USDA United States Department of Agriculture

At-Risk Species

Assessment Supplemental Report
Wayne National Forest

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Prepared By:
Katrina Schultes (Forest Service)
Patrick Mercer (Forest Service)
Richard L. Gardner (Ohio Department of Natural Resources)
Gerald Scott (Forest Service)
Reed Kuennen (Forest Service)
Kyle Brooks (Forest Service)
Lynda Andrews (Forest Service)
Nathan Schlater (Rural Action)
Tim Ferrell (Rural Action)
Lisa Kluesner (Forest Service)
Jeffrey Rebitzke (Forest Service)

Responsible Official:
Forest Supervisor Carrie Gilbert

Cover Photo:
The federally endangered running buffalo clover (*Trifolium stoloniferum*).
USDA photo by Kyle Brooks

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At-Risk Species

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. At-risk species consist of two groups: 1) federally recognized threatened, endangered, proposed, and candidate species; and 2) species of conservation concern.

Threatened and endangered species are federally designated by the U.S. Fish and Wildlife Service (terrestrial species) under the Endangered Species Act of 1973. This act was created to protect critically imperiled species from extinction and identify a path towards their recovery. A proposed species is a species being evaluated in detail to determine if they should be listed as a threatened or endangered species under the Endangered Species Act. A candidate species is one where there is sufficient information that it should be considered for listing for it is waiting for a detailed evaluation due to other higher priority species. For some threatened or endangered species, critical habitat important to the recovery of the species has also been identified. Similarly, proposed species may have proposed critical habitat identified.

Species of conservation concern are species other than a federally recognized threatened, endangered, proposed, or candidate species 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).

Notable Changes Between the Draft and Final of this Report

Additional information has been included in the table for the potential plant species of conservation concern (appendix A), including the landtype forest class (and forest ecosystem and ecological succession class when appropriate) and habitat integrity by species, as well as clarification of the determination rationale. The potential wildlife species of conservation concern are now included in this document (see appendix B).

How At-Risk Species Inform Revision of the Forest Plan

The 2012 planning rule requires plans to use a complementary ecosystem and species-specific approach to provide for the diversity of plant and animal communities and maintain the persistence of all native species in the plan area, regardless of any special status, listing, or designation. This approach is often referred to as the coarse-filter/fine-filter approach.

The ecosystem-level plan components are designed to maintain or restore healthy ecosystems that support a wide variety of species. The Forest Service expects that by focusing on healthy ecosystems, management will create conditions that support the long-term persistence of most native species in the plan area by maintaining a diversity of plant and animal communities. The

species-specific plan components are intended to provide for species whose specific habitat needs may not be fully met under the ecosystem-level plan components.

Although a species that is secure in the plan area cannot be identified as species of conservation concern, the planning unit may serve a distinctive role in the conservation of a species considering risks across its broader range. Given that forests are required to evaluate the plan area's distinctive roles and contributions within the broader landscape, the responsible official for the forest plan has the discretion to include plan components where needed to contribute to the ecological sustainability of a species across its range, even if it has not been identified as a species of conservation concern.

At-risk species play a role in all three phases of the forest plan revision process:

- *Assessment* – Identify species listed under the Endangered Species Act that occur in the plan area and develop potential species of conservation concern.
- *Plan Revision* – The regional forester identifies species of conservation concern for the plan area derived from the potential species identified during the assessment phase and after consideration of public comment. Plan components are developed to maintain ecosystem integrity, with incorporation of species-specific plan components when needed to provide for species whose specific habitat needs may not be fully met under the ecosystem-level plan components.
- *Monitoring* – Observe monitoring indicators periodically to determine whether the revised plan is providing ecological conditions necessary to contribute to maintaining a viable population of a species. For select at-risk species, a select set of ecological conditions, including habitat, is monitored.

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 it was 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 for this species along current and proposed trails 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 (personal communication, P.J. Harmon, 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 (Personal communication, Jenny Finfera).

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.

Federally Listed Wildlife

Introduction

This section's purpose is to identify threatened and endangered wildlife species within or relevant to the Wayne National Forest, designated by the U.S. Fish and Wildlife Service (USFWS). 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 non-native 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 or threats 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 cyphyus*), **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 cave- and mine-hibernating bats across the eastern United States, including within the Wayne National Forest. Most bat monitoring in the Wayne National Forest was geared towards documentation of Indiana bats, since that was the only listed bat prior to white-nose syndrome. However, all bats encountered during monitoring were recorded. Since the overall narratives for bat population trends of white-nose affected bats are similar, tables and figures relevant to bat monitoring will be shown only once below in the Indiana bat section to avoid redundancy.

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 presumably still present in the Wayne National Forest year-round, and certainly suitable habitat for all life stages still exists. However, 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 USFWS 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 abandoned mine environments, as the geology of the Wayne National Forest does not support karst ecosystems, responsible for cave development. One known hibernaculum exists in the Ironton Unit and several fall swarming sites also exist in the Athens Unit, which may or may not also have been hibernation sites. However, given the onset of white-nose syndrome, while suitable overwintering habitat may still exist, monitoring data suggest there are no known hibernating Indiana bats currently using such habitats in the Wayne National Forest.

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 roosts trees have been discovered over time in 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 in the Wayne, with some preference for American elm (*Ulmus amerciana*) 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.

