 18% in 2014, they were absent from the Athens Unit and captured in the Ironton Ranger District at a rate far below normal. However, they still made up a significant proportion of the bats captured in the Marietta Unit in 2014, although at a lower rate than in 2004 (table 5).

Data corresponding with roost tree identification and mist net siting suggest a less refined use of habitat by the northern long-eared bat versus the Indiana bat. Over the past 13 years, the Wayne National Forest has provided a wide range of habitat opportunities, with no known rebound in this species population since white-nose syndrome, locally or regionally. However, the previous and future goals of national forest management will strive to maintain diversity across the landscape. To that extent, the Wayne National Forest has and will seek better outcomes for forest health and resilience, and in a larger sense, ecological integrity, which should encourage species recovery.

Terrestrial Invertebrates

American Burying Beetle

Background

The American burying beetle was designated as a federal endangered species in July 1989.

Range

The American burying beetle has shown a dramatic decline in population, both nationally and statewide. Historically, the beetle was once known to occur in thirty-five eastern and Midwestern states, the District of Columbia, and southern Canada. It appears that the decline of this beetle started to take place in 1910 and continued westward. By the 1980's only small populations in three states in the Midwest and one a small island in Rhode Island were known to occur.

Habitat and Behavior

American burying beetle are habitat generalists. Carrion availability (appropriate in size as well as numbers) may possibly be the more important factor of where beetles occur than the type of vegetation or soil structure. The specific habitat requirements of this species are not fully understood and it appears that the availability of carrion may be the limiting factor. This species is a habitat generalist and has been observed in grassland prairie, scrubland, and forest edges (DOI 2019).

The American burying beetle is a carrion beetle that is nocturnal and active from April to late September when temperatures are above 60° F. During summer, adult beetles bury an animal carcass, the size of a dove or chipmunk, in the ground. In June or July, they lay their eggs on the carcass, which is used as a source of food for the American burying beetle larvae. American burying beetles are univoltine, which means they generally only raise one brood per year. Adult beetles burrow into the soil to overwinter.

Trend Since 2006

Since the 1989 listing of this species, the Ohio Department of Natural Resources, Division of Wildlife and Ohio State University initiated a reintroduction program in Ohio in July 1998 with the goal of re-establishing a self-sustaining viable population of the American burying beetle within Ohio. The Wayne National Forest was identified in the *Ohio Conservation Plan* as a potential release site. The Wayne National Forest agreed to work cooperatively on this effort, and in June 2008 a 5-year reintroduction project began in the Athens Unit. In 2012, the last release of the species was conducted on National Forest System land.

Post-listing and prior to the reintroduction effort, American burying beetle surveys were conducted in the Wayne National Forest with negative results of species presence. Throughout the years since the reintroduction effort began in the Wayne National Forest and after 2012, multiple post-release surveys were conducted by interested parties, including the Forest Service, FWS, and Ohio State University to determine efficacy of releases. Overall, surveys documented successful rearing of offspring during the release year but did not provide any indication of over winter survival. Because of American burying beetle dispersal potential from release sites and

proximal recovery habitat potential, the Wayne National Forest has maintained a role in determining whether or not species occupancy is occurring within a designated area, as determined by the FWS.

Releases are continuing within the vicinity of the Wayne National Forest, now using what are thought to be heartier adults that originate from the Great Plains region of the United States, in the hopes that their overwintering mechanisms provide the needed propagation advantage here in Ohio.

Freshwater Mussels

In a letter dated 4/12/2012, following the listing of several mussel species shown below, the FWS Ecological Services Columbus Field Office agreed with determinations made in an analysis by the Wayne National Forest that no impacts are anticipated to currently listed mussel species with implementation of projects under the 2006 Wayne Forest Plan.

It is worth noting that National Forest System lands in Ohio occur adjacent to only one known location for any of the five listed freshwater mussel species. This location happens to occur within the Ohio River. Fragmented, cumulative National Forest System lands (within the Marietta Unit of the Wayne) immediately adjacent to the Ohio River total approximately three river miles, or 0.0067% of the total mileage that the river runs along Ohio's border (451 miles).

Unless otherwise noted, mussel species information is sourced from the FWS Midwest Region's website (2019), which contains fact sheets and recovery updates on all listed species relevant to the Wayne. Additional information was obtained in collaboration with the Columbus Field Office.

Snuffbox

Background

The snuffbox was listed as federally endangered in February 2012.

Range

Though the snuffbox occurs outside the Ohio River System, this system is most relevant to the Wayne and arguably to the species as whole, given the number of occurrences compared to other systems.

The Ohio River System once represented the largest block of available habitat for this species prior to the initiation of the navigational improvements in 1830 (Butler 2007). Nearly the entire Ohio River mainstem is now impounded with a series of locks and dams (Butler 2007). Sizable populations historically occurred in at least a dozen streams in the system (DOI 2018b).

Habitat and Behavior

There is no new information available on habitat or ecosystem conditions since the publication of the final listing rule in 2012.

The snuffbox is found in small- to medium-sized creeks to larger rivers, and in lakes (Cummings and Mayer 1992; Parmalee and Bogan 1998). The species occurs in swift currents of riffles and shoals and wave-washed shores of lakes over gravel and sand with occasional cobble and boulders. Individuals generally burrow deep into the substrate, except when spawning or attempting to attract a host (Parmalee and Bogan 1998).

The biology of the snuffbox is similar to other bivalved mollusks belonging to the family Unionidae. They are sexually dimorphic though the age of sexual maturity is unknown. The verified snuffbox host fish are the logperch (*Percina caprodes*), blackside darter (*P. maculata*), rainbow darter, Iowa darter (*E. exile*), blackspotted topminnow (*Fundulus olivaceus*), mottled sculpin, banded sculpin (*C. carolinae*), Ozark sculpin (*C. hypselurus*), largemouth bass (*Micropterus salmoides*), and brook stickleback (*Culaea inconstans*) (DOI 2018b).

Trend Since Listing

The Snuffbox was listed by the FWS with a high degree of threat and a low recovery potential. According to the FWS 5-Year Review, no new information on the biology and behavior of the species has been developed since listing (DOI 2018b). With exception of a single confirmation within the Muskingum River in ~2014, no other known confirmations within proximity of the Wayne National Forest have been made since listing or since 2006.

Rayed Bean

Background

Along with the snuffbox, the rayed bean was listed in February 2012.

Range

The rayed bean was historically found across a wide expanse that included parts of the Midwest and Eastern United States, north to Ontario, Canada. Once found in at least 115 streams, canals, and lakes, the rayed bean now occurs in only 31 streams and one lake; a 73 percent reduction in the number of occupied streams and lakes. The species has been extirpated from Illinois, Kentucky, and Virginia, but is still found in Indiana, Michigan, New York, Ohio, Pennsylvania, and Ontario, Canada. After extirpation from Tennessee and West Virginia, reintroductions have restored the rayed bean to these states.

Locally, the rayed bean is known only to occur within Scioto Brush Creek, whose watershed occurs west of National Forest System lands. The creek generally runs north-south on the west side of Scioto County. National Forest System lands occur on the eastern edge of Scioto County.

Habitat and Behavior

The rayed bean generally lives in smaller, headwater creeks, but it is sometimes found in large rivers and wave-washed areas of glacial lakes. It prefers gravel or sand substrates, and is often found in and around roots of aquatic vegetation. Adults spend their entire lives partially or completely buried in substrate, filtering water through their gills to remove algae, bacteria, detritus, microscopic animals, and dissolved organic material for food.

The life cycle of the rayed bean, like most freshwater mussels, is unusual and complex. Males release sperm into the water column that is then siphoned by females to fertilize their eggs. Fertilized eggs develop into microscopic larvae, called glochidia, within special gill chambers. Females expel mature glochidia, which then must attach to the gills or fins of specific host fish species to complete development into juvenile mussels. After attaching to host fish, glochidia mature within a few weeks. Juvenile mussels then drop off and continue to grow, if they fall onto appropriate substrate. Using fish as a host species allows the rayed bean to move upstream and populate habitats it could not otherwise reach.

Trend Since Listing

No trend data since listing were discovered for this species.

Sheepnose

Background

After continued absence was noted across its historic range, the sheepnose was listed in April 2012.

Range

The sheepnose is found across the Midwest and Southeast. However, it has been eliminated from two-thirds of the streams from which it was known historically; 25 streams are currently occupied compared to 76 in the past.

Additionally, the sheepnose was eliminated from hundreds of miles of rivers in the Illinois, Cumberland, Mississippi and Tennessee River basins. The sheepnose is now found in Alabama, Illinois, Indiana, Iowa, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and Wisconsin.

In the vicinity of the Wayne National Forest, the sheepnose has been confirmed in the Ohio River and Muskingum River, adjacent to both Washington and Gallia Counties. However, it has no known confirmations in rivers or streams within the Wayne National Forest.

Habitat and Behavior

Where present, sheepnose mussels live in larger rivers and streams where they are usually found in shallow areas with moderate to swift currents that flow over coarse sand and gravel. However, they have also been found in areas of mud, cobble, and boulders, and in large rivers they may be found in deep runs.

The life cycle of the sheepnose is complex and includes a stage parasitic on fish. Males release sperm into the river current. As females siphon water for food and respiration, they also siphon sperm that fertilizes their eggs. Within special gill chambers, fertilized eggs develop into microscopic larvae called glochidia. After they mature, female mussels expel the glochidia, which must then attach to the gills or fins of a specific species of fish to continue developing into a juvenile mussel.

Sheepnose glochidia are expelled in jellylike masses of mucus that are attractive to fish. These masses of mucus are called conglutinates. Sheepnose conglutinates are narrow, red or pink, and discharged in an unbroken line, similar in appearance to small worms. When a fish eats a conglutinate, glochidia are exposed to and attach to the fish's gills.

The only confirmed wild host for sheepnose glochidia is the sauger (*Stizostedion canadense*), although laboratory studies have successfully transformed sheepnose glochidia on fathead minnow (*Pimephales promelas*), creek chub (*Semotilus atromaculatus*), central stoneroller (*Camptostoma anomalum*) and brook stickleback (*Culaea inconstans*).

If glochidia successfully attach to a host fish, they mature into juvenile mussels within a few weeks, then drop off. If they land on suitable habitat, glochidia grow and mature into adult mussels. Using fish as hosts allows the sheepnose to move upstream and populate habitats it could not otherwise reach.

As a group, mussels are long-lived, with individuals living up to several decades and sometimes up to 100 to 200 years. Sheepnose are reported to live as long as 30 years.

Trend Since 2006

Sheepnose were confirmed in the vicinity of the Wayne National Forest as recently as 2008 and 2014. These confirmations occurred in the Ohio River, adjacent to Washington County, within the same mileage ranges where National Forest System lands do occur. National Forest System lands cumulatively accounts for roughly three miles of river frontage between Ohio River mile 138 south to mile 165.

Fanshell

Background

The fanshell was listed in June 1990.

Range

This freshwater mussel historically occurred in the Ohio River and many of its large tributaries in Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Kentucky, Tennessee, Alabama, and Virginia. At the time of listing, the fanshell was believed to be reproducing in only three rivers—the Green and Licking Rivers in Kentucky, and the Clinch River in Tennessee and Virginia. Additionally, small, apparently non-reproducing populations (based on the collection of a few old specimens in the 1980s) may still persist in the Muskingum River, Ohio.

Habitat and Behavior

This mussel is found in medium to large rivers. It buries itself in sand or gravel in deep water of moderate current, with only the edge of its shell and its feeding siphons exposed.

Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. When the male discharges sperm into the current, females downstream siphon in the sperm in order to fertilize their eggs, which they store in their gill pouches until the larvae hatch. The females then expel the clustered larvae, which resemble

spiral worms attractive to its fish host. When the fish attack, the larvae attach themselves to the fish's gills. They then grow into juveniles with shells of their own. At that point they detach from the host fish and settle into the streambed, ready for a long (possibly up to 50 years) life as an adult mussel.

Trend since 2006

No trend data was found on the status of the fanshell, but corollary evidence from Indiana suggests that any significant droughts that may have locally occurred over the years could have detrimentally impacted any existing, local populations.

Pink Mucket Pearly Mussel

Background

This species was listed on June 14, 1976.

Range

Despite its wide range in historical times, the pink mucket has apparently always been an uncommon species. A contributing factor to the pink mucket's rarity is the fact that its inhabited range is a fraction of its historic range, having lost several thousand miles of large river habitat to habitat degradation and impoundments. Considering this range loss, it is likely the current total population size of the pink mucket represents a small proportion of its historical numbers.

Habitat and Behavior

This mussel is found in mud and sand and in shallow riffles and shoals swept free of silt in major rivers and tributaries. This mussel buries itself in sand or gravel, with only the edge of its shell and its feeding siphons exposed.

Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. When the male discharges sperm into the current, females downstream siphon in the sperm in order to fertilize their eggs, which they store in their gill pouches until the larvae hatch. The females then expel the larvae. Those that manage to find a fish host to clamp onto by means of clasping valves, grow into juveniles with shells of their own. At that point they detach from the host fish and settle into the streambed, ready for a long (possibly up to 50 years) life as an adult mussel.

Trend since 2006

Relevant to the Wayne National Forest, the Muskingum River and Ohio River have historically held this species. However, no trend data were discovered since the last forest plan revision process.

Conclusion

The Wayne National Forest has a vested professional and legal commitment to consider and further recovery actions for federally listed species, in conjunction with determinations made in consultation with the FWS. Over the last 13 years, dedicated biologists and others have ensured

that the agreements made between both agencies have been implemented to meet their intended purpose. At times, this has involved back and forth conversations to further clarify how to suitably match up species ecological needs with operational constraints or influence.

Ecological conditions that positively influence recovery habitat are complex to say the least, but activities associated with existing forest management actions are developed with underlying guidance on how the actions maintain or improve conditions for listed species. Due to implementation of best management practices and some of the 2006 Wayne Forest Plan standards and guidelines, diverse and productive systems can be encouraged. Commensurate habitat objectives that promote diversity are one way to buffer ecosystems and species from changes such as climate fluctuations and other drivers and stressors.

Existing inputs and their impacts on species are incredibly difficult to predict into the future. Climate change threats to listed species' habitats may be the most complex and unpredictable in time and space. Climate influences on species' primary constituent elements—the critical needs for species proliferation—are variable, depending on species needs. Comprehensively covering these influences is outside the scope of this document. Certain generalities could be made regarding projected habitat impacts, but properly addressing species impacts would largely be conjecture, and would involve developing new information, which is counter to formal direction for the assessment phase. More appropriately, and consistent with that direction, it would be more productive to track trend data moving forward, to see if patterns emerge that further elucidate the role of climate change with respect to local species impacts.

Trend data are enlightening, and should continually serve to inform the Wayne National Forest on species management considerations for the future. Conversely, a scarcity of data may indicate a future monitoring need. The Forest Service is interested in logical courses of action that can be well-supported by data and implemented to promote species recovery. This further shapes an understanding of the role National Forest System lands play locally, using what is known to amplify landscape conservation and species objectives while meeting multiple use mandates. Ideally, future measures associated with recovery can be identified at the coarse and fine scales that simultaneously promote long term ecological health and species recovery.

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Plant Species of Conservation Concern

Introduction

The Regional Forester is the responsible official for identifying any species of conservation concern in a plan area. Identifying species of conservation concern usually occurs during the plan development phase, but may occur at any time.

This section covers the lichens, non-vascular plants, and vascular plants portion of identifying species of conservation concern for the revision of the 2006 Wayne Forest Plan. The Land Management Planning Handbook (FSH 1909.12 chapter 20) defines species of conservation concern as follows: “A species of conservation of concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species’ capability to persist over the long-term in the plan area.”

The Land Management Planning Handbook, referred to as handbook, guided the creation of the list of potential species of conservation concern. This section describes the process and rationale to determine the plants and lichens for species of conservation concern status in the Wayne National Forest.

Methods

There are over 600 species listed in Ohio’s 2018 to 2019 rare plant list (ODNAP 2018). Species status is determined by the number of populations or occurrences that have been observed within the last 20 years. Data to determine status comes from the Ohio Natural Heritage database which is managed by the Ohio Department of Natural Resources Division of Wildlife, and the Division of Natural Areas and Preserves. The initial list of species to be considered for species of conservation concern was developed from the merging of three lists: NatureServe’s Ohio global rare plant list, Ohio’s 2018 to 2019 rare native plants list, and Wayne National Forest’s Regional Forester sensitive species list.

This combining of lists was executed to ensure all rare plants and lichens were initially evaluated for the species of conservation concern list which is more than what is specified in the handbook. The rationale of this decision was to make sure all rare species reported for Ohio were reviewed. For example, *Juglans cinerea* (butternut) is on the Regional Forester sensitive species list, but it is not on the Ohio rare plant list or considered globally rare. Also, NatureServe lists several globally rare *Crataegus* (hawthorns) that are not included in the current Ohio rare plant list (NatureServe 2018). Some of these species have questionable taxonomy and their distribution remains unclear in Ohio (Phipps 2014, B. Riley pers. comm. 2018). See table 6 for the list of globally rare vascular plant taxa attributed to Ohio but are not known to occur in the Wayne National Forest planning area. The planning area is defined as the National Forest System lands within the proclamation boundary.

Table 6. A list of vascular plants globally listed by NatureServe that are found in Ohio, but have not been recorded in or near the Wayne National Forest planning area

Species	Global Status	Comments
<i>Berberis canadensis</i>	G3G4	No known specimens for Ohio
<i>Chaerophyllum procumbens</i> var. <i>shortii</i>	G5T3T4Q	Too common to list in Ohio
<i>Crataegus ater</i>	G2G4Q	Questionable taxon; no known specimens for Ohio.
<i>Crataegus beata</i>	G2G4	No known specimens for Ohio
<i>Crataegus fluviatilis</i>	G3G4Q	Questionable taxon; no known specimens for Ohio
<i>Crataegus formosa</i>	G2G3	No known specimens for Ohio
<i>Crataegus suborbiculata</i>	G3?	Confirmed specimens from NE Ohio; Wayne NF is outside its range
<i>Lycopodiella margueritiae</i>	G1G2	Questionable taxon and no specimens for Ohio (J. Larson pers. com. 2019)
<i>Poa paludigena</i>	G3	Too common to list in Ohio; northern distribution in Ohio; closest known site is a historical site in Ross County
<i>Polemonium reptans</i> var. <i>villosum</i>	G5T3T4	Too common to list in Ohio; not tracked in Ohio
<i>Robinia hispida</i> var. <i>fertillis</i>	G4T1Q	No known specimens for Ohio; questionable taxon
<i>Rubus prestonensis</i>	G3	No known specimens for Ohio; questionable taxon.
<i>Rudbeckia fulgida</i> var. <i>deamii</i>	G5T1T3	Questionable taxon; this taxon has been included under <i>R. fulgida</i> or <i>R. umbrosa</i> . Not tracked in Ohio; status in Ohio unclear
<i>Silphium terebinthinaceum</i> var. <i>luciae-brauniae</i>	G4G5T3?Q	Questionable taxon; not tracked in Ohio.

After creating the initial list, experts were consulted on select groups and individual species for their expert opinion on current status, threats, and possible presence in the Wayne National Forest. For lichens, lichenologist Ray Showman—who has been studying Ohio’s lichens for about forty years—was consulted on the status of globally ranked lichens that are currently not on Ohio’s rare plant list. One globally rare crustose lichen, *Fellhanera hybrida*, is listed from Ohio based on a specimen from Shawnee State Forest in Scioto County as reported by Harris and Lendemer (2009). The distribution and abundance of crustose lichens are very poorly known and is unclear if it would occur in the Wayne (Showman pers. comm. 2018).

There were a number of globally rare mosses listed for Ohio by NatureServe (table 7). Bryologist Dr. Barb Andreas—who has been studying Ohio mosses for about forty years—was consulted on the status of these mosses and their potential of being present in the Wayne.

Table 7. Globally rare bryophytes listed for Ohio by NatureServe that have not been recorded in or near the Wayne National Forest planning area

Species	Global Status	Comments*
<i>Anthoceros scariosus</i>	G2G4	No confirmed specimens.
<i>Brothera leana</i>	G3G4	According to the Consortium, it is found in Delaware, Franklin, Hamilton, Hocking, Jackson, Lawrence, Miami, and Pike Counties. Most of the records are modern. Is expected in the Wayne.
<i>Discelium nudum</i>	G3G4	<i>Discelium nudum</i> is an annual that grows from persistent protonema. It is only obvious when there is a capsule present. It is considered rare, mostly because you have to be in the right place at the right time. May be found in the Wayne.
<i>Fissidens exilis</i>	G3G4	According to the Consortium, <i>Fissidens exilis</i> is known from Butler, Cuyahoga, Delaware, Franklin, Hamilton, Hocking, Jackson, Lorain, Portage, and Richland Counties. Plants arise from a persistent protonema, and it is easily overlooked. Is expected on the Wayne.
<i>Frullania selwyniana</i>	G2G3	There are no records of this liverwort in the Consortium. No confirmed specimens.
<i>Lejeunea ruthii</i>	G3G4	According to the Consortium, it is known from Hocking and Jackson Counties. The Hocking County collections are from "hollows." May occur in deep, shaded ravines in the Wayne.
<i>Mannia triandra</i>	G3G4	According to the Consortium, <i>Mannia triandra</i> is known from Adams, Clark, Franklin, Highland, and Mahoning Counties. Most of these records are pre 1900. It occurs in at least 17 states, mostly east of the Mississippi River. It is a known calciphile.
<i>Pedinophyllum interruptum</i>	G3G4	According to the Consortium, it is known from Adams, Champaign, Cuyahoga (dubious), and Franklin Counties. Most Ohio collections are before 1900.
<i>Philonotis longiseta</i>	G3G4	In Ohio, it has been found on wet sandy soil in Conkle's Hollow SNP (Hocking Co), and wet sandstone in Lake Katharine SNP (Jackson Co). This species appears to be rare throughout its range. Expect it in deep, shaded ravines in the Wayne.
<i>Physcomitrium hookeri</i>	G2G4	According to the Consortium, it is known in Ohio from an 1877 collection from Franklin County. Like most members of the genus <i>Physcomitrium</i> , it prefers disturbed habitats. May be found in the Wayne.
<i>Weissia phascopsis</i>	G3G4	According to the Consortium, there are no Ohio records. No known specimens.

*Comments are adapted from Dr. Andreas, pers. comm. 2018.

Potential Species of Conservation Concern

The species in table 8 were candidates for consideration as potential species of conservation concern. By group there were 7 fungi, 3 non-vascular plants, and 68 vascular plants considered.

Table 8. Candidate species for potential plant species of conservation concern

Scientific Name	Common Name	Group	Habit
<i>Canoparmelia caroliniana</i>	Carolina canoparmelia lichen	Fungi	Lichen
<i>Canoparmelia texana</i>	Texas canoparmelia lichen	Fungi	Lichen
<i>Dibaeis absoluta</i>	pink dot lichen	Fungi	Lichen
<i>Hypotrachyna showmanii</i>	Showman's hypotrachyna lichen	Fungi	Lichen
<i>Ramalina farinacea</i>	farinose cartilage lichen	Fungi	Lichen
<i>Ramalina intermedia</i>	intermediate cartilage lichen	Fungi	Lichen
<i>Ramalina pollinaria</i>	cartilage lichen	Fungi	Lichen
<i>Campylostelium saxicola</i>	campylostelium moss	Non-Vascular Plant	Moss
<i>Dichelyma capillaceum</i>	dichelyma moss	Non-Vascular Plant	Moss
<i>Loeskeobryum brevirostre</i>	loeskeobryum moss	Non-Vascular Plant	Moss
<i>Acalypha deamii</i>	Deam's threeseed mercury	Vascular Plant	Forb/herb
<i>Ageratina aromatica</i>	lesser snakeroot	Vascular Plant	Forb/herb
<i>Andropogon glomeratus</i>	bushy bluestem	Vascular Plant	Graminoid
<i>Asclepias amplexicaulis</i>	clasping milkweed	Vascular Plant	Forb/herb
<i>Asclepias variegata</i>	redring milkweed	Vascular Plant	Forb/herb
<i>Aureolaria pedicularia</i> var. <i>pedicularia</i>	fernleaf yellow false foxglove	Vascular Plant	Forb/herb
<i>Botrychium biternatum</i>	sparselobe grapefern	Vascular Plant	Forb/herb
<i>Calamagrostis porteri</i> ssp. <i>insperata</i>	Porter's reedgrass	Vascular Plant	Graminoid
<i>Cardamine dissecta</i>	forkleaf toothwort	Vascular Plant	Forb/herb
<i>Carex complanata</i>	hirsute sedge	Vascular Plant	Graminoid
<i>Carex crinita</i> var. <i>brevicrinis</i>	fringed sedge	Vascular Plant	Graminoid
<i>Carex gigantea</i>	giant sedge	Vascular Plant	Graminoid
<i>Carex juniperorum</i>	juniper sedge	Vascular Plant	Graminoid
<i>Carex louisianica</i>	Louisiana sedge	Vascular Plant	Graminoid
<i>Carex reznicekii</i>	Reznicek's sedge	Vascular Plant	Graminoid
<i>Carex striatula</i>	lined sedge	Vascular Plant	Graminoid
<i>Chimaphila umbellata</i>	pipsissewa	Vascular Plant	Subshrub
<i>Chionanthus virginicus</i>	white fringetree	Vascular Plant	Tree, Shrub
<i>Cirsium carolinianum</i>	soft thistle	Vascular Plant	Forb/herb
<i>Clitoria mariana</i>	Atlantic pigeonwings	Vascular Plant	Vine, Forb/herb
<i>Corallorhiza wisteriana</i>	spring coralroot	Vascular Plant	Forb/herb
<i>Crataegus uniflora</i>	dwarf hawthorn	Vascular Plant	Tree, Shrub
<i>Cuscuta cuspidata</i>	cuspid dodder	Vascular Plant	Forb/herb, Vine
<i>Cystopteris tennesseensis</i>	Tennessee bladderfern	Vascular Plant	Forb/herb
<i>Dichanthelium villosissimum</i>	whitehair rosette grass	Vascular Plant	Graminoid
<i>Dichanthelium yadkinense</i>	cypress panicgrass	Vascular Plant	Graminoid

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Scientific Name	Common Name	Group	Habit
<i>Eryngium yuccifolium</i>	button eryngo	Vascular Plant	Forb/herb
<i>Eupatorium godfreyanum</i>	Godfrey's thoroughwort	Vascular Plant	Forb/herb
<i>Eupatorium incamatum</i>	pink thoroughwort	Vascular Plant	Forb/herb
<i>Gentiana alba</i>	plain gentian	Vascular Plant	Forb/herb
<i>Gentiana villosa</i>	striped gentian	Vascular Plant	Forb/herb
<i>Gratiola virginiana</i>	roundfruit hedgehyssop	Vascular Plant	Forb/herb
<i>Gratiola viscidula</i>	Short's hedgehyssop	Vascular Plant	Forb/herb
<i>Heuchera parviflora</i>	littleflower alumroot	Vascular Plant	Forb/herb
<i>Hexalectris spicata</i> var. <i>spicata</i>	spiked crested coralroot	Vascular Plant	Forb/herb
<i>Hydrastis canadensis</i>	goldenseal	Vascular Plant	Forb/herb
<i>Iris verna</i>	dwarf violet iris	Vascular Plant	Forb/herb
<i>Isoetes engelmannii</i>	Appalachian quillwort	Vascular Plant	Graminoid
<i>Juglans cinerea</i>	butternut	Vascular Plant	Tree
<i>Lathyrus venosus</i>	veiny pea	Vascular Plant	Vine, Forb/herb
<i>Liatris cylindracea</i>	Ontario blazing star	Vascular Plant	Forb/herb
<i>Ligusticum canadense</i>	Canadian licorice-root	Vascular Plant	Forb/herb
<i>Magnolia tripetala</i>	umbrella-tree	Vascular Plant	Tree
<i>Malaxis unifolia</i>	green adder's-mouth orchid	Vascular Plant	Forb/herb
<i>Opuntia cespitosa</i>	eastern pricklypear cactus	Vascular Plant	Forb/herb
<i>Packera paupercula</i>	balsam groundsel	Vascular Plant	Forb/herb
<i>Panax quinquefolius</i>	American ginseng	Vascular Plant	Forb/herb
<i>Passiflora incarnata</i>	purple passionflower	Vascular Plant	Vine, Forb/herb
<i>Penstemon pallidus</i>	pale beardtongue	Vascular Plant	Forb/herb
<i>Phacelia covillei</i>	Coville's phacelia	Vascular Plant	Forb/herb
<i>Phaseolus polystachios</i>	thicket bean	Vascular Plant	Vine, Forb/herb
<i>Piptochaetium avenaceum</i>	blackseed speargrass	Vascular Plant	Graminoid
<i>Platanthera ciliaris</i>	yellow fringed orchid	Vascular Plant	Forb/herb
<i>Pleopeltis polypodioides</i>	resurrection fern	Vascular Plant	Forb/herb, Vine
<i>Polygala incarnata</i>	procession flower	Vascular Plant	Forb/herb
<i>Quercus falcata</i>	southern red oak	Vascular Plant	Tree
<i>Rhododendron periclymenoides</i>	pink azalea	Vascular Plant	Shrub
<i>Saccharum alopecuroidum</i>	silver plumegrass	Vascular Plant	Graminoid
<i>Scleria pauciflora</i>	fewflower nutrush	Vascular Plant	Graminoid
<i>Scleria triglomerata</i>	whip nutrush	Vascular Plant	Graminoid
<i>Scutellaria saxatilis</i>	smooth rock skullcap	Vascular Plant	Forb/herb
<i>Solidago odora</i>	anisescented goldenrod	Vascular Plant	Forb/herb
<i>Stenanthium gramineum</i>	eastern featherbells	Vascular Plant	Forb/herb
<i>Symphyotrichum oblongifolium</i>	aromatic aster	Vascular Plant	Forb/herb
<i>Triadenum tubulosum</i>	lesser marsh St. Johnswort	Vascular Plant	Forb/herb
<i>Triadenum walteri</i>	greater marsh St. Johnswort	Vascular Plant	Forb/herb
<i>Verbesina occidentalis</i>	yellow crownbeard	Vascular Plant	Forb/herb
<i>Viola lanceolata</i>	bog white violet	Vascular Plant	Forb/herb

Of the species on the combined lists, the Wayne planning area currently has 70 documented species of which most have been observed within the last 20 years (see table 9 in appendix A). Chapter 10 of the Land Management Planning Handbook (FSH 1909.12) was used to guide determining species of conservation concern. Ohio Natural Heritage Database, expert opinion, and literature were used for determining species for further consideration. Wayne National Forest botanist Trey Scott was consulted during the coarse- and fine-filter stages of developing the candidate species of conservation concern list. Mr. Scott provided valuable information on the most current conditions of known populations on the Wayne. Element occurrence ranks in the Ohio Natural Heritage Database were used to aid in determining long-term viability of populations across a species range in Ohio. Element occurrence rank considers population condition, abundance, and landscape context. Factors that were used in considering a species for listing include: ecological processes, ecological condition (habitat), human disturbances, genetic diversity, level of conservatism, state rank, poaching, herbivory, disease, invasive species, and climate change. Of these factors, climate change was the most difficult to measure for individual species due to limited published literature. Climate models have been developed for tree species and these predictions were generalized to cover potential species of conservation concern. Current climate models predict increases in oaks, hickories, pines (except white pine), and other species adapted to warmer, drier conditions. This trend would benefit 32 (~46%) potential species of conservation concern species recorded in the Wayne. An example of one of these species is *Aureolaria pedicularia* var. *pedicularia* (woodland fern leaf false foxglove), which parasitizes on oaks. Species that would likely decrease include species of mesic habitats such as *Scutellaria saxatilis* (rock skullcap) and *Panax quinquefolius* (American ginseng).

For a majority of the species evaluated for the species of conservation concern list, data gaps occurred in genetic diversity, population demographics, ecological processes, and climate change. To look at population and distribution trends, the Ohio Natural Heritage Database provided the best information for state listed plants in the Wayne National Forest and across the state. In most cases, only populations of endangered and threatened species had regular site visits to evaluate population trends. *Hydrastis canadensis* and *Panax quinquefolius* are two globally rare species that are frequent enough in Ohio (S4S5 and S4 respectively) that neither one is tracked by the Ohio Department of Natural Resources. Their status is based on limited monitoring data from federal and state agencies, and expert opinion from field botanists.

Additional rare plant inventory work is needed across the Wayne National Forest. The Ironton Ranger District has the highest diversity of habitats number of state and regional rare plants and should be the focus of future rare plant inventory work.

Next Steps

The initial recommendations for plant species of conservation concern will be assessed during the forest plan revision process. Based on the review of the potential species of conservation concern, the Regional Forester will identify the species of conservation concern in coordination with the Responsible Official for the plan area. The expertise of the public and local, State, Tribal, and other Federal natural resource agencies, will continue to be considered for identifying species of conservation concern. Engaging the public and inviting public input when identifying species of conservation concern is part of the public participation strategy (FSH 1909.12, ch. 40,

sec. 42). Note that this is not a static list—at any time new information can be evaluated on species of conservation concern and whether to add or remove a species from the list.