Summer habitat selection may also hinge on climatic factors. Loeb and Winters (2012) suggested that the distribution of suitable Indiana bat summer maternity habitat may shift northward in response to a warming climate. Their modeling suggested the western portions of the species' current range, including Ohio, would become climatically unsuitable under most future climate models, and suitable Indiana bat maternity range would be concentrated in the northeastern United States and Appalachian Mountains. The authors noted that "When behavioral changes fail to mitigate the effects of high temperature, range shifts are likely to occur."

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 USFWS 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 white-nose syndrom 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.

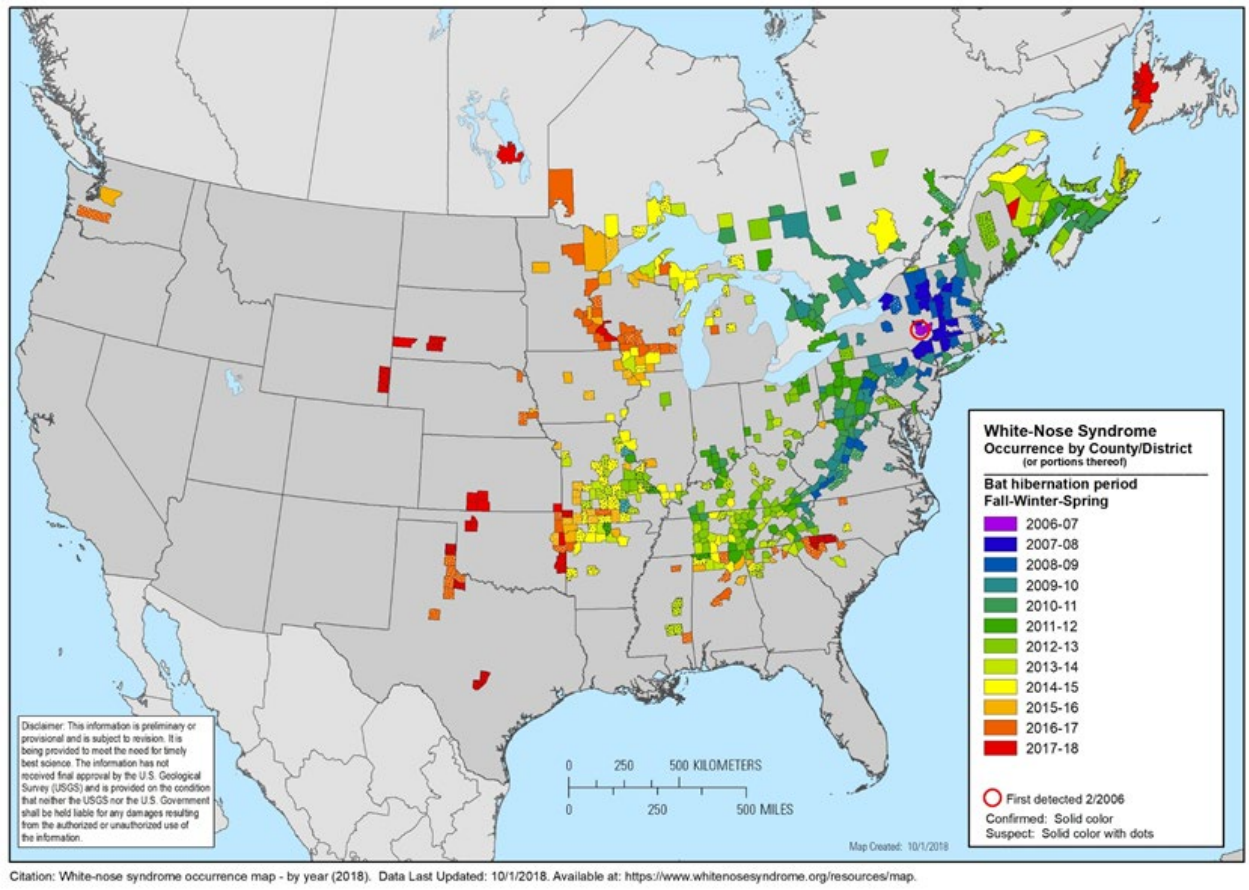

Figure 1. White-nose syndrome occurrence map by year across the United States and Canada, showing spread in all cardinal directions from initial detection in upstate New York, 2006

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 known hibernaculum, including the Indiana bat and federally threatened northern long-eared bat. There have been no detections of Indiana or northern long-eared bats since 2013, 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 in 2012. 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 in the Ironton Ranger District, both pre- and post-white-nose syndrome (WNS)

Year	*Myotis lucifugus*	*Myotis sodalis*	*Perimyotis subflavus*	*Eptesicus fuscus*	*Myotis septentrionalis*	Unidentified	Total Bats	Wayne WNS 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	Yes
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
2018	0	0	0	2	0	0	2	Yes
2020	0	0	1	5	0	0	6	Yes

Note: The Lawrence County 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).