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Appendix A. Initial Recommendations of Potential Plant Species of Conservation Concern

The Wayne National Forest and Eastern Region initial recommendations for inclusion and against including as species of conservation concern are indicated. The following species have been identified as potential plant species of conservation concern (see table 9). Reviewers: Richard L. Gardner, Ohio Department of Natural Resources Botanist; Gerald Scott, Wayne National Forest Botanist; and Jeffery Rebitzke, Eastern Region Regional Botanist

Table 9. Candidate species as potential plant species of conservation concern and initial recommendation

Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
Canoparmelia caroliniana	Carolina canoparmelia lichen	CACA68	Fungi	Lichen	G3S1	E	RFSS	3	1	33%	2006	NatureServe rank is G3S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Showman and Flenniken 2004.	Bark of trees in large forested floodplains.	Yes.	No serious threats.	INCLUDE: Ohio is the edge of its range; most common in southeastern states.	INCLUDE
Canoparmelia texana	Texas canoparmelia lichen	CATE22	Fungi	Lichen	G3S2	NR	N/A	14	2	14%	2009	NatureServe rank is G3S2.	Ohio Natural Heritage Database; Showman and Flenniken 2004; Showman, R. personal communication, October 2018.	Bark of chestnut oaks in dry-mesic oak forests.	Yes.	No serious threats.	Do NOT Include: According to lichenologist Ray Showman this species is not uncommon in southern Ohio and suitable habitat is not rare (R. Showman pers. comm. 2018).	Do NOT Include
Dibaeis absoluta	pink dot lichen	DIAB2	Fungi	Lichen	G4S2	T	N/A	7	2	29%	2009	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources; Showman and Flenniken 2004.	Moist sandstone rocks/cliffs in mixed mesophytic forests.	Yes.	No serious threats.	INCLUDE: Lichen has very specific habitat	INCLUDE
Hypotrachyna showmanii	Showman's hypotrachyna lichen	HYSH	Fungi	Lichen	G3G4	NR	N/A	Unknown	1	Unknown	N/A	NatureServe rank is G3G4.	Showman and Flenniken 2004; R. Showman Pers. Comm. 10/2018	Often on chestnut oak in dry-mesic oak forests.	Yes.	No serious threats.	Do NOT Include: According to Showman this species is not uncommon in southern Ohio and is under reported in the literature. Recorded in at least 9 counties in south-central Ohio (Showman and Flenniken 2004).	Do NOT Include
Ramalina farinacea	farinose cartilage lichen	RAFA60	Fungi	Lichen	G5S1	E	N/A	2	1	50%	2008	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources; Showman and Flenniken 2004.	Bark of trees in large forested floodplains.	Yes.	No serious threats.	INCLUDE: Ohio is the edge of its range; most common in northeastern states.	INCLUDE
Ramalina intermedia	intermediate cartilage lichen	RAIN3	Fungi	Lichen	G5S1	E	N/A	6	0	N/A	N/A	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources; Showman and Flenniken 2004.	Dry sandstone cliffs in dry oak-pine forests.	No.	No serious threats.	INCLUDE: The population is within about 100 meters of the WNF. It likely occurs within the boundaries of the WNF. Most common in the Hocking Hills Region and recently found in northeast Ohio. Its status will downgrade to threatened in 2020.	INCLUDE: As long as there is consensus we assume the species likely occurs within the plan area, and ignoring the criteria that an occurrence must be within the plan area.

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Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
Ramalina pollinaria	cartilage lichen	RAPO60	Fungi	Lichen	G4S1	E	N/A	10	1	10%	2001	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources; Showman and Flenniken 2004.	Sandstone in dry oak-pine and dry-mesic oak forests.	Yes.	Habitat loss due to succession.	INCLUDE: Lichen has very specific habitat	INCLUDE
Campylostelium saxicola	campylostelium moss	CASA30	Non-Vascular Plant	Moss	G3S2	T	RFSS	6	1	17%	2010	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Moist, sandstone rocks/cliffs with mixed mesophytic and Appalachian northern hardwood systems.	Yes.	Severe changes in canopy caused by non-compatible land use.	INCLUDE: Moss has very specific habitat.	INCLUDE
Dichelyma capillaceum	dichelyma moss	DICA28	Non-Vascular Plant	Moss	G5S1	E	RFSS	3	1	33%	2010	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Base of shrubs in buttonbush swamps in large floodplain systems.	Yes.	Sedimentation from severe flood events.	Do NOT Include: The species has recently been discovered at a number of sites in northeastern Ohio that are not in the ONHD (Jim Bissell pers. comm. 12/2018). The moss is likely overlooked and may be taken off the Ohio rare plant list in 2020. The three sites in the ONHD are from southern Ohio.	Do NOT Include
Loeskeobryum brevirostre	loeskeobryum moss	LOBR7	Non-Vascular Plant	Moss	G5S1	E		1	1	100%	2008	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Moist, sandstone rocks/cliffs in mixed mesophytic and Appalachian northern hardwood systems.	Yes; population size is unknown	Severe changes in canopy caused by HWA and/or non-compatible land use. Population size is unknown for current occurrence.	INCLUDE: WNF is the periphery of its range. The moss is very habitat conservative.	INCLUDE
Acalypha deamii	Deam's threeseed mercury	ACDE4	Vascular Plant	Forb/herb	G4S3	NR	RFSS	22	1	5%	2010	Federal high priority for conservation.	Becus 2003; Ohio Natural Heritage Database.	Mixed mesophytic forests on limestone/calcareous clay soils.	Yes.	No serious threats; edge of its range.	Do NOT Include: This species was discovered to be not at all uncommon in southwestern Ohio where limestone based soils are frequent (Becus 2003). Quality habitat for this species is rare in the WNF.	Do NOT Include
Ageratina aromatica	lesser snakeroot	AGAR4	Vascular Plant	Forb/herb	G5S1	E	RFSS	7	1	14%	1980	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens, edges, and open canopies in dry oak-pine and dry-mesic oak forests.	Yes, historically; site is overgrown	Known site is overgrown and it is likely extirpated. Wayne National Forest is at the northern limit of its range.	INCLUDE: Species is presumed extirpated in the WNF. This species should be at other parts of the WNF; however, surveys have turned up no new sites.	Do NOT Include: The known location has no individuals, has marginal/nonexistent habitat, and 39 years have passed since it was last found. If we are using a base timeframe of 20 years since it was last seen within the plan area, this species does not occur within the plan area.

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Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
<i>Andropogon glomeratus</i>	bushy bluestem	ANGL2	Vascular Plant	Graminoid	G5S1	E	N/A	3	1	33%	1964	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Meadows along the edge of dry-mesic oak forests.	The only known site has been greatly altered and is likely extirpated from the WNF.	Habitat loss due to succession.	Do NOT Include: The species is likely extirpated from the WNF. In Ohio, <i>A. glomeratus</i> has been documented in highly disturbed habitats, roadsides and edges of thickets.	Do NOT Include
<i>Asclepias amplexicaulis</i>	clasping milkweed	ASAM	Vascular Plant	Forb/herb	G5S3	P	N/A	75	5	7%	2014	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings within dry oak-pine and dry-mesic oak forests.	Yes.	Habitat loss due to succession.	Do NOT Include: Over 70 occurrences state-wide; populations are small except in the Oak Openings Region of NW Ohio. New sites being discovered on an almost annual basis the last 10.	Do NOT Include
<i>Asclepias variegata</i>	redring milkweed	ASVA	Vascular Plant	Forb/herb	G5S3	P	N/A	45	7	16%	2016	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings within dry oak-pine and dry-mesic oak forests.	Yes.	Habitat loss due to succession.	Do NOT Include: Over 40 occurrences state-wide; most populations are small. A large number of sites were found last year in Jackson County.	Do NOT Include
<i>Aureolaria pedicularia</i> var. <i>pedicularia</i>	fernleaf yellow false foxglove	AUPEP	Vascular Plant	Forb/herb	G5S1	E	RFSS	3	1	33%	2018	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry, open woodlands with Dry Oak-Pine Forest and Dry-Mesic Oak Forest Systems	Yes.	Habitat loss due to succession; deer browse; parasitic on oaks.	INCLUDE: WNF has the largest population in the state. Susceptible to extirpation if habitat is not maintained by prescribed fire or thinning.	INCLUDE
<i>Botrychium biternatum</i>	sparselobe grapefern	BOBI	Vascular Plant	Forb/herb	G5S1	E	RFSS	9*	3	30%	2009	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Younger mixed mesophytic and dry-mesic oak forests.	Yes; multiple occurrences in the plan area, but just 2 within the last 20 years.	It grows in early to mid-successional woods with other grape ferns.	Do NOT Include: All recent occurrences on the WNF are based on observations without a voucher specimen to verify ID. The only specimen from the Wayne was noted as " <i>B. parallelum</i> first state record?" by Dr. Herb Wagner in 1992. Wagner was a world authority on the group and wrote the treatment for the Flora of North America series. <i>Botrychium parallelum</i> is not a published name. Ohio is the edge of this species range.	Do NOT Include
<i>Calamagrostis porteri</i> ssp. <i>insperata</i>	Porter's reedgrass	CAPOI	Vascular Plant	Graminoid	G4S2	T	N/A	20	1	5%	2008	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-mesic oak forests.	Yes.	Fire or other disturbance required to stimulate flowering/fruiting. Overshading through succession is a major concern.	INCLUDE: Decline in its Ohio range. Poor sexual reproduction. Susceptible to extirpation if habitat is not maintained by prescribed fire and /or thinning.	INCLUDE

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<i>Cardamine dissecta</i>	forkleaf toothwort	CADI28	Vascular Plant	Forb/herb	G4S3	P	N/A	35	2	6%	2014	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed mesophytic forests.	Yes.	Hybridization; habitat loss due to incompatible landuse.	INCLUDE: Over 30 occurrences statewide; however, it is rare to find "pure" <i>C. dissecta</i> in Ohio. Many populations have plants with intermediate characters when growing with other toothworts (Johnson and Murray 1990; McCance and Burns 1984).	INCLUDE
<i>Carex complanata</i>	hirsute sedge	CACO9	Vascular Plant	Graminoid	G5S2	T	RFSS	9	4	44%	2010	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Vincent et al. 2011	Dry-Mesic Oak Forest and Dry Oak-Pine Forest	Yes; multiple occurrences in the last 10 years.	Habitat loss due to succession.	Do NOT Include: New populations are being found in south central Ohio. Habitat is not rare in the Ironton Ranger District.	Do NOT Include
<i>Carex crinita</i> var. <i>brevicrinis</i>	fringed sedge	CACRB	Vascular Plant	Graminoid	G5S2	T	N/A	9	1	11%	2009	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	edges of swamps in Large Floodplain Forest System	Yes.	Unauthorized ATV use; non-native invasive species.	Do NOT Include: Taxa is often overlooked due to its very similar appearance to the common <i>Carex crinita</i> var. <i>crinita</i> . It is likely more common than currently known. Habitat is not rare in the Ironton Ranger District.	Do NOT Include
<i>Carex gigantea</i>	giant sedge	CAGI4	Vascular Plant	Graminoid	G4S1	E	RFSS	1	1	100%	2017	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Vincent et al. 2011	Vernal pools of flatwoods in Large Floodplain Forest System	Yes; only occurrence in the plan area was last observed in 2017. Site is in a special interest area.	Unauthorized ATV use; non-native invasive species.	INCLUDE: WNF site is the furthest east population in its range. Habitat is rare in Ohio. Surveys have failed to find it in similar habitats in the WNF or other sites in extreme southern Ohio.	INCLUDE
<i>Carex juniperorum</i>	juniper sedge	CAJU2	Vascular Plant	Graminoid	G3S3	NR	RFSS	82	12	15%	2018	NatureServe rank is G3; Federal high priority for conservation.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest	Yes.	Habitat loss due to succession.	Do NOT Include: Locally common in xeric limestone prairies in Adams County where most of the 82 recorded occurrences are located. Scattered in barrens in south-central Ohio.	Do NOT Include

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Carex louisianica	Louisiana sedge	CALO6	Vascular Plant	Graminoid	G5S2	T	RFSS	10	6	60%	2017	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Vernal pools of flatwoods within Large Floodplain Forest System	Yes; multiple occurrences within the past 10 years.	Unauthorized ATV use; non-native invasive species.	INCLUDE: Suitable habitat is rare. After its initial discovery at Lick Branch SIA, it has been found in similar habitats in the same general area along Symmes Creek. Searches outside of this area have been unsuccessful. It should be listed since the WNF has 60% of the known populations in Ohio.	INCLUDE
Carex reznicekii	Reznicek's sedge	CARE18	Vascular Plant	Graminoid	G5S2	T	N/A	12	1	8%	2014	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural History Database; Vincent et al. 2011	Dry-Mesic Oak Forest System	Yes.	Habitat loss due to succession; non-native invasive species.	Do NOT Include: Its range and abundance is still being determined for this recently described species. It has dropped from endangered to potentially threatened in 10 years. Based on trend, it will likely be found in additional areas in southern Ohio. Its preferred habitat is frequent in south central Ohio.	Do NOT Include
Carex striatula	lined sedge	CAST17	Vascular Plant	Graminoid	G4SH	X	RFSS	2*	0	0%	N/A	NatureServe Rank is SH; Federal high priority for conservation; Presumed Extirpated in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed Mesophytic Forest and Dry-Mesic Oak Forest System	No.	Non-native invasive species.	Do NOT Include: The WNF specimen was recently determined as <i>Carex laxiflora</i> by Jenna Dorey who is writing a new taxonomic treatment on the <i>C. laxiflora</i> group. This explains why staff could not locate the species at the site. The only confirmed records in Ohio according to Dorey are from Jackson and Vinton counties outside of the WNF.	Do NOT Include
Chimaphila umbellata	pipsissewa	CHUM	Vascular Plant	Subshrub	G5S1	E	N/A	14*	0	0%	N/A	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest	No.	Deer browse; non-native invasive species.	Do NOT Include: An occurrence was recorded within a couple hundred meters of the Wayne National Forest in 1986. This population was searched for in 2010 without success locating it. It is possible this species is now extirpated from SE Ohio.	Do NOT Include

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Chionanthus virginicus	white fringetree	CHV13	Vascular Plant	Tree, Shrub	G5S2	P	RFSS	20	6	30%	2015	NatureServe rank is S2; Federal high priority for conservation; Potentially Threatened in Ohio.	Cipollini and Peterson 2018; Ohio Natural Heritage Database; Ohio Department of Natural Resources; Peterson and Cipollini 2017.	Mixed Mesophytic Forest and Dry-Mesic Oak Forest System	Yes.	Emerald ash borer (EAB) attacks this species. Some populations have already disappeared due to this threat. Individuals close to roads are often dug up for landscaping.	INCLUDE: Emerald ash borer is a serious threat to the long-term viability of the rare species (Peterson and Cipollini 2017; Cipollini and Peterson 2018). It is still a popular shrub to collect for landscaping. Southern Ohio is at the edge of its range.	INCLUDE
Cirsium carolinianum	soft thistle	CICA7	Vascular Plant	Forb/herb	G5S2	T	RFSS	15	4	27%	2006	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Suitable habitat is rare. Most populations in Ohio are small. Species may become S1 in the next 10 years.	INCLUDE
Clitoria mariana	Atlantic pigeonwings	CLMA4	Vascular Plant	Vine, Forb/herb	G5S3	P	N/A	35	11	31%	2010	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Dry Oak Pine Forest	Yes.	Habitat loss due to succession; non-native invasive species.	Do NOT Include: A species that requires open woodlands, edges. Disturbance dependent species. Well documented in southern Ohio. A number of sites have not been rediscovered in recent years. Over 30 occurrences in Ohio. Recently downgraded to S3 based on new sites.	Do NOT Include
Corallorhiza wisteriana	spring coralroot	COW15	Vascular Plant	Forb/herb	G5S3	P	N/A	25	2	8%	2003	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; often limestone based soils	Yes.	Incompatible land use; non-native invasive species.	Do NOT Include: New occurrences have discovered in Athens County and a few other counties. Species is more common than thought. It may be downgraded to "Watch List" in 2020.	Do NOT Include
Crataegus uniflora	dwarf hawthorn	CRUN	Vascular Plant	Tree, Shrub	G5S2	P	N/A	17	5	29%	2010	NatureServe rank is S2; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest; often limestone based soils	Yes; multiple occurrences in the last 10 years.	Loss of habitat due to succession; too frequent fire intervals; non-native invasive species.	INCLUDE: Habitat is rare. Susceptible to extirpation if habitat is not maintained.	INCLUDE
Cuscuta cuspidata	cuspid dodder	CUCU2	Vascular Plant	Forb/herb, Vine	G5S1	E	N/A	3	1	33%	2004	NatureServe rank is S1; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Large Floodplain Forest; often on asters	Yes.	Non-native invasive species.	INCLUDE: Dodder seems to be rare throughout its range. Didders are difficult to identify and may be more frequent than currently known.	INCLUDE