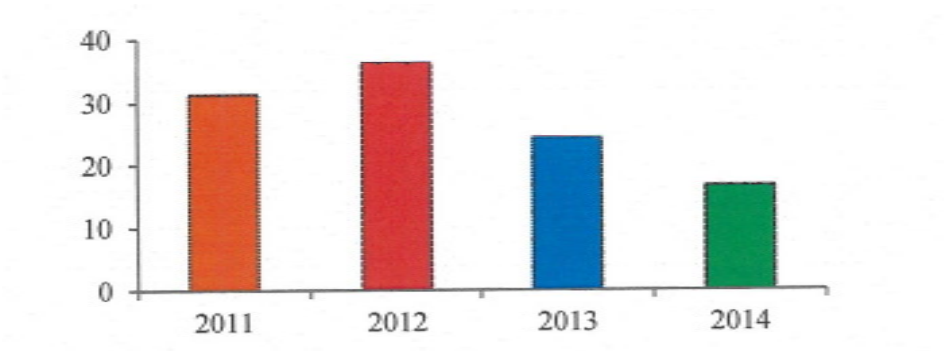

Figure 2. Acoustic bat detections per survey rate over four years of data collection for all routes in Ohio (2011 to 2014)

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 in 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 Myotids.

Range-wide, Ohio's Indiana bats have declined dramatically over the past decade, as evidenced by the USFWS 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 USFWS.

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 USFWS, 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.

Initial reasons for listing this species revolved primarily around disturbance and habitat alteration. As indicated above, the previous forest plan revision 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 USFWS 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

In the Wayne, this bat is generally associated with forests ranging from 60 to 80 year old second growth stands, many of which are even aged, as well as stands 100 years old or older. The bat 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, although they are also known for using live trees for these purposes.

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, and includes non-traditional hibernation sites, which is probably why they are comment during fall swarming surveys but not hibernation surveys. 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 philopatry[1] 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, 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.

Summer and winter habitat selection may also hinge on climatic factors. In the federal register listing documentation for the northern long-eared bat (dated 2 April 2015, page 18003), the USFWS provided a discussion of the relevant aspects of climate change and related effects. Their conclusion was that they have information suggesting that climate change may affect the species but not that climate change itself has led to population declines. Furthermore, discerning effects from climate change from those of the more pervasive white-nose syndrome may be difficult.

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.

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 in 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 nights of mist-netting.

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 at the time 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

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

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 1980s 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, USFWS, 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 USFWS.

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 USFWS Ecological Services Columbus Field Office agreed with determinations made in an analysis by the Wayne National Forest that no effects are anticipated to currently listed mussel species (snuffbox, rayed bean, and sheepnose) with implementation of projects under the 2006 Wayne Forest Plan, due to the fact that each of these species' currently known locations fall outside of National Forest System lands and watersheds affected by Agency actions occurring in National Forest System lands.

In fact, only one known location for any of the five listed freshwater mussel species occur adjacent to National Forest System lands in Ohio. This location is within the Ohio River. Cumulatively across fragmented parcels, 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 USFWS 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

Although the snuffbox occurs in a broader range than just the Ohio River System, this system is most relevant to the Wayne, and arguably to the species as whole, given the number of occurrences within it compared to other river 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 sexually maturity is unknown. The verified snuffbox host fish are the logperch (*Percina caprodes*), blackside darter (*P. maculata*), rainbow darter (*Etheostoma caeruleum*), Iowa darter (*E. exile*), blackspotted topminnow (*Fundulus olivaceous*), mottled sculpin (*Cottus bairdii*), 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 USFWS with a high degree of threat and a low recovery potential. According to the USFWS 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, which is outside of all watersheds connected to National Forest System lands, 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 and is outside of all watersheds connected to 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 atrromaculatus*), central stoneroller (*Campostoma 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 account 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 USFWS. 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 individual species' needs. Comprehensively covering these influences is outside the scope of this document, but population trajectories may be guessed at by assessing habitat trends and basic life history elements, such as environmental specificity of a species. 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.

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), referred to as the 2012 planning rule, and further guidance from the Forest Service Land Management Planning Handbook (FSH 1909.12; ch 10), the Wayne National Forest has determined potential species of conservation concern for both plants and animals (wildlife). Species of conservation concern are specific to the 2012 planning rule and are not synonymous with the regional forester sensitive species, which were previously developed in accordance with the 1982 planning rule considerations.

Consistent with the assessment phase of the forest plan revision process, 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 process to propose plant species differed due to variances in data availability, comparability, and reliability, relative to that of wildlife species. Both processes 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.

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. If new scientific information indicates a potential change is needed to the list of species of conservation concern, national forest and regional office staff will evaluate that information following the criteria described in the Forest Service Handbook at 1909.12 section 21.22b. If that evaluation leads the regional forester to add a species of conservation concern, the forest supervisor will assess whether existing forest plan

components would provide the ecological conditions necessary to maintain the long-term persistence of the species within the plan area, and amend the forest plan if needed. If the regional forester removes a species of conservation concern, the forest supervisor will review the forest plan and amend the plan, if appropriate.

Climate Change Vulnerability of At-Risk Species

Information specific to individual at-risk species and the effects of climate change are acknowledged as an information gap at the time of this assessment. Generally speaking, climate change may affect at-risk plant and wildlife species in a number of direct and indirect ways. It is likely to have both short- and long-term effects on individuals, populations, species, and communities (Butler et al. 2015). The changed environmental conditions can fall outside a species' physiological limits and adaptations putting pressure on physiological capabilities and evolutionary processes (Chown et al. 2010; Shaw and Etterson 2012). For example, changes in temperature and precipitation can lead to such stressors as changes in the timing of water and food availability, alteration of thermal niches, changes in phenology and synchrony, and increased interaction with pests and diseases, which lead to novel selection pressures that can affect species fitness or survival in currently unknown or unpredictable ways (King and Finch 2013; McKelvey et al. 2013; Olson and Saenz 2013a, b; Butler et al. 2015; Becklin et al. 2016). Species with limited distributions or dispersal capabilities are likely to be disproportionately vulnerable to climate change due to reductions in or changes to suitable habitat or ability to migrate to new suitable habitat (Schwartz et al. 2006).