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<i>Cystopteris tennesseensis</i>	Tennessee bladderfern	CYTE3	Vascular Plant	Forb/herb	G5S3	P	N/A	27	0	0%	N/A	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mesic sandstone rocks in Mixed Mesophytic Forest	No.	Sudden change in canopy cover.	Do NOT Include: One occurrence in Washington County is within a few hundred meters of the WNF. This species is widespread in eastern and southern Ohio. It's similar to the more common <i>C. tenuis</i> and therefore likely overlooked.	Do NOT Include
<i>Dichanthelium villosissimum</i>	whitehair rosette grass	DIV17	Vascular Plant	Graminoid	G5S2	P	N/A	17	1	6%	2013	NatureServe rank is S2; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; well-drained acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	Do NOT Include: New populations are being found in south central. Habitat is not rare in the Ironton Ranger District.	Do NOT Include
<i>Dichanthelium yadkinense</i>	cypress panicgrass	DIDID	Vascular Plant	Graminoid	GNS2	P	N/A	20	2	10%	2009	NatureServe rank is S2; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; well-drained acidic soils	Yes.	Habitat loss through succession.	Do NOT Include: Ohio currently accepts this as a species but a number of treatments have it as a variety or included under another taxon. A number of new populations have been discovered in the last 15 years. Habitat is not rare in southern Ohio and it is easily overlooked due to its close resemblance to the abundant <i>D. dichotomum</i> .	Do NOT Include
<i>Eryngium yuccifolium</i>	button eryngo	ERYU	Vascular Plant	Forb/herb	G5S3	P	N/A	26	2	8%	2014	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest	Yes.	Habitat loss through succession.	Do NOT Include: This species is most common in the xeric limestone prairies of Adams County OH. Species responds well to fire. Over 20 occurrences state wide. Some sites have over 10,000 individuals.	Do NOT Include
<i>Eupatorium godfreyanum</i>	Godfrey's thoroughwort	EUGO4	Vascular Plant	Forb/herb	G4S1	E	N/A	4	1	25%	2013	NatureServe rank is S1; Endangered in Ohio.	Conquist 1985; Gleason and Cronquist 1991; Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; well-drained acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Known from a few, small populations. WNF is at the northern edge of its range.	INCLUDE
<i>Eupatorium incarnatum</i>	pink thoroughwort	FLIN2	Vascular Plant	Forb/herb	G5S2	T	N/A	31	2	6%	2009	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; well-drained acidic soils; early successional	Yes.	Habitat loss due to succession due to lack of disturbance; non-native invasive species.	INCLUDE: Steep declines in number and size of populations in the last 20 years. Early successional habitats are maturing, shading plants out.	INCLUDE

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<i>Gentiana alba</i>	plain gentian	GEAL4	Vascular Plant	Forb/herb	G4S2	T	RFSS	11	3	27%	2014	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest; limestone soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Small (1 to 75 plants) isolated populations throughout its Ohio range.	INCLUDE
<i>Gentiana villosa</i>	striped gentian	GEVI5	Vascular Plant	Forb/herb	G4S1	E	RFSS	11	5	45%	2009	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings within Dry-Mesic Oak Forest; well-drained soils	Yes; a few occurrences within last 10 years.	Habitat loss due to succession; non-native invasive species.	INCLUDE: A number of sites have disappeared in the last 30 years. All known populations are total 15 or less individuals. Recent surveys have failed to find 4 of the 11 known sites. Four populations have been found in WNF since 2000.	INCLUDE
<i>Gratiola virginiana</i>	roundfruit hedgehyssop	GRVI	Vascular Plant	Forb/herb	G5S2	T	N/A	16	1	6%	1991	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Swamps within Large Floodplain Forests	Yes; failed to find in 2009 but habitat still present.	Habitat loss due to succession; non-native invasive species.	Do NOT Include: This species is likely more common than reported.	Do NOT Include: The only Forest record is more than 20 years old and the population has not been found since. Assume it is no longer in the plan area.
<i>Gratiola viscidula</i>	Short's hedgehyssop	GRVI2	Vascular Plant	Forb/herb	G4S3	P	N/A	46	2	4%	2009	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Swamps within Large Floodplain Forests	Yes.	Habitat loss due to succession; changes in hydrology; non-native invasive species.	Do NOT Include: Locally common along edges of swamps and marshes in south central Ohio. Some populations number in the thousands of individuals, e.g. Lake Katharine SNP in Jackson County. Ohio's plants have been split into a separate subspecies, subsp. <i>shortii</i> (Spooner 1984). This entity is no longer an excepted taxon.	Do NOT Include
<i>Heuchera parviflora</i>	littleflower alumroot	HEPA10	Vascular Plant	Forb/herb	G4S3	T	RFSS	56	46	82%	2010	Threatened in Ohio; Federal high priority for conservation.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Moist crevices of sandstone cliffs and rock shelters in Mixed Mesophytic Forest	Yes; multiple occurrences in the last 10 years.	Loss of canopy; illegal rock climbing.	INCLUDE: Species is S3 and is locally common; however, it is habitat specific and susceptible to extirpation if habitat is not maintained. WNF is at the northern limit of its range.	INCLUDE

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Hexalectris spicata var. spicata	spiked crested coralroot	HESPS3	Vascular Plant	Forb/herb	G5S3	P	N/A	54	3	5%	2005	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; limestone based soils	Yes; all occurrences contained in one valley.	Unauthorized ATV use; non-native invasive species.	Do NOT Include: This species is most common in and along edges of xeric limestone prairies in Adams County OH. It can be locally common in that county. Species responds well to fire. Suitable habitat is rare in the WNF.	Do NOT Include
Hydrastis canadensis	goldenseal	HYCA	Vascular Plant	Forb/herb	G3G4	NR	N/A	U	U	N/A	2018	NatureServe rank is G3G4.	BONAP; Ohio Department of Natural Resources Botanist & Wayne National Forest Botanist.	Mixed Mesophytic Forest	Yes; common within the plan area.	Collecting roots for herbal trade.	Do NOT Include: The collecting pressure on this species in Ohio seems to be low. Goldenseal is still frequent throughout its range in Ohio and in some areas can be locally abundant. Ohio Natural Heritage Program does not track this species because of its high frequency.	Do NOT Include
Iris verna	dwarf violet iris	IRVE	Vascular Plant	Forb/herb	G5S3	T	N/A	49	4	8%	2017	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Dry Oak-Pine Forest	Yes.	Habitat loss through succession; illegal ATV use.	Do NOT Include: Locally frequent in the Shawnee State Forest area in Scioto County.	Do NOT Include
Isoetes engelmannii	Appalachian quillwort	ISEN	Vascular Plant	Graminoid	G4S1	T	RFSS	5	1	20%	2017	NatureServe rank is S1; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Shallow water of ponds; along small intermittent streams within Large Floodplain Forests	Yes.	Non-native invasive species; changes in hydrology, sedimentation.	INCLUDE: Sensitive to changes in hydrology. It has become extirpated in northern Ohio in the last 10 years.	INCLUDE
Juglans cinerea	butternut	JUCI	Vascular Plant	Tree	G4S4	NR	RFSS	321*	18	6%	2010	Federal high priority for conservation.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed Mesophytic Forest	Yes.	Over 300 occurrences in ONHD with additional records not entered into the database. Canker has declined this species throughout its range (Schultz 2003). Seedlings are extremely rare and unlike <i>Castanea dentata</i> , re-sprouting from the base is extremely rare as well. Most of the 300 occurrences in the ONHD have not been re-visited in the last 15 years. Long-term viability is poor.	INCLUDE: Although S4, this species is declining throughout its range including Ohio and the WNF. The best conservation plan for this species is to find and protect resistant individuals (Schultz 2003). Butternut also hybridizes with the introduced Japanese walnut (Hoban et al 2009). Its long-term viability is questionable.	INCLUDE

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Lathyrus venosus	veiny pea	LAVE	Vascular Plant	Vine, Forb/herb	G5S1	E	RFSS	5	2	40%	2009	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry, open woodlands and barrens with Dry-Mesic Oak Forest	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: All known populations add up to <20 individuals. Small populations with little recorded flowering stems. Poor long-term viability throughout Ohio range. Species is susceptible to extirpation if habitat is not maintained.	INCLUDE
Liatris cylindracea	Ontario blazing star	LICY	Vascular Plant	Forb/herb	G5S3	T		41*	1	2%	1986	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Prairies; barrens with Dry-Mesic Oak Forests	Yes.	Habitat loss due to succession.	Do NOT Include: Species is locally common in the xeric limestone prairies of Adams County, OH. The only site in the WNF was Buffalo Beats RNA where it has not been seen since the 1980s. Majority of the populations (98%) occur outside of the WNF purchase boundary area.	Do NOT Include
Ligusticum canadense	Canadian licorice-root	LICA16	Vascular Plant	Forb/herb	G4S1	E	RFSS	1	1	100%	2011	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed Mesophytic Forest	Yes; single record with a few individuals.	Unauthorized ATV use; non-native invasive species.	INCLUDE: WNF has the only site and ATVs are frequent in the valley where the few plants were discovered. Southern Ohio is northern limit of its range.	INCLUDE
Magnolia tripetala	umbrella-tree	MATR	Vascular Plant	Tree	G5S3	P	N/A	74	4	5%	2018	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed Mesophytic Forest	Yes.	Incompatible land use.	Do NOT Include: Over 70 occurrences state-wide; no signs of decline. Recently found at new locations extending its range in southern Ohio. Locally common in Shawnee State Forest and Lake Katharine SNP areas.	Do NOT Include
Malaxis unifolia	green adder's-mouth orchid	MAUN	Vascular Plant	Forb/herb	G5S3	P	N/A	43	5	12%	1987	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Dry Oak-Pine Forest	Yes.	Incompatible land use.	Do NOT Include: Over 40 occurrences state-wide; most populations are small. Populations fluxuate year to year and difficult to see populations trends. The number of extant populations has remained constant within about 40 since the list was created in 1980. A couple new populations were found in 2019.	Do NOT Include

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Opuntia cespitosa	eastern pricklypear cactus		Vascular Plant	Forb/herb	G5S3	P	N/A	36	1	3%	2010	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens with Dry-Mesic Oak Forest	Yes.	Habitat loss through succession.	Do NOT Include: Over 30 extant occurrences state-wide most occur in northwest Ohio. The only occurrence on the WNF grows on an old railroad bed. This population may be an escape from a local planting.	Do NOT Include: The taxonomy on this is not settled; NRCS PLANTS database apparently does not recognize this species.
Packera paupercula	balsam groundsel	PAPA20	Vascular Plant	Forb/herb	G5S3	T	RFSS	24	2	8%	2018	Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest; limestone soils	Yes.	Habitat loss due to succession and destruction; non-native invasive species.	INCLUDE: Ranked S3; however, suitable habitat is rare in the WNF and is susceptible to extirpation if habitat is not maintained by prescribed fire and/or thinning. Dozens of acres of habitat are being lost every year due to limestone quarry activity in northern Ohio.	INCLUDE
Panax quinquefolius	American ginseng	PAQU	Vascular Plant	Forb/herb	G3S4	NR	N/A	U	U	U	2018	NatureServe rank is G3.	BONAP; Ohio Department of Natural Resources Botanist & Wayne National Forest Botanist.	Mixed Mesophytic Forest and Dry-Mesic Oak Forest System	Yes; common within the plan area.	Over collected for herbal market; non-native invasive species.	Do NOT Include: This species is still frequent throughout the WNF. Ginseng is still relatively common throughout its range in Ohio and is not tracked by the Ohio Natural Heritage Program. Large populations of 100+ are rare in southeast Ohio.	Do NOT Include
Passiflora incarnata	purple passionflower	PAIN6	Vascular Plant	Vine, Forb/herb	G5S2	T	RFSS	10	2	20%	2006	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Edges of Mixed Mesophytic and Large Floodplain Forests	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Declines in populations along the Ohio River.	INCLUDE
Penstemon pallidus	pale beardtongue	PEPA7	Vascular Plant	Forb/herb	G5S2	T	RFSS	16	1	6%	1990	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry, open, rocky areas within Dry-Mesic Oak Forests; well-drained soils	Yes; failed to find in 2009 but habitat still present.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Rare on the WNF and most populations in Ohio are small and along roadsides. Species is susceptible to extirpation if habitat is not maintained.	INCLUDE
Phacelia covillei	Coville's phacelia	PHCO30	Vascular Plant	Forb/herb	G3S1	E	RFSS	3	2	67%	2019	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Sewell and Vincent 2006.	Dry to mesic, well-drained open woodlands and small stream terraces	Yes; two large populations in the plan area.	Primary concern is non-native invasive species.	INCLUDE: WNF has 2/3 of the known populations and the largest population in Ohio.	INCLUDE

Draft At-Risk Species Supplemental Report

Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
Phaseolus polystachios	thicket bean	PHPO2	Vascular Plant	Vine, Forb/herb	G5S3	P	N/A	23	5	22%	2009	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings within Dry-Mesic Oak Forest and Dry Oak-Pine Forest; well-drained soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Ranked S3; however, suitable habitat is rare in the WNF and is susceptible to extirpation if habitat is not maintained by prescribed fire and/or thinning. ODNR botanists have failed to find several populations in Ohio due to overshadowing from lack of disturbance.	INCLUDE
Piptochaetium avenaceum	blackseed speargrass	PIAV	Vascular Plant	Graminoid	G5S1	E	RFSS	2	1	50%	2008	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings within Dry-Mesic Oak Forest	Yes.	Primary concern is overshadowing by woody vegetation.	INCLUDE: This species is at northern limit of its range and likely was never common in Ohio.	INCLUDE
Platanthera ciliaris	yellow fringed orchid	PLCI2	Vascular Plant	Forb/herb	G5S2	T	RFSS	20	2	10%	2008	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Moist acidic meadows; wet sand, boggy meadows	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Suitable habitat is very rare in Ohio. Habitat requires frequent management. Most of southern Ohio populations are a few individuals and some have become extirpated.	INCLUDE
Pleopeltis polypodioides	resurrection fern	PLPO2	Vascular Plant	Forb/herb, Vine	G5S2	P	N/A	18	1	6%	2009	NatureServe rank is S2; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dolomite, limestone or sandstone rocks in Dry-Mesic Oak Forest; very rare on trees in OH	Yes.	Drying of habitat due to canopy loss.	INCLUDE: Several new sites have been found in the last 10 years possibly a result of climate change. However; most populations are very small and can easily disappear.	INCLUDE
Polygala incarnata	procession flower	POIN4	Vascular Plant	Forb/herb	G5S2	T	N/A	9	1	11%	2013	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry, open woodlands; woodland edges; acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Recently found on the WNF in a powerline right-of-way. Habitat is scarce in the WNF.	INCLUDE
Quercus falcata	southern red oak	QUFA	Vascular Plant	Tree	G5S3	T	N/A	31	8	26%	2009	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Oak-Pine Forest; acidic soils	Yes.	Non-native invasive species.	Do NOT Include: Locally frequent in south central Ohio with over 30 occurrences statewide. There are no signs of decline in abundance or range. Southern red oak is at the edge of its range.	Do NOT Include
Rhododendron periclymenoides	pink azalea	RHPE4	Vascular Plant	Shrub	G5S2	T	RFSS	14	10	71%	2009	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Oak-Pine Forest; acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: At the edge of its range. Habitat loss due to succession.	INCLUDE