Understanding these interactions will be an important step in developing time-appropriate management strategies to help species survive the changing climate. Such strategies will need to incorporate both population-level and habitat-level management. Some options that have been identified for management include (1) maintaining and restoring existing habitats to improve habitat resilience; (2) augmenting acreages of intact habitat blocks; (3) adapting management actions to reduce environmental stressors; (4) maintaining and improving landscape connectivity; (5) promoting landscape diversity; (6) reducing stress on current populations and habitats; and (7) monitoring change (King and Finch 2013; McKelvey et al. 2013; Olson and Saenz 2013a, b). A common theme among all of these options centers on habitat. The *Terrestrial Ecosystems Supplemental Report* presented habitat integrity ratings for each of the Ecological Landtypes, which incorporated climate change vulnerability ratings derived from the *Central Appalachians Forest Ecosystem Vulnerability Assessment and Synthesis* (Butler et al. 2015). These ratings can help serve as a climate change impact metric and have been applied as an evaluation factor for each proposed at-risk species until species-specific information gaps can be filled in during the plan development phase.

Plant Species of Conservation Concern

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 (ODNR 2018b). 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; personal communication, B. Riley, 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 plan area. The plan 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 plan area

Species	Global Status	Comments
Berberis canadensis	G3G4	No known specimens for Ohio
Chaerophyllum procumbens var. shortii	G5T3T4Q	Too common to list in Ohio
Crataegus ater	G2G4Q	Questionable taxon; no known specimens for Ohio.
Crataegus beata	G2G4	No known specimens for Ohio
Crataegus fluviatilis	G3G4Q	Questionable taxon; no known specimens for Ohio
Crataegus formosa	G2G3	No known specimens for Ohio
Crataegus suborbiculata	G3?	Confirmed specimens from NE Ohio; Wayne NF is outside its range
Lycopodiella margueritiae	G1G2	Questionable taxon and no specimens for Ohio (J. Larson pers. com. 2019)

Species	Global Status	Comments
Poa paludigena	G3	Too common to list in Ohio; northern distribution in Ohio; closest known site is a historical site in Ross County
Polemonium reptans var. villosum	G5T3T4	Too common to list in Ohio; not tracked in Ohio
Robinia hispida var. fertilis	G4T1Q	No known specimens for Ohio; questionable taxon
Rubus prestonensis	G3	No known specimens for Ohio; questionable taxon.
Rudbeckia fulgida var. deamii	G5T1T3	Questionable taxon; this taxon has been included under *R. fulgida* or *R. umbrosa*. Not tracked in Ohio; status in Ohio unclear
Silphium terebinthinaceum var. luciae-brauniae	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 (personal communication, Showman, 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 plan area

Species	Global Status	Comments*
Anthoceros scariosus	G2G4	No confirmed specimens.
Brothera leana	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.
Discelium nudum	G3G4	*Discelium nudum* 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.
Fissidens exilis	G3G4	According to the Consortium, *Fissidens exilis* 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.
Frullania selwyniana	G2G3	There are no records of this liverwort in the Consortium. No confirmed specimens.
Lejeunea ruthii	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.

Species	Global Status	Comments*
Mannia triandra	G3G4	According to the Consortium, *Mannia triandra* 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.
Pedinophyllum interruptum	G3G4	According to the Consortium, it is known from Adams, Champaign, Cuyahoga (dubious), and Franklin Counties. Most Ohio collections are before 1900.
Philonotis longiseta	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.
Physcomitrium hookeri	G2G4	According to the Consortium, it is known in Ohio from an 1877 collection from Franklin County. Like most members of the genus Physcomitrium, it prefers disturbed habitats. May be found in the Wayne.
Weissia phascopsis	G3G4	According to the Consortium, there are no Ohio records. No known specimens.

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

Candidate Plant 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
Canoparmelia caroliniana	Carolina canoparmelia lichen	Fungi	Lichen
Canoparmelia texana	Texas canoparmelia lichen	Fungi	Lichen
Dibaeis absoluta	pink dot lichen	Fungi	Lichen
Hypotrachyna showmanii	Showman's hypotrachyna lichen	Fungi	Lichen
Ramalina farinacea	farinose cartilage lichen	Fungi	Lichen
Ramalina intermedia	intermediate cartilage lichen	Fungi	Lichen
Ramalina pollinaria	cartilage lichen	Fungi	Lichen
Campylostelium saxicola	campylostelium moss	Non-Vascular Plant	Moss
Dichelyma capillaceum	dichelyma moss	Non-Vascular Plant	Moss
Loeskeobryum brevirostre	loeskeobryum moss	Non-Vascular Plant	Moss
Acalypha deamii	Deam's threeseed mercury	Vascular Plant	Forb/herb
Ageratina aromatica	lesser snakeroot	Vascular Plant	Forb/herb
Andropogon glomeratus	bushy bluestem	Vascular Plant	Graminoid
Asclepias amplexicaulis	clasping milkweed	Vascular Plant	Forb/herb
Asclepias variegata	redring milkweed	Vascular Plant	Forb/herb
Aureolaria pedicularia var. pedicularia	fernleaf yellow false foxglove	Vascular Plant	Forb/herb
Botrychium biternatum	sparselobe grapefern	Vascular Plant	Forb/herb
Calamagrostis porteri ssp. insperata	Porter's reedgrass	Vascular Plant	Graminoid