Draft At-Risk Species Supplemental Report

Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
Saccharum alopecuroidum	silver plumegrass	SAAL21	Vascular Plant	Graminoid	G5S1	E	RFSS	3	1	33%	2013	NatureServe rank is S1; Federal high priority for conservation; Endangered in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Dry Oak-Pine Forest; woodland edges; acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: At the edge of its range in southern Ohio. This species is a recent discovery in the WNF.	INCLUDE
Scleria pauciflora	fewflower nutrush	SCPA5	Vascular Plant	Graminoid	G5S3	P	RFSS	36	2	6%	2018	Federal high priority for conservation; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest and Dry Oak-Pine Forest	Yes.	Habitat loss through succession.	Do NOT Include: Numerous new occurrences have been found within the last 10 years and may be downgraded to "Watch List" in 2020. It responds favorably to fire and often germinates from the seedbank after a fire (e.g. found at 2 sites in the WNF after fires).	Do NOT Include
Scleria triglomerata	whip nutrush	SCTR	Vascular Plant	Graminoid	G5S3	P	RFSS	48	3	6%	2009	Federal high priority for conservation; Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Barrens within Dry-Mesic Oak Forest and Dry Oak-Pine Forest	Yes.	Habitat loss through succession.	Do NOT Include: Northwest Ohio is this species stronghold but is locally frequent in south central Ohio. It responds favorably to fire too.	Do NOT Include
Scutellaria saxatilis	smooth rock skullcap	SCSA5	Vascular Plant	Forb/herb	G3S2	T	RFSS	35	22	63%	2010	NatureServe rank is S2; Federal high priority for conservation; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Mixed Mesophytic Forest and Dry-Mesic Oak Forest System	Yes.	Primary concern is unauthorized recreation (ATVs) and opening of the canopy; non-native invasive species. Climate change may be a long-term stressor as well.	INCLUDE: Species ranked S2 based on recent declines in its Ohio range. A number of sites on private properties have not been surveyed in the last 20 years.	INCLUDE
Solidago odora	anisescented goldenrod	SOOD	Vascular Plant	Forb/herb	G5S3	T	N/A	40	4	10%	2009	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest and Dry Oak-Pine Forest; acidic soils	Yes.	Habitat loss due to succession; non-native invasive species.	INCLUDE: Ranked S3; however, this species has seen a decline in the last 20 years with 12 sites that have disappeared due to habitat loss from succession or other factors (ONHD). ODNR surveys have found number of individuals dropping into single digits at a number of sites. A number of these sites have plants in poor, vegetative condition. Susceptible to extirpation if habitat is not maintained by prescribed fire and/or thinning.	INCLUDE

Draft At-Risk Species Supplemental Report

Scientific Name	Common Name	NRCS Code	Group	Habit	NatureServe Rank	State Rank	Forest Status	Occurrences in State	Occurrences in Plan Area	% Forest	Most Recent Observation	Reason(s) for Consideration	Best Available Scientific Information	Habitat/Ecological Conditions	Known to Occur in Plan Area	Substantial Concern Over Persistence?	Initial Wayne NF Recommendation	Initial RO Recommendation
Stenanthium gramineum	eastern featherbells	STGR2	Vascular Plant	Forb/herb	G4S3	P	N/A	21	12	57%	2010	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Openings in Dry-Mesic Oak Forest	Yes.	Habitat loss to succession; non-native invasive species.	INCLUDE: This species is locally common in Gallia and Jackson counties. It should be included because of the high percentage of populations on the WNF.	INCLUDE
Symphotrichum oblongifolium	aromatic aster	SYOB	Vascular Plant	Forb/herb	G5S3	T	N/A	46	0	N/A	N/A	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Xeric limestone prairies and barrens	No.	Habitat loss through succession.	Do NOT Include: This species is locally frequent in xeric limestone prairies in Adams County. The Hocking County site was reported in 1983 within a few hundred meters of the WNF. There are over 40 known occurrences in Ohio.	Do NOT Include
Triadenum tubulosum	lesser marsh St. Johnswort	TRTU	Vascular Plant	Forb/herb	G4S3	T	N/A	27	3	11%	2009	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Swamp forests/edge of shrub swamps within Large Floodplain Forest	Yes.	non-native invasive species; changes in hydrology	Do NOT Include: This species has been discovered at a number of new locations in south central Ohio in the last 10 years and is not as rare as once thought.	Do NOT Include
Triadenum walteri	greater marsh St. Johnswort	TRWA	Vascular Plant	Forb/herb	G5S2	T	N/A	11	2	18%	2017	NatureServe rank is S2; Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Swamp forests/edge of shrub swamps within Large Floodplain Forest	Yes.	Non-native invasive species; changes in hydrology.	INCLUDE: Species has been recently found in northeastern Ohio. Majority of Ohio's populations occur within the Symmes Creek watershed in southern OH.	INCLUDE
Verbesina occidentalis	yellow crownbeard	VEOC	Vascular Plant	Forb/herb	G5S3	T	N/A	28	17	61%	2009	Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Dry-Mesic Oak Forest; woodland edges	Yes.	Habitat loss through succession.	Do NOT Include: Additional occurrences have been discovered within the last 10 years. Some populations are large.	Do NOT Include
Viola lanceolata	bog white violet	VILA4	Vascular Plant	Forb/herb	G5S3	P	N/A	40	2	5%	2014	Potentially Threatened in Ohio.	Ohio Natural Heritage Database; Ohio Department of Natural Resources.	Boggy habitats as a result of acid mine drainage	Yes.	Changes in hydrology.	Do NOT Include: V. lanceolata is widespread and is most abundant in NW Ohio. This species has colonized bog-like habitats created by un-reclaimed strip mine areas in south central Ohio. There are over 30 known extant occurrences in Ohio.	Do NOT Include

* = Includes historical records

** NL = Not Listed

^ = Srank is based on ONHD accessed 4/8/2019 not NatureServe Srank. NatureServe's Srank is not regularly updated.

NNIS = Non-native, Invasive Species

E = State Endangered
T = State Threatened
P = State Potentially Threatened
41 species recommended for SCC.

Wildlife Species of Conservation Concern

Introduction

In accordance with the 2012 National Forest System Land Management Planning Rule (USDA, Forest Service 2012; Federal Register Vol. 77, Nos. 68, Monday April 09, 2012), often called the 2012 Planning Rule) and further guidance from the Forest Service Land Management Planning Handbook (FSH 1909.12; ch 10), the Wayne National Forest is producing a proposed species of conservation concern list for both plants and animals (wildlife). Moreover, production of the Wayne's species of conservation concern list is specific to the 2012 planning rule. It is not synonymous with the Wayne's Regional Forester sensitive species list, which has been previously developed in accordance with the 1982 planning rule considerations.

Consistent with the assessment phase of the forest plan revision process and the preliminary need to change document that concludes this phase, development of the species of conservation concern list is largely a data-gathering endeavor that leads toward a logical conclusion, in this case for a subset of at-risk species.

Though many similarities exist between candidates for consideration as species of conservation concern in the plant and wildlife species list development, the selection process described in this document is applicable to wildlife species proposals only. The process to propose plant species differed due to variances in data availability, comparability, and reliability, relative to that of wildlife species. As a result, the Wayne used different approaches to achieve the same outcome. Both are aimed at satisfying agency guidance, using sound ecological and species principles to inform determinations.

The 2012 planning rule (36 CFR 219) defines a species of conservation concern as "a species, other than a federally recognized threatened, endangered, proposed or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area" (36 CFR 219.9). Direction for identifying species of conservation concern is in the Forest Service handbook (FSH) for land management planning (i.e., the planning directives) at FSH 1909.12, chapter 10, section 12.52 and at chapter 20, section 21.22a. Also central to the species of conservation concern identification process is the use of best available scientific information, which is clarified at FSH 1909.12, Zero Code, section 07. Furthermore, "if the species is secure and its continued long-term persistence in the plan area is not at risk based on knowledge of its abundance, distribution, lack of threats to persistence, trends in habitat, or responses to management that species cannot be identified as a species of conservation concern." Because of these qualifying and disqualifying statements, the burden of proof for species of conservation concern rests with the conclusiveness of available data.

Wildlife Species of Conservation Concern Process Summary

Determining the Initial List of Species Considered

The categories of species to consider originate from the final planning directives at FSH 1909.12, chapter 10, section 12.52. Consistent with Forest Service guidance, the responsible official (for the Wayne's species of conservation concern, the Eastern Region's Regional Forester) and staff shall consider only species native to, and known to occur in, the plan area (for the purposes of species of conservation concern designation, the plan area is National Forest System lands in Ohio). Furthermore, according to guidance, species from the following sources below either must or should be considered for designation as Forest Service species of conservation concern:

- Must consider NatureServe global (G) or intraspecific taxon (T) ranks of 1 or 2
- Should consider species with ranks G3/T3 and rankings for Ohio-based species S1-2 (NatureServe 2018)
- U.S. Fish and Wildlife Service (FWS) Species of Concern list for Ohio (USFWS 2018)
- Species that were removed within the last five years from the Federal list of threatened or endangered species, and other delisted species that the regulatory agency still monitors
- Ohio Department of Natural Resources (ODNR) Division of Wildlife (ODW) list of endangered and threatened species (ODNR 2018)
- ODW's Statewide Wildlife Action Plan (SWAP) Species of Greatest Conservation Need (SGCN) list (ODNR 2015)
- Forest Service, Eastern Region Regional Forester sensitive species list (USDA Forest Service 2017)

Influenced by the shared stewardship approach sought at the outset of the Wayne's revision process and as set forth in the FSH, taxa consideration parameters listed above promoted the initial list of species that would be considered within the species of conservation concern process. These sources generated nearly 450 species across 15 taxa that met the general consideration criteria listed above. The planning record exhibit spreadsheet developed by Mercer (2019) displays all animals considered for further assessment as potential species of conservation concern, lists the conservation status, and provides documentation regarding whether a species is known to occur on National Forest System lands of the Wayne National Forest. However, as a result of future public engagement and collaboration with other entities, additional species may warrant species of conservation concern consideration.

Determining Species Known to Occur in the Plan Area

Data for this list of nearly 450 species was examined to determine whether each species is known to occur in the plan area (National Forest System lands in the Wayne National Forest). The extensive use of geographic information system data was instrumental in providing the most spatially accurate determinations of species occurrence. Species occurrences within 10

kilometers of National Forest System lands of the Wayne were considered for mobile species or locations with low precision.

The following sources were helpful and may be referenced further (Mercer 2019):

- Amphibians of Ohio (Pfungsten et al. 2013)
- Butterflies and Moths of North America online Geospatial Database (2018)
- The Second Atlas of Breeding Birds in Ohio (Rodewald et al. 2016)
- Rare, Declining, and Poorly Known Lepidoptera of Forests and Woodlands in the Eastern US (Schweitzer et al. 2011)
- Freshwater Mussels of Ohio (Watters et al. 2009)
- FishNet2 Online Geodatabase (2018)
- Forest Service Natural Resource Manager Wildlife Database (2018)
- Forest Service Conservation Assessments/Internal Correspondence
- iNaturalist Citizen Science Database
- North American Moth Photographers Group Online Map Database (Mississippi State University 2018)
- NatureServe Explorer (2018)
- Ohio Division of Wildlife General Species Range Maps
- Ohio Division of Wildlife GIS Data (2018)
- Ohio Environmental Protection Agency (OEPA), Division of Surface Water (DSW) Fish GIS Data (2018)
- OEPA DSW Macroinvertebrate GIS Data (2018)
- Ohio Lepidopterist Society Records (2012)
- Ohio Natural History GIS Database (2018)
- Ohio Odonata Survey GIS Data (2017)
- The Ohio State University Mussel Online Database (2013)
- The Ohio State University Fish Division Online Geospatial Database (2018)
- U.S. Fish & Wildlife Service Map Data
- Wayne internal confirmation
- Correspondence/data with subject matter experts

Species are removed from further consideration if they were designated by the state as extirpated or extinct (Mercer 2019). According to the planning directives, species with individual occurrences in a plan area that are merely “accidental” or “transient,” or are well outside the species’ existing range at the time of plan development, is not established or becoming

established in the plan area. If the range of a species is changing so that what is becoming its “normal” range includes the plan area, an individual occurrence should not be considered transient or accidental.

Following the deliberative process to determine which initial species under consideration might be *presently* confirmed to occur within the planning area (USDA Forest Service 2019a), the lists of species in appendix B was generated. The lists in appendix B accounted for the historical nature of many species occurrences and whether there was a reasonable likelihood that a species would still be present, based on last known sighting and generational times. As a general rule, for any species, data older than 20 years were deemed insufficient to confirm species presence in the plan area. That said, species that were not further considered due to lack of data or stale data may warrant further consideration if newer data are presented or if future monitoring efforts confirm presence.

Next Steps for Species Qualifications

Following determinations on species status and known occurrence in the plan area that generated the list of species in appendix B (of this document), a secondary process is set to occur. This secondary process involves more deliberation and additional data-gathering, resulting in a more refined wildlife species of conservation concern proposal list. The more refined list will include only those species for which the best available scientific information indicates substantial concern about the species’ capability to persist over the long-term in the plan area.

To be crystal clear, the refined wildlife species of conservation concern list (not to be confused with appendix B) will be different because the Wayne National Forest “Species to be Further Assessed for Their Potential as Wildlife Species of Conservation Concern (SCC)” list in Appendix B does not reflect attempts to review or qualify species, other than by general species ranks and presence on National Forest System lands of the Wayne National Forest.

Eastern Region office staff, in coordination with the Wayne’s forest plan revision team and other experts as needed, will evaluate the best available scientific information to determine which species they recommend be identified as species of conservation concern, and which species should not be identified as species of conservation concern. The recommendations are based on criteria contained in the planning directives at FSH 1909.2, chapter 10, section 12.52c. Summary rationale will be provided for all recommendations to the Regional Forester for ultimate identification as species of conservation concern.

Forest Service guidance directs that these factors be considered when reviewing candidate species of conservation concern:

- Document the best available scientific information supporting the identification of a species as a potential species of conservation concern
- Document the best available scientific information that supports a species that was considered but *not* identified as a potential species of conservation concern. Such rationale may include:

- ◆ Knowledge of the species abundance, distribution, lack of threats to persistence, trends in habitat, and responses to management, or
- ◆ Lack of sufficient scientific information available about the species' status

FSH 1909.12, 12.55 provides additional guidance and suggestions to determine the status of at-risk species, which may also be taken into account specifically for species of conservation concern. The suggested approach provides more details to supplement the above bullets.

Forest Service guidance indicates that an amalgam of information be used to inform species of conservation concern decision making. In an effort to make the species of conservation concern process more objective and transparent, when taking into account influences at multiple scales and local and non-local data, the Wayne developed a qualifying system to consider factors that would lead to species of conservation concern proposal. This approach creates a means to “plug in” available data across major qualifying factors relative to species persistence in the plan area over the long term.

Wildlife Species of Conservation Concern Qualification System & Factors

Background

Since the inception of the species qualification system, a fundamental premise has remained in place: to develop a system to fairly assess species for proposal that would integrate largely available data across taxa to elevate species of conservation concern.

The Wayne uses attributes that are known or can be estimated for most taxa and that are meaningful for all taxa (Millsap et al. 1990). Ideally, species proposals can be reviewed and updated as new data become available, especially for species for which data is insufficient.

In developing the Florida system, Millsap et al. (1990) admitted that systems developed for endangered species required detailed life history information that is not available for many non-game species. The species of conservation concern process should not be equivocated with the effort of upholding federal listing; however, the Forest Service must still make an informed decision to propose species, even in the face of having less robust data.

Three primary factors revolve around the major determinants of species persistence—habitat, populations, and threats. Within those determinants (or factors), subfactors are highlighted to provide further insight into how different elements limit or promote taxa.

The Wayne National Forest strongly considered Ohio's Statewide Action Plan to develop its list of potential species of conservation concern (Mercer 2019). The Statewide Action Plan used a system of scoring species across taxa. Millsap et al. (1990) developed a prioritization system to rank species in Florida according to biological, action, and supplemental variables. Using groups of taxa specialists from across the state to collectively score those variables, the 2015 Ohio Statewide Action Plan largely used the Florida system in ranking conservation priorities for species of greatest conservation need (ODNR 2015).

In part, NatureServe rankings were used to develop the Wayne’s initial list of species for further species of conservation concern consideration. In Master et al. (2012), NatureServe outlines some of the considerations and influences that lead to the organization’s rankings. Furthermore, the Forest Service directs that units *must* consider NatureServe global rankings G1 or G2, interspecific taxon ratings T1 or T2 (species is imperiled or vulnerable) and *should* consider vertebrate species that rank 3, but not species that rank 4 (species is apparently secure) or 5. Clearly, there is a data-driven, objectively determined break-point between species that are “vulnerable” and those that are “apparently secure.” That separation is the product of a ranking system that delineates which species qualify for a certain designation and which do not.

For a respected organization such as NatureServe, developing a system to categorize species makes sense—scoring the data at-hand, then updating those scores periodically as new data become available. The same rationale applies to the Wayne, where species initially qualify as proposed species of conservation concern or not, then get reviewed and updated in the future.

Insight and consideration was furthered by both systems previously mentioned. The Wayne’s approach was to consider the ways both systems and their inputs could help inform and develop a locally relevant, functional species of conservation concern proposal mechanism.