Scientific Name	Common Name	Group	Habit
Cardamine dissecta	forkleaf toothwort	Vascular Plant	Forb/herb
Carex complanata	hirsute sedge	Vascular Plant	Graminoid
Carex crinita var. brevicrinis	fringed sedge	Vascular Plant	Graminoid
Carex gigantea	giant sedge	Vascular Plant	Graminoid
Carex juniperorum	juniper sedge	Vascular Plant	Graminoid
Carex louisianica	Louisiana sedge	Vascular Plant	Graminoid
Carex reznicekii	Reznicek's sedge	Vascular Plant	Graminoid
Carex striatula	lined sedge	Vascular Plant	Graminoid
Chimaphila umbellata	pipsissewa	Vascular Plant	Subshrub
Chionanthus virginicus	white fringetree	Vascular Plant	Tree, Shrub
Cirsium carolinianum	soft thistle	Vascular Plant	Forb/herb
Clitoria mariana	Atlantic pigeonwings	Vascular Plant	Vine, Forb/herb
Corallorhiza wisteriana	spring coralroot	Vascular Plant	Forb/herb
Crataegus uniflora	dwarf hawthorn	Vascular Plant	Tree, Shrub
Cuscuta cuspidata	cusp dodder	Vascular Plant	Forb/herb, Vine
Cystopteris tennesseensis	Tennessee bladderfern	Vascular Plant	Forb/herb
Dichanthelium villosissimum	whitehair rosette grass	Vascular Plant	Graminoid
Dichanthelium yadkinense	cypress panicgrass	Vascular Plant	Graminoid
Eryngium yuccifolium	button eryngo	Vascular Plant	Forb/herb
Eupatorium godfreyanum	Godfrey's thoroughwort	Vascular Plant	Forb/herb
Eupatorium incarnatum	pink thoroughwort	Vascular Plant	Forb/herb
Gentiana alba	plain gentian	Vascular Plant	Forb/herb
Gentiana villosa	striped gentian	Vascular Plant	Forb/herb
Gratiola virginiana	roundfruit hedgehyssop	Vascular Plant	Forb/herb
Gratiola viscidula	Short's hedgehyssop	Vascular Plant	Forb/herb
Heuchera parviflora	littleflower alumroot	Vascular Plant	Forb/herb
Hexalectris spicata var. spicata	spiked crested coralroot	Vascular Plant	Forb/herb
Hydrastis canadensis	goldenseal	Vascular Plant	Forb/herb
Iris verna	dwarf violet iris	Vascular Plant	Forb/herb
Isoetes engelmannii	Appalachian quillwort	Vascular Plant	Graminoid
Juglans cinerea	butternut	Vascular Plant	Tree
Lathyrus venosus	veiny pea	Vascular Plant	Vine, Forb/herb
Liatris cylindracea	Ontario blazing star	Vascular Plant	Forb/herb
Ligusticum canadense	Canadian licorice-root	Vascular Plant	Forb/herb
Magnolia tripetala	umbrella-tree	Vascular Plant	Tree
Malaxis unifolia	green adder's-mouth orchid	Vascular Plant	Forb/herb
Opuntia cespitosa	eastern pricklypear cactus	Vascular Plant	Forb/herb
Packera paupercula	balsam groundsel	Vascular Plant	Forb/herb
Panax quinquefolius	American ginseng	Vascular Plant	Forb/herb
Passiflora incarnata	purple passionflower	Vascular Plant	Vine, Forb/herb
Penstemon pallidus	pale beardtongue	Vascular Plant	Forb/herb
Phacelia covillei	Coville's phacelia	Vascular Plant	Forb/herb

Scientific Name	Common Name	Group	Habit
Phaseolus polystachios	thicket bean	Vascular Plant	Vine, Forb/herb
Piptochaetium avenaceum	blackseed speargrass	Vascular Plant	Graminoid
Platanthera ciliaris	yellow fringed orchid	Vascular Plant	Forb/herb
Pleopeltis polypodioides	resurrection fern	Vascular Plant	Forb/herb, Vine
Polygala incarnata	procession flower	Vascular Plant	Forb/herb
Quercus falcata	southern red oak	Vascular Plant	Tree
Rhododendron periclymenoides	pink azalea	Vascular Plant	Shrub
Saccharum alopecuroidum	silver plumegrass	Vascular Plant	Graminoid
Scleria pauciflora	fewflower nutrush	Vascular Plant	Graminoid
Scleria triglomerata	whip nutrush	Vascular Plant	Graminoid
Scutellaria saxatilis	smooth rock skullcap	Vascular Plant	Forb/herb
Solidago odora	anisescented goldenrod	Vascular Plant	Forb/herb
Stenanthium gramineum	eastern featherbells	Vascular Plant	Forb/herb
Symphyotrichum oblongifolium	aromatic aster	Vascular Plant	Forb/herb
Triadenum tubulosum	lesser marsh St. Johnswort	Vascular Plant	Forb/herb
Triadenum walteri	greater marsh St. Johnswort	Vascular Plant	Forb/herb
Verbesina occidentalis	yellow crownbeard	Vascular Plant	Forb/herb
Viola lanceolata	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. 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. Scott provided valuable information on the most current conditions of known populations in 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.

Wildlife Species of Conservation Concern

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 (USFWS) 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 list of endangered and threatened species (ODNR 2018);
- ODW's Statewide Wildlife Action Plan Species of Greatest Conservation Need list (ODNR 2015);
- Forest Service, Eastern Region Regional Forester sensitive species list (USDA 2017)

Influenced by the shared stewardship approach sought at the outset of the Wayne's revision process and as set forth in the Forest Service Handbook, 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. Partners and recent new state observations prompted us to add several species for consideration (for example, common raven, blue crawfish, and additional fish and crayfish species; refer to appendix B).

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 (Pfingsten 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 Fish GIS Data (2018)
- Ohio Environmental Protection Agency, Division of Surface Water 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, or are not established or becoming established in the plan area, are not considered. 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 plan area (USDA Forest Service 2019a), the lists of species identified as candidates for consideration as wildlife species of conservation concern was generated (page 51). These candidate list 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.

Evaluating Potential Species of Conservation Concern

Following determinations on species status and known occurrences in the plan area that generated the list of species to be evaluated, a secondary process occurred. This secondary process involved evaluating the list of must and should consider species known from the plan

area to see whether they meet the definition of a species of conservation concern. If not, the rationale was documented, and if so, they were recommended as potential species of conservation concern and the rationale was documented. This process involved more deliberation and additional data-gathering. See appendix B for the worksheets of species evaluated, as well as the 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.

Eastern Region office staff, in coordination with the Wayne's forest plan revision team and other experts as needed, evaluated the best available scientific information to determine which species they recommended 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 *State Wildlife Action Plan* to develop its list of potential species of conservation concern (Mercer 2019). The *State Wildlife 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 State Wildlife 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 FSVeg 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 were considered to refine the list of species presented 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. See appendix B to see the evaluation of the factors listed below.

- 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 1: 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 *State Wildlife Action Plan*, specific to population trends in Ohio, as available. For most species, the *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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, forest 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 vernals 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 Ecosystems* and *Aquatic Ecosystems & Watersheds 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, *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 *State Wildlife 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 corralling 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 National Forest 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 *State Wildlife Action Plan*. Better information on current status is needed.
- Subfactor B: Distribution and Abundance in the Plan Area - Only known statewide 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. An "extreme habitat specialist" (Wells 2007). Completely terrestrial and fundamentally tied to shaded, moist (but not wet) sandstone and limestone rock outcrops and ledges embedded within mature deciduous forests. In the Wayne National Forest, they appear to only use sandstone rock outcrops. The rock outcrops must have suitable moist crevices for this species to retreat into, and cannot be sheer walls of unbroken rock. Will venture out of rock retreats on humid and moist nights, including on the ground and onto and up trees. Has been known to be found underneath peeling bark of standing dead or downed trees, especially in historic records. Sometimes reaches high population densities in logged areas where the tops are left.
  - 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: Ohio's populations of green salamanders are noteworthy. Not only are they exceedingly rare in the state, but these populations comprise a disjunct and apparently genetically isolated population compared to the rest of this species' range. The Wayne harbors some of the few known individuals of this noteworthy population. However, their extreme environmental specificity puts this species at a much heightened risk of extirpation from not only the Wayne, but Ohio as a whole. The multitude of threats this species faces calls into question their long-term persistence in the plan area and immediate surrounding area. Therefore, this species is identified as a potential species of conservation concern.

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.

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 Unglaciated 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 *Wayne National Forest Assessment*, 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% (see *Wayne National Forest Assessment*). 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 (USDA 2006).
  - Subfactor H: Threats in or relevant to the Plan Area – long-term threat is loss of young forest habitat due to succession and lack of fire, forest management, or regular large-scale natural disturbances. Also since the early 2000s in Ohio, mortality associated with the West Nile virus is of growing concern (personal communication, Mark Wiley, 2020).

SPECIES PROPOSED for potential species of conservation concern

RATIONALE for potential SCC determination: There have been drastic population declines of ruffed grouse in Ohio and specifically in the plan area. They have very narrow environmental specificity and have experienced a loss of early successional forest breeding habitat, as well as a necessary juxtaposition of young and mature forests and specific required conditions. Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time. They should respond well to even-aged forest management.

BASI: Ohio Department of Natural Resources. 2015. State Wildlife 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 (USFWS 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 State Wildlife Action Plan). This species was observed along 61 percent of the Wayne's Breeding Bird Survey routes in 2003 (USDA 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 (USDA 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% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (USDA 2018; see *Wayne National Forest Assessment*). 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 (USDA 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 *Wayne National Forest 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 National Forest 2006 Land Management Plan Final Environmental Impact Statement (USDA2006), 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. State Wildlife Action Plan. (http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/birds/cerulean-warbler obtained 1-2020).

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Candidate Wildlife Species of Conservation Concern

The following species were 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 section. See appendix B. Potential Wildlife Species of Conservation Concern for the assessments.