Data Approach and Limitations

Part of the motivation for forest plan revision at the Wayne revolved around the ability to more effectively implement landscape-scale conservation in coordination with other agencies and planning infrastructure. In this sense, sharing data across agencies is a natural intersection of that effort. It leverages the conservation capacity of the Wayne National Forest and its partners. Rather than using only Forest Service specific data to inform the species of conservation concern process, the collective information available from other sources provides a truer representation of where the national forest fits in southeast Ohio and Ohio as a whole.

Qualification factors that lead to species of conservation concern proposal occur across three primary areas of consideration—population, habitat, and threats. Within these areas, certain metrics are assessed that readily tie back to the primary area. This approach is meant to provide enough data inclusivity to warrant a reasonably informed conclusion for species of conservation concern proposal, while simultaneously providing for data use consistency at the local level. This allows near-universal application of qualification factors across taxa, within the context of the planning area. To achieve that balance, there was an accounting of the best available science across the qualification factors.

“Best” science to help assist the species qualification system includes data that are as locally relevant as possible. In terms of scale, reliable local data may be statewide only in some cases and in other cases they may be unit-level. Local data are ideal, as they allow the Wayne to make more informed determinations at an appropriate scale; however, local data are not always readily available. Source data for informing the species qualification system are contained within the assessment phase’s supplemental reports and includes unit-level Wayne National Forest FS Veg data and Forest Inventory and Analysis data, as well as Ohio Environmental Protection Agency Division of Surface Water data. The species qualification system also incorporates Ohio Division

of Wildlife Statewide Action Plan data (ODNR 2018), which may be influenced by local data but has both local and statewide implications.

Datasets used are meant to serve as a relative “snapshot” of species. Occurrence combines with other current factors and trends that speak to species persistence or concern for persistence. These datasets are reflective of what is available to evaluate the status of each species and are chosen because they help meet the desired system goal of equal data application to inform conclusions for all taxa under consideration.

If the above sources cannot adequately provide the needed data to inform the species qualification system, then general, non-local data are sought to fill the need. Non-local data primarily come from peer-reviewed scientific publications, which may still be applied to local taxa assessment, but lack known, acute implications at the local national forest level. Even in the absence of those implications, the data may still be considered influential to long-term species persistence.

It is important to note that non-local data usage may highlight a local information gap. In some cases, data gaps due to non-local data or no available data may influence species assessment outcomes (and subsequent species of conservation concern proposal).

Assessment Factors

The best available scientific information must indicate substantial concern about the species’ capability to persist over the long term in the plan area. In general, substantial concern is best demonstrated by some combination of a decreasing population (abundance or distribution), decreasing habitat, and/or significant threats, particularly when greater than expected under natural variation. Other factors considered during this evaluation include geographic distribution, reproductive potential, dispersal capabilities, and other demographic and life history characteristics of the species that could influence long-term persistence in the plan area. Rarity alone typically is not considered a substantial concern unless accompanied by one or more of the three general conditions listed above, or there are other prominent circumstances leading to concern for long-term persistence in the plan area.

The species qualification factors listed below will be considered to refine the list of species in Appendix B, so that specialists in the Eastern Region can make a recommendation to the Regional Forester regarding identification of species of conservation concern for the plan area. The documents showing evaluation of the factors listed below will be publicly available.

- Primary Factor 1: Population Trend, Distribution, and Range
 - ◆ Subfactor A: Population Trend
 - ◆ Subfactor B: Distribution and Abundance in the plan area
 - ◆ Subfactor C: Range
- Primary Factor 2: Habitat Quantity, Quality, Trend and Integrity
 - ◆ Subfactor D: Habitat Description - Quantity and/or Quality

- ◆ Subfactor E: Habitat Trend and Integrity
- Primary Factor 3: Threats, Vulnerabilities, and other Limiting Factors
 - ◆ Subfactor F: Relevant Life History and Environmental Specificity
 - ◆ Subfactor G: Forest Service Management Implications
 - ◆ Subfactor H: Threats Relevant in or to the Plan Area

Primary Factor I: Population Trend, Distribution, & Range

Across the national forest, there have been limited systematic surveys conducted for most of the species being considered. With few exceptions, there is a local data deficit in species population trends, and to some extent, Wayne-specific distribution of taxa under consideration. Expertise and targeted efforts are short in supply. In many cases, local targeted surveys for a given species may never have occurred or are extremely spotty at best. In lieu of national forest-derived data, there are other data to meet the need, with local implications. This primary factor illustrates how larger-scale data are relevant.

Using Ohio's state-scale population and species distribution data are consistent with the shared stewardship model for conservation planning. There is a high value in determining species presence within a conservation-capable land base, such as the Wayne, but also a value in determining what the data outside the Wayne means in a larger context. A larger population and distribution dataset from outside the national forest helps put the species in context within National Forest System lands and may be illustrative of an undocumented or undervalued distribution trend in the Wayne. Persistence or a lack of persistence across the landscape helps to tell a local story.

Subfactor A: Population Trends

Species population trends are based upon information provided in Ohio's Statewide Action Plan, specific to population trends in Ohio, as available. For most species, the Statewide Action Plan represents the most recent, locally relevant and collective best available science. If Wayne National Forest-specific population trend data are available, they are used to confirm consistency with Statewide Action Plan determinations. As mentioned above, typically, the Wayne's species data are incapable of generating population trends and is limited to individual occurrence data and limited species distributions.

Population trends were developed by teams of internal and external species experts within various taxa groups during the prioritization of the Ohio Statewide Action Plan's Species of Greatest Conservation Need. Species were ranked as increasing, stable, decreasing or unknown. Insofar as future efforts to identify species of conservation concern may be concerned, this information will serve as a minimal baseline for consideration. Although population trend is often statewide in nature, many of the species under consideration for species of conservation concern are specific to the unglaciated portion of the state and occur within the primarily-forested area of southeast Ohio, of which the national forest makes up a small percentage. Thus, the trends disclosed in the Statewide Action Plan, in effect, are relatively local in nature.

In cases where population trends are not known, a critical population trend data gap is noted. If population trend is not known, there cannot logically be a further basis of evaluation within the species qualification system. This may also promote a need to consider the species or species group further in a monitoring plan to help align state wildlife priorities with Forest Service capabilities.

Subfactor A: Ohio Population Trend – Species Decreasing, Stable, Increasing

Unknown = Disqualification from species of conservation concern consideration

Subfactor B: Distribution and Abundance in the Plan Area

Distribution of species has been localized to the extent possible to account for the relative value that the Wayne might play for the species' persistence in Ohio. Many of the species under consideration as species of conservation concern are regional in nature, specifically occurring in unglaciated portions of the state. To the extent possible, we consider the role of the Wayne as part of the bigger picture when discussing populations and distribution, rather than working insularly. The Ohio Population Distribution subfactor is a reflection of that. The distribution of such taxa corresponds with the forested habitat present in and around the Wayne.

Subfactor B: Species Ohio Distribution

- Wayne National Forest only or one of few documented state sites,
- Occurs only in 1 or more of 12 counties that have National Forest System lands,
- Unglaciated Ohio species only,
- Statewide distribution

Subfactor C: Range

Ohio's Statewide Action Plan was utilized to provide parameters for ranges, and thus, they were already determined for a large portion of taxa. Species range follows a similar fashion as statewide distribution in terms of conservation, in that the Wayne's role extends beyond the boundary of the national forest. Taxa that have been shown to range only in Ohio or areas immediately surrounding contribute greatly to the state's biodiversity and that of the region. As one of the primary conservation landholders in the state, the Wayne National Forest's ability to contribute to state and regional species diversity is appropriately considered with this subfactor. In cases where there is not substantial concern for long-term persistence of a species in the plan area, it would not qualify as a species of conservation concern. However, if the plan area plays a distinctive role and contribution for a species at risk within the broader landscape, plan components may still be developed to contribute to its conservation on the Wayne (Deputy Chief Letter, June 6, 2016).

Subfactor C: Species Range

- Very limited range with most of its range in Ohio,
- Center of range in or near Ohio,
- Disjunct from main portion of range but occurs in Ohio,
- Periphery of range is Ohio, Expansive range including Ohio

Primary Factor 2: Habitat Quantity, Quality, & Integrity

It is well understood that habitat trends are a major contributor to the current and future status of any species. The degree to which habitat is available *and* the relative condition (i.e., quality) of that habitat is fundamentally tied to species well-being. Barring all else, habitat availability allows species to proliferate and function. Unless a species is highly adaptable in its habitat use, the decline in available habitat usually precipitates the downward population trend in most species. Thus, habitat availability is an indirect way to assess a species' prospects within a given occupied area. For terrestrial habitat, the Wayne has vegetation data (through FSVeg and FIA) that can speak to composition and structure of that habitat within the national forest. These predictive habitat elements are key factors for terrestrial species persistence potential.

Alternatively, for aquatic habitat, quality drives the ability of species to persist in aquatic systems. The use of a quality rating versus quantity for aquatic is largely predicated upon the relative lack of change in the quantity of aquatic resources when averaged over time within the planning area. Water availability and associated aquatic habitat fluctuates based on a number of hydrological factors, but the scale of water-based resources is seen as temporally moderated and stable in terms of number, types, surface area, and lengths (Climate change introduces greater variance in that predictability and will be addressed within a different qualification factor). Again, existing data play a role. Datasets that speak to quality are available through the Ohio Environmental Protection Agency; thus, it is the best choice to score species habitat in this subfactor.

For both Subfactors D and E (Habitat Quantity/Quality and Integrity, respectively), we acknowledge that habitat loss or loss of suitable conditions is a threat to species unto itself.

Subfactor D: Habitat Description, Quantity & Quality

Habitat quality or quantity trends are one of several subfactors assessed for the species qualification system. Where possible and available, habitat type quantity trends or quality ratings are determined from the assessment phase's *Terrestrial Ecosystems Supplemental Report* and the *Aquatic Ecosystems & Watersheds Supplemental Report*. These two supplemental reports utilize Forest Service corporate data, and if habitat trend or rating data is not available from the supplemental reports, habitat data may be derived from companion or other sources. In some cases, especially within aquatic ecosystems, habitat information at the scale needed to describe species suitability may be wholly unavailable. The rationale for considering habitat quantity or quality is provided below.

Terrestrial

Terrestrial species primary habitat trend data are assessed as either remaining stable, increasing or decreasing in quantity (national forest-wide habitat area is becoming more available or less available) in quantity. Terrestrial habitat quantity trends provide an assessment as to whether or not habitat availability is a limiting factor for terrestrial species.

In the event that breeding habitat is not the same as adult or dispersal habitat, breeding habitat quantity and quality is considered most important.

Subfactor D: Exclusively Terrestrial Species Using Same Breeding and Dispersal Habitat

Subfactor D: Exclusively Terrestrial Species Using Different Breeding and Dispersal Habitats (Breeding and Dispersal Habitats are both assessed).

Inferences about composition and structure associated with forest types may be reasonably surmised over the planning area, considering the data source trends, natural succession, and existing management direction within the habitat types. These inferences allow a reasonable determination that a change in habitat quantity can be reliably measured as a factor in imperilment or encouragement of species persistence over time.

Aquatic

Aquatic species assessment assesses the quality of habitat using qualitative metrics (Ohio Environmental Protection Agency Division of Surface Water physical and biological metrics): the Aquatic Life Use Attainment status and the Qualitative Habitat Evaluation Index (QHEI) scores. Where applicable and available and in-lieu of the QHEI, the Ohio Environmental Protection Agency's Headwater Habitat Evaluation Index (HHEI) may be used. As opposed to quantity, quality indicates a likelihood of potential use and possible occurrence. Effectively, if quality is not notably compromised, then species limitations are not likely habitat-based.

Subfactor D: Exclusively Aquatic Species

- Aquatic Habitat Quality in Non-or Partial Attainment Status,
- Aquatic Habitat Quality in Full Attainment Status,
- Aquatic Habitat Quality where QHEI is Fair, Poor, or Very Poor,
- Aquatic Habitat Quality where QHEI is Good or Excellent.

Terrestrial and Aquatic Habitat Use

Certain species require both terrestrial and aquatic habitat for different life stages. In this case, aquatic breeding habitat—fundamentally important for species persistence—is seen as more important than dispersal habitat and will be assessed using the factors listed above for aquatic species.

Embedded Exceptions for Microhabitat

For both terrestrial and aquatic taxa, certain species are primarily reliant on a microhabitat type. Reliance on microhabitats is considered in species assessments, but there may not be sufficient

information to determine their quantity or quality. Because of the difficulty in measuring quantity or quality at the microhabitat scale, the habitat conditions that surround it—hereafter macrohabitat (where the microhabitat is nested)—is assessed. It has been shown that surrounding landscapes seem to substantially influence local species richness and composition (Götmark et al. 2011).

Forest macrohabitat is used as an indicator of terrestrial microhabitat quantity. In both oak and beech-fir forest types, microhabitat conditions and availability above-ground (within tree) are influenced by species composition and age (Regnery et al. 2013; Larrieu et al. 2013). At the ground-level, microhabitat conditions could also be said to be greatly influenced by those same two factors, amongst others, due to succession and nutrient cycling.

Across the spectrum of biodiversity that occurs within forest habitat, it may be appropriate to say that trees are the overarching elements that contribute most to the preferred microhabitat conditions across a range of taxa. They provide and contribute to structure, function, composition, and connectivity across ecosystems. Both the living and dead parts of trees have biotic and abiotic functions. They indirectly or directly provide food and shelter to nearly all forms of life within the forest, while providing important byproducts to soil and water. Where and how they provide different functions vary across the landscape in a vast number of ways.

When tree provisions combine with other specific features or conditions, microhabitats start to develop or are inherently present. However, at the grand scale, across the national forest, the wide ranging scenarios where these complexities come together and the ability to measure them all is an inexact modeling exercise that has not yet been undertaken. But, as a primary contributor to microhabitat, forest habitat trends (in the way of species and age) provide a common denominator and assessable feature to help indicate where microhabitat conditions might be developing or present. No other measure has universal application to forest taxa habitat availability.

The absence of a predictive microhabitat model forces the predictive macrohabitat assumption. This rationale provides a means to scale up less frequently encountered habitat and make logical determinations by association across the planning area. The overarching assumption is that if the larger ecosystem or habitat type is being shown to collectively increase, the opportunity for microhabitat existence or development also increases due to natural succession and habitat transition. Microhabitat variables that provide the needs of several different species would thus be met through multiple key ecological characteristics likely to occur over space and time within developing ecosystems, measured at the macrohabitat level.

In a study to determine a microhabitat vole species, Orrock et al. (2000) acknowledged that low-resolution habitat classifications may suffice for detecting suitable vole habitats within forest types, but prediction of abundance is most accurate at the greatest resolution. Effectively, the Forest Service seeks to understand where the microhabitat is occurring using low-resolution applied at a large scale for broad coverage.

The primary approach to meeting species conservation objectives within the 2012 planning rule is by evaluation and management of ecological integrity, ecosystem diversity, and sustainability

(Hayward et al. 2016). Consequently, the prior approach is a conditions-based approach. By ensuring that habitat conditions are present, or in this case, accounting for where the microhabitat would likely develop or where it is most likely to be encountered, we are effectively meeting the direction set forth in the planning rule.

Lastly, to help account for low resolution at scale, additional assessment will seek to add more consideration to the narrow ecological niche a species might fill. Specific exceptions for aquatic microhabitat and water-dependent ecosystems within a terrestrial environment follow:

The first exception occurs where vernal pools and ephemeral bodies of water are concerned. There is no available data source that broadly measures their local quality on the landscape or the Wayne specifically, nor is there is truly reliable way to predict vernal pool occurrence in southeastern Ohio. Corollary evidence from Massachusetts suggests that vernal pools occurrence is influenced by topography, glacial history, and land use, which “influence geomorphic processes and thereby influence the occurrence of a vernal pool in the landscape” (Grant 2005). Species that exclusively use vernal pools may have that microhabitat provided within the terrestrial habitat that they occupy, due to multiple site-specific factors, but lacking a reliable data source to determine their presence, the availability and integrity of the terrestrial systems serve as a proxy for vernal pools and ephemerals.

The second exception occurs where riparian areas and bottomland forest overlap. If a species dispersal habitat is exclusively within the riparian area (or nearly so), riparian habitat quality receives increasing consideration. This is an assumption made due to continued 2006 Wayne Forest Plan implementation of riparian buffers. With some possible exceptions, the riparian zone itself does not measurably increase in area. A higher quality trend (versus quantity trend) is assumed as an appropriate value when extrapolated across the plan area given the protections in place. There are undoubtedly site-specific exceptions to increases in riparian habitat quality, but when viewed at scale and in the context of actual National Forest System lands, the limited upland activities that have affected any primarily forested riparian zones do not skew the overall buffer benefit across the Wayne. It is important to keep in mind that other factors that could influence riparian areas and other habitats are accounted for in a separate qualification factor (Threats, Vulnerabilities, and Other Limiting Factors).

Wintering Habitat

If data are available to support that wintering habitat is in decline for migratory bird species, it would warrant additional consideration for habitat quantity decline. Influence on this trend is outside the management control of the Forest Service, but the Migratory Bird Treaty Act applies specifically to many of the birds being considered for species of conservation concern. This factor elevates the importance of protecting National Forest System lands for breeding and is a more inclusive approach to the nuances of migratory bird consideration.

Subfactor D: Wintering Habitat (Migratory Birds Only)

Subfactor E: Habitat Trend and Integrity

To increase the likelihood that our initial habitat assessment is more reliable into the future, we adopted an additional habitat subfactor that scores ecological integrity as a reflection of

composition, structure, function, and connectivity. Integrity will be a reflective of each species' associated ecological community, based on the habitat used within that community. The terrestrial and aquatic supplemental reports discuss integrity in more detail.

For the ecological integrity assessments shown in examples below, it is important to note that unlike the approach developed for NatureServe (Master et al. 2015 "Number of Occurrences with Good Viability/Ecological Integrity"), the integrity assessment the Wayne uses is not an attempt to score or rank individual species occurrences in multiple locations and then determine integrity within those specific locations. Rather, it is used as an indicator to reveal whether or not ecological community integrity across the Wayne, regardless of individual occurrences, can further species persistence. Although the data the Wayne is using for species locations are as reliable as can be, only in limited cases could we say that our confidence is high that the occurrences we have are the only occurrences we should account for within the species qualification system or any planning effort. The community integrity approach allows us to effectively account for the potential of other unknown occurrences that undoubtedly occur elsewhere, thus accounting for the known and the unknown.

Subfactor E: Forest-wide Ecological Community Integrity Rating for Terrestrially Exclusive Species

- Low, Moderate or High Terrestrial Community Integrity

Subfactor E: Forest-wide Ecological Community Integrity Rating for Terrestrially or Aquatically Breeding and Terrestrially Dispersing Species

- Low, Moderate or High Terrestrial or Aquatic Breeding Community Integrity
- Low, Moderate or High Terrestrial Dispersal Community Integrity

Subfactor E: Forest-wide Ecological Community Integrity Rating for Aquatically Exclusive Species

- Low, Moderate or High Aquatic Community Integrity

Primary Factor 3: Threats, Vulnerabilities, & Other Limiting Factors

Above all other factors for the species qualification system, it is most difficult to assess the existing and future impacts to species persistence from threats, vulnerabilities and other limiting factors (also referred to simply as threats).

As previously mentioned, to some extent, assessing threats is to make educated projections or cumulative assumptions. Master et al. (2012) indicate that threats may be observed, inferred, or projected to occur. How threats interact with each other over time and space is difficult to determine at best, but an attempt is made across listed threats to try and account for the significance of threats to the plan area as they may locally relate to each species.

There are both direct and indirect threats to species and their habitat. NatureServe's approach (Master et al. 2012) does not include indirect threats when calculating the overall threat, because they are synonymous with drivers or root causes and otherwise add to the occurrence or

persistence of proximate direct threat. There is typically a chain of contributing factors behind any direct threat and the negative contributing factors are direct threats (Salafsky et al. 2008).

Some threats, like climate change, have the capacity to affect both a species and its habitat. It could also be defined as both a threat (synonymous with stressor, Salafsky et al. 2008; Young and Sanzone 2002) and a driver. The species qualification system considered climate change within a habitat context due to the ability of projected habitat outcomes to be extrapolated over larger areas and broadly relevant to any species that reside within those habitats. In this approach, habitat-based outcomes can be consistently applied across species habitat, whereas data to inform species specific vulnerabilities would be inconsistently available, surmised, and not widely applicable.

When considering threats, the species qualification system will consider the current and potential future trajectory of threats relevant to a species in the Wayne as well as its relevant life history and environmental specificity (Master et al. 2012).

Subfactor F: Relevant Life History and Environmental Specificity

In some ways, downward habitat and population trends, included in the first two primary factors of the species qualification system, could be considered existential threats. Moreover, the vulnerability of taxa due to life history needs or limitations may also have ramifications, and thus, it is taken into account as an additional factor.

Life history factors such as time to first breeding, time between generations of breeding adults, relative reproductive success, dispersal and migratory characteristics, and ability to colonize areas of new or changing habitat are important considerations when looking at long-term persistence of a species and when developing plan components for management.

Master et al. (2012) describe environmental specificity as “the degree to which a species or ecosystem depends on a relatively scarce set of habitats, substrates, food types, or other abiotic and/or biotic factors within the overall range” (i.e., the life history needs). “Relatively narrow requirements are thought to increase the vulnerability of a species or ecosystem. This factor is most important when the number of occurrences, and the range extent or area of occupancy, is largely unknown.” The values to assess this subfactor are defined by Master et al. (2002) and are listed as follows:

- *Very Narrow*: Specialist or ecosystem with key requirements scarce. For species, specific habitat(s), substrate(s), food type(s), hosts, breeding/non-breeding microhabitats, or other abiotic and/or biotic factor(s) are used or required by the species or ecosystem in the area of interest, with these habitat(s) and/or other requirements furthermore being scarce within the generalized range of the species or ecosystem within the area of interest, and, the population (or the number of breeding attempts) expected to decline significantly if any of these key requirements become unavailable. For ecosystems, environmental requirements are both narrow and scarce (e.g., calcareous seepage fens).
- *Narrow*: Specialist or ecosystem with key requirements common. Specific habitat(s) or other abiotic and/or biotic factors (see above) are used or required by the species or

ecosystem, but these key requirements are common and within the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are narrow but common (e.g., floodplain forest, alpine tundra).

- *Moderate*: Generalist or community with some key requirements scarce. Broad-scale or diverse (general) habitat(s) or other abiotic and/or biotic factors are used or required by the species or ecosystem, but some key requirements are scarce in the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are broad but scarce (e.g., talus or cliff forests and woodlands, alvars, many rock outcrop communities).
- *Broad*: Generalist or community with all key requirements common. Broad-scale or diverse (general) habitat(s) or abiotic and/or biotic factors are used or required by the species or ecosystem, with all key requirements common in the generalized range of the species or ecosystem in the area of interest. For animals, if the preferred food(s) or breeding/non-breeding microhabitat(s) become unavailable, the species switches to an alternative with no resulting decline in numbers of individuals or number of breeding attempts. For ecosystems, environmental requirements are broad and common (e.g., forests or prairies on glacial till, or forests and meadows on montane slopes).
- *Unknown*

Environmental specificity is effectively tied to habitat use and survival strategy. In the narrowest of terms, it is where specific and finite resources or factors are needed for optimal survival and proliferation (Master et al. 2012). It may have local or range-wide population implications, but it is best accounted for as a vulnerability.

Subfactor F: Environmental Specificity

- Very Narrow or Narrow Specificity, Moderate Specificity, Broad, or Unknown

Subfactor G: Forest Service Management Implications

Although threats have been quantified across the Ohio landscape, the element of local applicability of threats must be dealt with to help provide threat context to the planning area. Some potential threats are reduced by law and regulation, while others are subject to changing land uses over time. To most effectively address how these threats relate to the Wayne National Forest, Statewide Action Plan calculated threats shown as high or medium (as opposed to negligible or low) are cross-referenced for management significance to National Forest Lands of the Wayne National Forest.

The current forest plan (USDA Forest Service 2006) affords many protections to species, habitats, and elements that are especially important to species. However, existing land management may be changed in the future. Additionally, the existing forest plan has limitations based upon best available scientific information available when it was written, so it could only account for resource vulnerabilities, habitat trends, and threats known to exist during the early 2000s and prior. Although the 2006 Wayne Forest Plan has been said to be “habitat-based” or “habitat-driven,” considerations associated with certain elements of resource protection may lack adequacy in measure, spatial or temporal scope, or strategy when evaluated against knowledge

and trends that have emerged more recently. Accounting for substantive differences within this subfactor helps point towards existing and potential vulnerabilities to species associated with current habitat management direction in the Wayne National Forest and can be used to help inform development of future forest plan components.

Potential for new management direction and potential effects of existing management direction are highlighted across broad categories. Where resource values of the Wayne intersect with high and medium threat calculations from the Statewide Action Plan, local management vulnerability is indicated.

Subfactor H: Threats in or Relevant to the Plan Area

Taxa associated with similar habitat types may face systemic threats within the habitat and share the threat. Threats and vulnerabilities manifest themselves across the spectrum of all other subfactors within the species qualification system and have no regard for geopolitical boundaries, especially within habitat matrices as fragmented as the Wayne or southeast Ohio as a whole.

Source results to inform threats were developed by species and habitat experts involved with Ohio Department of Natural Resource's Statewide Action Plan (SWAP 2015), using standardized definitions and methodologies (Salafsky et al. 2008; Master et al. 2012). Though the methodology used can apply to individual species or ecosystems, the Statewide Action Plan chose to focus on recording threat impacts related to ecosystems, specifically broad terrestrial and aquatic habitat categories: forest; grassland; wetland; caves and mines; artificial and man-made environments; Ohio River tributaries; headwater and small inland streams; and man-made lakes and ponds. The Statewide Action Plan's intent was to choose habitat categories that identify landscape-scale terrestrial and aquatic ecosystems, while providing an organizational framework for arranging of wildlife and related conservation threats or actions (ODNR 2015). The following direct threats were considered to habitats in preparation of the Statewide Action Plan's threat impact determinations:

- Residential and Commercial Development
- Agriculture and Aquaculture
- Energy Production and Mining
- Transportation and Service Corridors
- Biological Resource Use
- Human Intrusion and Disturbance
- Natural System Modifications
- Invasive and Other Problematic Species and Genes
- Pollution
- Geological Events
- Climate Change and Severe Weather

Threats are first determined in conjunction with an individual species' habitat. Because so many of the species being initially considered for species of conservation concern overlap with the Ohio Species of Greatest Conservation Need list, nearly all species have already been associated with their primary habitat within the Statewide Action Plan. However, multiple species under consideration are known to individually use multiple habitats. When that occurs, the single highest threat associated with the species or the most vulnerable habitat for any given species is considered.

Climate Change

As shown within the bulleted list above, it is within subfactor H that climate change is considered within the species qualification system process.

“For aquatic and terrestrial species alike, the first response to changing climate is often a shift in location, to stay within preferred environmental conditions. At the cooler extremes of their distributions, species are moving poleward, whereas range limits are contracting at the warmer range edge, where temperatures are no longer tolerable” (Pecl et al. 2017). It is understood that this shift is generalized and driven by habitat conditions, but does not fully account for what happens with individual species based on other inputs.

Individual species use habitat differently throughout their lives and may follow habitat resources and conditions on an as-needed basis, when motivated. In many cases, species' needs are dependent on other species or byproducts and not all of those other species will shift to new locations at the same time. This shift may be both individual and generational.

Though a species-specific climate change subfactor was considered during species qualification system development, the complexity of species movement, interactions, and climate model variance created major predictive challenges in developing a reliable subfactor.

Determining whether climate change is currently an overall negative, negligible, or potentially positive factor for individual species may be best undertaken carefully and separately, within another assessment whose focus is on corraling and likely developing the right data to make determinations. Urban et al. (2016) highlights that most current climate change predictive species models exclude important biological mechanisms such as demography, dispersal, evolution, and species interactions, amongst others, resulting in efforts that do not provide accurate predictions; furthermore the data to inform mechanistic models are almost always missing, even amongst well studied species. This leaves the species-specific implications of climate change to be considered more simply in the species qualification system, within a habitat context, because more complex considerations are not within reach or within the Wayne's developmental capabilities during this planning process.

While there have been attempts to understand and project individual species vulnerability elsewhere, it is hard to say there is a truly reliable way to methodically measure it. Insofar as the species qualification system is concerned, it seems appropriate to evaluate a species potential response based on habitat susceptibility to change. Because of the seemingly accelerated, unpredictable, and complex repercussions that climate change can have on the natural world,

within every species' qualification system there is some uncertainty about the future effects of climate change.

Wayne Determinations

The best available scientific information must be sufficient to make a determination about whether a species should be listed as a species of conservation concern. In other words, the system is accounting for currently understood and available inputs, using basic natural relationships to indicate a relative conservation concern when the chosen factors are taken as a whole. Literally, does the sum of the system parts equal a compelling need to propose a species as species of conservation concern, without excessive attempts to project unknown outcomes? In short, the system is meant to rapidly assess known influences to species, rather than make debatable extrapolations.

If unknown influences or a lack of data indicate there is simply not enough information from which to draw effective conclusions as to whether there is substantial concern for long-term persistence of a species in the plan area, a species cannot be proposed as a species of conservation concern at that time. Lack of sufficient scientific information includes having limited inventory data resulting from low survey effort, lack of effective detection methods, or—in the case of purported population declines—lack of reasonably consistent monitoring methods among trend monitoring periods that would preclude meaningful comparison. The ideal is for the Forest Service and its partners to continue to look for, develop, and share new data so we can responsibly add or remove species designations over time, using the process specified in the 2012 planning rule.

Examples of Species Assessment

To illustrate how the species qualification system works, individual species examples are provided below.

Green salamander (*Aneides aeneus*)

- Primary Factor 1: Population Trend, Distribution, and Range
 - ◆ Subfactor A: Population Trend - State endangered species. Ranked 6th of amphibians of greatest conservation need in Statewide Action Plan. Better information on current status is needed.
 - ◆ Subfactor B: Distribution and Abundance in the plan area - statewide only known from 3 counties along the Ohio River. Wayne National Forest only or one of few documented state sites.
 - ◆ Subfactor C: Expansive Range including Ohio
- Primary Factor 2: Habitat Quantity, Quality, Trend, and Integrity
 - ◆ Subfactor D: Habitat Description, Quantity, and/or Quality. Found within mature forests in damp (but not wet) crevices in shaded rock outcrops and ledges. Also beneath loose bark and in cracks of standing or fallen trees (e.g., in cove hardwoods); sometimes in or under logs on ground. Sometimes reaches high population densities in logged areas

where tree tops are left. Eggs are laid in rock crevices, rotting stumps, or similar dark, damp places. Stays in deep moist cracks in limestone cliffs during the day and ventures out onto the cliff face as night.

- ◆ Subfactor E: Habitat Trend and Integrity - Stable, Moderate
- Primary Factor 3: Threats, Vulnerabilities, and other Limiting Factors
 - ◆ Subfactor F: Relevant Life History and Environmental Specificity - Very narrow. This salamander is exclusively terrestrial with no aquatic life stage. Reaches sexual maturity two to three years after hatching. Adult females evidently do not produce eggs every year. Lay 20 to 30 eggs within rock crevices and they hatch in September.
 - ◆ Subfactor G: Forest Service Management Implications - Maintenance of forested habitat within 100 meters around occupied rock outcrops is beneficial (Petranka 1998). There are no regulations requiring this management action.
 - ◆ Subfactor H: Threats in or relevant to the Plan Area - blasting or removal of rock for roads, over-collecting, habitat loss, disease such as Chytrid fungus, and drought.

SPECIES PROPOSED for potential species of conservation concern

RATIONALE for potential species of conservation concern determination: Listed as endangered by State. Narrow environmental specificity. Need to maintain mature forest next to known rock outcrop breeding sites in the national forest.

BASI: NatureServe. 2019. NatureServe Explorer: An online encyclopedia of life [web application, Accessed: January 12, 2020]. Version 7.1. Arlington (VA): NatureServe. <http://explorer.natureserve.org>.

Black bear (*Ursus americanus*)

- Primary Factor 1: Population Trend, Distribution, and Range
 - ◆ Subfactor A: Population Trend - increasing. Black bears were extirpated by 1850, but have returned as Ohio's forest land recovered. State endangered species provided full protection under the law as their population becomes established and grows.
 - ◆ Subfactor B: Distribution and Abundance in the plan area - Increasing, now known to occur in 45 counties, including Wayne National Forest.
 - ◆ Subfactor C: Range - Expansive range including Ohio
- Primary Factor 2: Habitat Quantity, Quality, Trend, and Integrity
 - ◆ Subfactor D: Habitat Description, Quantity, and/or Quality. Wooded habitats, ranging from swamps and wetlands to dry upland hardwood and coniferous forests. Mature mast-bearing oaks, large hollow trees for den sites, significant downed woody debris that hosts food insects are important habitat components.
 - ◆ Subfactor E: Habitat Trend and Integrity - Increasing, Moderate
- Primary Factor 3: Threats, Vulnerabilities, and other Limiting Factors

- ◆ Subfactor F: Relevant Life History and Environmental Specificity - Generally, one litter is produced every other year. First litters generally have only one cub, but two or three in subsequent litters. The young remain with the mother for the first year and a half of their lives. Broad, habitat generalist.
- ◆ Subfactor G: Current Forest Service Management Implications - Diverse habitats provided in the Wayne. Species is managed by Ohio Division of Wildlife. Cooperating on management of human bear conflicts is beneficial.
- ◆ Subfactor H: Threats in or relevant to the Plan Area - most of bears killed due to vehicle-related mortality or trapped by Ohio Division of Wildlife employees for relocation due to repeated bear-human conflicts.