Mammals

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

Birds

Scientific Name	Common Name
Colinus virginanus	Northern Bobwhite
Ammodramus henslowii	Henslow's Sparrow
Circus cyaneus	Northern Harrier
Coccyzus erythropthalmus	Black-billed Cuckoo
Vermivora cyanoptera	Blue-winged Warbler
Helmitheros vermivorum	Worm-eating Warbler
Ardea alba	Great Egret
Scolopax minor	American Woodcock
Hylocichla mustelina	Wood Thrush
Parkesia motacilla	Louisiana Waterthrush
Accipiter striatus	Sharp-shinned Hawk
Protonotaria citrea	Prothonotary Warbler
Setophaga cerulea	Cerulean Warbler
Antrostomus vociferus	Eastern Whip-poor-will
Melanerpes erythrocephalus	Red-headed Woodpecker
Setophaga discolor	Prairie Warbler
Empidonax virescens	Acadian Flycatcher
Aix sponsa	Wood Duck
Ardea herodias	Great Blue Heron
Coccyzus americanus	Yellow-billed Cuckoo
Myiarchus chrinitus	Great Crested Flycatcher
Vireo flavifrons	Yellow-throated Vireo
Polioptila caerulea	Blue-gray Gnatcatcher
Mniotilta varia	Black-and-white Warbler
Setophaga ruticilla	American Redstart

Scientific Name	Common Name
Sturnella magna	Eastern Meadowlark
Icteria virens	Yellow-breasted Chat
Chaetura pelagica	Chimney Swift
Setophaga citrina	Hooded Warbler
Ammodramus savannarum	Grasshopper Sparrow
Spizella pusilla	Field Sparrow
Geothlypis formosa	Kentucky Warbler
Bonasa umbellus	Ruffed Grouse

Reptiles

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

Amphibians

Scientific Name	Common Name
Aneides aeneus	Green Salamander
Gyrinophilus porphyriticus porphyriticus	Northern Spring Salamander
Cryptobranchus alleganiensis	Eastern Hellbender
Hemidactylium scutatum	Four-toed Salamander
Necturus maculosus	Mudpuppy
Ambystoma jeffersonianum	Jefferson Salamander
Pseudotriton ruber ruber	Northern Red Salamander
Ambystoma opacum	Marbled Salamander
Pseudotriton montanus	Mud Salamander
Eurycea longicauda longicauda	Longtailed Salamander
Desmognathus fuscus fuscus	Northern Dusky Salamander
Pseudacris brachyphona	Mountain Chorus Frog
Notophthalmus viridescens viridescens	Red-spotted Newt
Pseudacris triseriata triseriata	Western Chorus Frog
Rana sylvatica	Wood Frog

Fish

Scientific Name	Common Name
Moxostoma duquesnei	Black Redhorse

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

Invertebrates – Bivalves & Mollusks

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

Invertebrates - Crustaceans

Scientific Name	Common Name
Cambarus diogenes	Devil Crayfish
Orconectes sanbornii	Sanborn's Crayfish
Cambarus robustus	Big Water Crayfish
Cambarus thomai	Little Brown Mudbug
Orconectes cristavarius	Spiny Stream Crayfish

Invertebrates - Insects

Dragonflies and Damselflies (Odonates)

Scientific Name	Common Name
Gomphus viridifrons	Green-faced Clubtail
Stylurus notatus	Elusive Clubtail

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

Butterflies (Lepidopterans)

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

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 A. Potential Plant Species of Conservation Concern

The following worksheets identify all the lichenous, nonvascular, and vascular species that were evaluated for potential species of conservation concern. Reviewers include Richard L. Gardner (Ohio Department of Natural Resources), Gerald Scott (Forest Service – Wayne National Forest), Jeffrey Rebitzke (Forest Service – Eastern Region), and Lisa Kluesner (Forest Service – Wayne National Forest). All species that have been identified as potential species of conservation concern appear at the top of their taxa group (e.g., lichen, moss, tree, shrub, etc.), and are also summarized in table 9.

Table 9. The potential recommended plant species of conservation concern.

Group	Common Name	Scientific Name	Recommended as Species of Conservation Concern
Lichenous	Carolina Canoparmelia Lichen	*Canoparmelia caroliniana*	Yes
Lichenous	Pink Dot Lichen	*Dibaeis absoluta*	Yes
Lichenous	Farinose Cartilage Lichen	*Ramalina farinacea*	Yes
Lichenous	Intermediate Cartilage Lichen	*Ramalina intermedia*	Yes
Lichenous	Cartilage Lichen	*Ramalina pollinaria*	Yes
Nonvascular Plants (Moss)	Campylostelium Moss	*Campylostelium saxicola*	Yes
Nonvascular Plants (Moss)	Loeskeobryum Moss	*Loeskeobryum brevirostre*	Yes
Vascular Plants (Tree)	Butternut	*Juglans cinerea*	Yes
Vascular Plants (Tree/Shrub)	White Fringetree	*Chionanthus virginicus*	Yes
Vascular Plants (Tree/Shrub)	Dwarf Hawthorn	*Crataegus uniflora*	Yes
Vascular Plants (Shrub)	Pink Azalea	*Rhododendron periclymenoides*	Yes
Vascular Plants (Graminoid)	Porter's Reedgrass	*Calamagrostis porteri*	Yes
Vascular Plants (Graminoid)	Giant Sedge	*Carex gigantea*	Yes
Vascular Plants (Graminoid)	Louisiana Sedge	*Carex louisianica*	Yes
Vascular Plants (Graminoid)	Appalachian Quillwort	*Isoetes engelmannii*	Yes
Vascular Plants (Graminoid)	Blackseed Speargrass	*Piptochaetium avenaceum*	Yes
Vascular Plants (Graminoid)	Silver Plumegrass	*Saccharum alopecuroides*	Yes
Vascular Plants (Forb/Vine)	Cusp Dodder	*Cuscuta cuspidata*	Yes
Vascular Plants (Forb/Vine)	Veiny Pea	*Lathyrus venosus*	Yes
Vascular Plants (Forb/Vine)	Purple Passionflower	*Passiflora incarnata*	Yes
Vascular Plants (Forb/Vine)	Thicket Bean	*Phaseolus polystachios*	Yes
Vascular Plants (Forb/Vine)	Resurrection Fern	*Pleopeltis polypodioides*	Yes
Vascular Plants (Forb/Herb)	Fernleaf Yellow False Foxglove	*Aureolaria pedicularia*	Yes
Vascular Plants (Forb/Herb)	Forkleaf Toothwort	*Cardamine dissecta*	Yes