SPECIES DOES NOT QUALIFY for potential species of conservation concern

RATIONALE for potential species of conservation concern determination: Continued long-term persistence in the plan area is not at risk based on knowledge of its population trend, distribution, trends in habitat, or responses to management. Even with relative rarity in Ohio and in the Wayne, this is a generalist species with the ability to maximize resources across habitats, with continued population expansion.

BASI: Ohio Department of Natural Resource. 2015. Statewide Action Plan.

<http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/mammals/black-bear-obtained-1-2020>.

Ruffed grouse (*Bonasa umbellus*)

- Primary Factor 1: Population Trend, Distribution, and Range
 - ◆ Subfactor A: Population Trend - No special state status. Decreasing. The ruffed grouse has declined dramatically since the early 1980s due to loss of early-successional habitat.
 - ◆ Subfactor B: Distribution and Abundance in the plan area - Likely or Mostly Unglaciaded Ohio
 - ◆ Subfactor C: Range - Periphery of Range
- Primary Factor 2: Habitat Quantity, Quality, Trend, and Integrity
 - ◆ Subfactor D: Habitat Description - Quantity and/or Quality. Prefers young forest habitat 0 to 10 years old.
 - ◆ Subfactor E: Habitat Trend and Integrity - Breeding habitat decreasing, moderate integrity. According to the *Draft Assessment* (2020), forest age class distribution based on plot surveys indicate that 0.1% of National Forest System land is comprised of forested lands less than 10 years of age. A comparison of forested stand data between 2006 and 2018 indicates young forests less than 20 years of age have declined in the Wayne National Forest by 93% (Wayne National Forest Draft Assessment 2020). Ohio's total forest cover has increased since the 1980's, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

- Primary Factor 3: Threats, Vulnerabilities, and other Limiting Factors
 - ◆ Subfactor F: Relevant Life History and Environmental Specificity - Each hen has one brood per year, but they may re-nest and lay a smaller clutch of eggs (7 is average) if the first nest is destroyed. Narrow, due to ephemeral nature of their early successional breeding and brood rearing habitat.
 - ◆ Subfactor G: Forest Service Management Implications - increasing the amount of early successional forest with down logs is beneficial. In the Central Hardwoods, home ranges for grouse may be up to 250 acres (Thompson and Fritzell 1989). Studies in southern Ohio indicate that early successional forest patches of at least 5 to 6 acres provide the most benefit to this species (Wayne Plan FEIS 2006).
 - ◆ Subfactor H: Threats in or relevant to the Plan Area - loss of young forest habitat due to succession.

SPECIES PROPOSED for potential species of conservation concern

RATIONALE for potential SCC determination: known habitat and population decline.

BASI: Ohio Department of Natural Resources. 2015. Statewide Action Plan.

<http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/birds/ruffed-grouse>.

Cerulean warbler (*Setophaga cerulea*)

- Primary Factor 1: Population Trend, Distribution, and Range
 - ◆ Subfactor A: Population Trend - State species of concern rank 1. The numbers of cerulean warblers are declining at rates comparable to the most precipitous rates documented among North American birds by the cooperative Breeding Bird Survey. Recent evidence suggests that events on breeding, stopover, and South American wintering grounds are implicated in this decline (FWS Cerulean warbler status assessment obtained 1-2020 https://www.fws.gov/midwest/es/soc/birds/cerw/cewa_sa.html). Decreasing statewide; experienced a 2.8 percent declining trend in the Ohio Hills Physiographic Region from 1966 to 2004. Sample size was too small to identify a population trend for the three North American Breeding Bird Survey routes found wholly within the Wayne (Wayne Plan FEIS 2006).
 - ◆ Subfactor B: Distribution and abundance in the plan area - Occurs in 12 counties of Wayne (6 to 10 according to the Statewide Action Plan). This species was observed along 61 percent of the Wayne's Breeding Bird Survey routes in 2003 (Wayne National Forest Plan 2006).
 - ◆ Subfactor C: Range - The Wayne is in the core breeding range for the cerulean warbler. Nearly 50 percent of the global cerulean warbler population breeds in the Ohio Hills Physiographic Region.
- Primary Factor 2: Habitat Quantity, Quality, Trend, and Integrity

- ◆ Subfactor D: Habitat Description, Quantity, and/or Quality - Prefer large tracts of mature deciduous woodlands (particularly oak-dominated forests) at least 50 to 75 acres in size. Favors very large oaks, is a canopy nester, and needs gaps in the canopy (Wayne Plan FEIS 2006).
- ◆ Subfactor E: Habitat trend and integrity - A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USFS 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (USDA FIA 2018h; Wayne Draft Assessment 2020). While the amount of mature forest habitat on the Wayne is increasing, oak woodlands, once comprising approximately 48% of the historical land base across the study area, now cover approximately 6%. Breeding habitat has low-moderate integrity due to low structural diversity. The vertical structure of these forest stands generally exhibits one tree age class as a result of past management (Wayne Plan FEIS 2006).
- Primary Factor 3: Threats, Vulnerabilities, and other Limiting Factors
 - ◆ Subfactor F: Relevant life history and environmental specificity - Moderate specificity. This species migrates to the Andes of South America for winter.
 - ◆ Subfactor G: Forest Service management implications - providing mature oak-dominated forests in tracts of 50 to 75 acres or more with canopy gaps and large oak trees is beneficial for breeding habitat. Implementation of uneven-aged management methods could provide optimal structural habitat conditions for the cerulean warbler (Wayne Plan FEIS 2006).
 - ◆ Subfactor H: Threats in or relevant to the Plan Area - Decline in breeding and wintering habitat quality. According to the *Draft Assessment*, the volume of white oak in Southeast Ohio declined by nearly 25% between 2006 and 2016. This decline is a function of harvest, natural mortality, and a lack of young regenerating oak to replace what is lost. In the Wayne, the acreage treated by burning was approximately 12,412 acres from 2008 to 2019, or 5.1% of National Forest System land. According to the Wayne Plan FEIS (2006), oak will likely decline on National Forest System lands over the long-term and oak forest communities treated with uneven-aged methods is likely to decline over time, which is not favorable for cerulean warbler breeding habitat structure.

SPECIES PROPOSED for potential species of conservation concern

RATIONALE for potential species of conservation concern determination: There is substantial concern for the species continued long-term persistence in the plan area based on knowledge of trends in its regional and statewide population, habitat quality trends in the plan area, responses to management, and threats to wintering habitat outside the plan area.

BASI: Ohio Department of Natural Resources. 2015. Statewide Action Plan.

(<http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/birds/cerulean-warbler-obtained-1-2020>).

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Conclusion

The intent of the species qualification system is to identify potential species of conservation concern for which there is substantial concern about the species capability to persist over the long-term in the plan area through an objective review of the best available scientific information. Additionally, the species qualification system is meant to provide context for Wayne conservation efforts at the local and regional scale. Unavailable data is a limiting factor in this process, but when available, it could be incorporated into the system during periodic species updates that could culminate in new species of conservation concern listing (and potentially delisting) recommendations. Or, when warranted, a review could be triggered by collection or discovery of previously unavailable data.

It is the hope of the Wayne that the species of conservation concern proposal process is as transparent and objective as it can be. The species qualification system is a process to similarly and systematically review species initially and perpetually, consistent with the 2012 planning rule.

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Appendix B: Species to be Further Assessed for Their Potential as Wildlife Species of Conservation Concern

The following species will be assessed for their potential as wildlife species of conservation concern. These species were determined to be known to occur in the Wayne as outlined in the Wildlife Species of Conservation Concern Process Summary.

The next step in the process will be assessing these species under the Wildlife Species of Conservation Concern Qualification System & Factors outlined in this document.

Mammals

Scientific Name	Common Name
<i>Eptesicus fuscus</i>	Big Brown Bat
<i>Myotis lucifugus</i>	Little Brown Myotis
<i>Perimyotis subflavus</i>	Tri-colored Bat
<i>Nycticeius humeralis</i>	Evening Bat
<i>Lasiurus borealis</i>	Eastern Red Bat
<i>Lasiurus cinereus</i>	Hoary Bat
<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Sorex hoyi</i>	Pygmy Shrew
<i>Tamias striatus</i>	Eastern Chipmunk
<i>Felis rufus</i>	Bobcat
<i>Microtus pinetorum</i>	Pine Vole
<i>Sorex fumeus</i>	Smoky Shrew
<i>Ursus americanus</i>	American Black Bear

Birds

Scientific Name	Common Name
<i>Colinus virginianus</i>	Northern Bobwhite
<i>Ammodramus henslowii</i>	Henslow's Sparrow
<i>Circus cyaneus</i>	Northern Harrier
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo
<i>Vermivora cyanoptera</i>	Blue-winged Warbler
<i>Helmitheros vermivorum</i>	Worm-eating Warbler
<i>Ardea alba</i>	Great Egret
<i>Scolopax minor</i>	American Woodcock
<i>Hylocichla mustelina</i>	Wood Thrush
<i>Parkesia motacilla</i>	Louisiana Waterthrush
<i>Accipiter striatus</i>	Sharp-shinned Hawk
<i>Protonotaria citrea</i>	Prothonotary Warbler
<i>Setophaga cerulea</i>	Cerulean Warbler
<i>Antrostomus vociferus</i>	Eastern Whip-poor-will
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker

Scientific Name	Common Name
<i>Setophaga discolor</i>	Prairie Warbler
<i>Empidonax virescens</i>	Acadian Flycatcher
<i>Aix sponsa</i>	Wood Duck
<i>Ardea herodias</i>	Great Blue Heron
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo
<i>Myiarchus chrinitus</i>	Great Crested Flycatcher
<i>Vireo flavifrons</i>	Yellow-throated Vireo
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher
<i>Mniotilta varia</i>	Black-and-white Warbler
<i>Setophaga ruticilla</i>	American Redstart
<i>Sturnella magna</i>	Eastern Meadowlark
<i>Icteria virens</i>	Yellow-breasted Chat
<i>Chaetura pelagica</i>	Chimney Swift
<i>Setophaga citrina</i>	Hooded Warbler
<i>Ammodramus savannarum</i>	Grasshopper Sparrow
<i>Spizella pusilla</i>	Field Sparrow
<i>Geothlypis formosa</i>	Kentucky Warbler
<i>Bonasa umbellus</i>	Ruffed Grouse

Reptiles

Scientific Name	Common Name
<i>Terrapene carolina carolina</i>	Eastern Box Turtle
<i>Eumeces laticeps</i>	Broadheaded Skink
<i>Opheodrys aestivus</i>	Rough Green Snake
<i>Lampropeltis getula nigra</i>	Black Kingsnake
<i>Crotalus horridus</i>	Timber Rattlesnake
<i>Heterodon platirhinos</i>	Eastern Hognose Snake
<i>Agkistrodon contortrix mokasen</i>	Northern Copperhead
<i>Coluber constrictor constrictor</i>	Black Racer

Amphibians

Scientific Name	Common Name
<i>Aneides aeneus</i>	Green Salamander
<i>Gyrinophilus porphyriticus porphyriticus</i>	Northern Spring Salamander
<i>Cryptobranchus alleganiensis</i>	Eastern Hellbender
<i>Hemidactylium scutatum</i>	Four-toed Salamander
<i>Necturus maculosus</i>	Mudpuppy
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander
<i>Pseudotriton ruber ruber</i>	Northern Red Salamander
<i>Ambystoma opacum</i>	Marbled Salamander
<i>Pseudotriton montanus</i>	Mud Salamander
<i>Eurycea longicauda longicauda</i>	Longtailed Salamander

Scientific Name	Common Name
<i>Desmognathus fuscus fuscus</i>	Northern Dusky Salamander
<i>Pseudacris brachyphona</i>	Mountain Chorus Frog
<i>Notophthalmus viridescens viridescens</i>	Red-spotted Newt
<i>Pseudacris triseriata triseriata</i>	Western Chorus Frog
<i>Rana sylvatica</i>	Wood Frog

Fish

Scientific Name	Common Name
<i>Moxostoma duquesnei</i>	Black Redhorse
<i>Clinostomus elongatus</i>	Redside Dace
<i>Hybopsis amblops</i>	Bigeye Chub
<i>Erimystax dissimilis</i>	Streamline Chub
<i>Erimyzon sucetta</i>	Lake Chubsucker
<i>Etheostoma camurum</i>	Bluebreast Darter
<i>Ammocrypta pellucida</i>	Eastern Sand Darter
<i>Ichthyomyzon bdellium</i>	Ohio Lamprey
<i>Ichthyomyzon unicuspis</i>	Silver Lamprey
<i>Lampetra aepyptera</i>	Least Brook Lamprey
<i>Moxostoma anisurum</i>	Silver Redhorse
<i>Moxostoma breviceps</i>	Smallmouth Redhorse
<i>Etheostoma variatum</i>	Variagate Darter
<i>Phoxinus erythrogaster</i>	Southern Redbelly Dace
<i>Percina sciera</i>	Dusky Darter
<i>Erimyzon claviformis</i>	Creek Chubsucker

Invertebrates – Bivalves & Mollusks

Scientific Name	Common Name
<i>Villosa lienosa/Leaunia lienosus aquilonius</i>	Little Spectaclecase
<i>Lasmigona compressa</i>	Creek Heelsplitter
<i>Simpsonaias ambigua</i>	Salamander Mussel
<i>Amblema plicata</i>	Threeridge
<i>Obovaria subrotunda</i>	Round Hickorynut
<i>Ligumia recta</i>	Black Sandshell
<i>Obiquaria reflexa</i>	Threehorn Wartyback
<i>Pleurobema sintoxia</i>	Round Pigtoe
<i>Anodontoides ferussacianus</i>	Cylindrical Papershell

Invertebrates - Crustaceans

Scientific Name	Common Name
<i>Cambarus diogenes</i>	Devil Crayfish
<i>Orconectes sanbornii</i>	Sanborn's Crayfish

Scientific Name	Common Name
<i>Cambarus robustus</i>	Big Water Crayfish
<i>Cambarus thomai</i>	Little Brown Mudbug
<i>Orconectes cristavarius</i>	Spiny Stream Crayfish

Invertebrates - Insects

Dragonflies and Damselflies (Odonates)

Scientific Name	Common Name
<i>Gomphus viridifrons</i>	Green-faced Clubtail
<i>Stylurus notatus</i>	Elusive Clubtail
<i>Chromagrion conditum</i>	Aurora Damsel
<i>Nehalennia irene</i>	Sedge Sprite
<i>Macromia alleghaniensis</i>	Allegheny River Cruiser
<i>Hetaerina titia</i>	Smokey Rubyspot
<i>Tachopteryx thoreyi</i>	Gray Petaltail
<i>Helocordulia uhleri</i>	Uhler's Sundragon
<i>Ischnura kellicotti</i>	Lilypad Forktail
<i>Stylurus plagiatus</i>	Russet-tipped Clubtail
<i>Boyeria grafiana</i>	Ocellated Darner
<i>Progomphus obscurus</i>	Common Sanddragon
<i>Cordulegaster maculata</i>	Twin-spotted Spiketail
<i>Cordulegaster obliqua</i>	Arrowhead Spiketail
<i>Anax longipes</i>	Comet Darner
<i>Ladona deplanata</i>	Blue Corporal

Butterflies (Lepidopterans)

Scientific Name	Common Name
<i>Glaucopsyche lygdamus</i>	Silvery Blue
<i>Polygonia progne</i>	Gray Comma
<i>Celastrina nigra</i>	Dusky Azure
<i>Eurytides marcellus</i>	Zebra Swallowtail
<i>Anthocharis midea annickae</i>	Falcate Orange Tip
<i>Calephelis borealis</i>	Northern Metalmark
<i>Hesperia leonardus</i>	Leonard's Skipper
<i>Celastrina negelectamajor</i>	Appalachian Blue
<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper
<i>Danaus plexippus</i>	Monarch