Group	Common Name	Scientific Name	Recommended as Species of Conservation Concern
Vascular Plants (Forb/Herb)	Soft Thistle	*Cirsium carolinianum*	Yes
Vascular Plants (Forb/Herb)	Godfrey's Thoroughwort	*Eupatorium godfreyanum*	Yes
Vascular Plants (Forb/Herb)	Pink Thoroughwort	*Eupatorium incarnatum*	Yes
Vascular Plants (Forb/Herb)	Plain Gentian	*Gentiana alba*	Yes
Vascular Plants (Forb/Herb)	Striped Gentian	*Gentiana villosa*	Yes
Vascular Plants (Forb/Herb)	Littleflower Alumroot	*Heuchera parviflora*	Yes
Vascular Plants (Forb/Herb)	Canadian Licorice-Root	*Ligusticum canadense*	Yes
Vascular Plants (Forb/Herb)	Balsam Groundsel	*Packera paupercula*	Yes
Vascular Plants (Forb/Herb)	Pale Beardtongue	*Penstemon pallidus*	Yes
Vascular Plants (Forb/Herb)	Coville's Phacelia	*Phacelia covillei*	Yes
Vascular Plants (Forb/Herb)	Yellow Fringed Orchid	*Platanthera ciliaris*	Yes
Vascular Plants (Forb/Herb)	Procession Flower	*Polygala incarnata*	Yes
Vascular Plants (Forb/Herb)	Smooth Rock Skullcap	*Scutellaria saxatilis*	Yes
Vascular Plants (Forb/Herb)	Anisescented Goldenrod	*Solidago odora*	Yes
Vascular Plants (Forb/Herb)	Eastern Featherbells	*Stenanthium gramineum*	Yes
Vascular Plants (Forb/Herb)	Greater Marsh St. Johnswort	*Triadenum walteri*	Yes

The habitats and habitat integrity trends used follow the ecosystem classifications and associated integrity ratings described in the *Terrestrial Ecosystems Supplemental Report* and the *Aquatic Ecosystems & Watersheds Supplemental Report*. All terrestrial species' habitats include the vegetation class each species is dependent upon. For some species, habitats are more specific than the ecosystems, so smaller classes are presented when appropriate. See table 10 for a breakdown of each terrestrial and aquatic ecosystem. In addition to detailing what the habitat is for each species, an environmental specificity statement is applied based on life history. See table 11 for an explanation of the different environmental specificity statements.

Table 10. Ecosystem types used in the species of conservation concern evaluation process (see *Terrestrial Ecosystems Supplemental Report* and *Aquatic Ecosystems & Watersheds Supplemental Report* for more details)

Term	Basic Descriptions
Primary Headwater Streams	The smallest streams, with average annual flows generally less than 2-5 cubic feet/second. They can be categorized as ephemeral, intermittent, perennial warmwater habitat, or perennial coldwater habitat.
Larger Streams & Rivers	Wadeable streams with pool depths greater than 40 cm, year-round flow, and drainage areas greater than 20 square miles; and larger rivers, or "boatable waters," usually larger than 5th order, too large to safely wade and must be accessed by boat.
Wetlands	Classified as either lacustrine (associated with large lake basins usually larger than 20 acres and shallow at the edges), riverine (contained within a channel and associated with flowing waters), or palustrine (associated with smaller basins or depressions, usually smaller than 20 acres with no wave action and depths less than 2 meters).
Lakes, Ponds & Reservoirs	Lakes are large inland filled basins that fed and drained by streams or rivers; ponds are smaller and shallower than lakes; reservoirs are human-made impoundments created by building a dam or otherwise altering a stream or river to fill a basin.

Term	Basic Descriptions
Groundwater-Dependent Systems	Localized points in aquatic ecosystems at which at which groundwater is discharged to the surface, and include springs and seeps. Springs are defined by flowing water at the point of discharge, while seeps are where water slowly discharges, forming a wet area at the surface.
Dry Oak Forest	Oak-dominated landtype occurring on rugged upland positions, primarily ridgetops and southwest-facing upper slopes.
Class A	Age class 0-3 years, herbaceous (grassland/savanna) maintained by frequent fire, herbaceous cover 0-100%
Class B	Age class 4-19 years, early tree regeneration phase including saplings <5" DBH, shrub cover 0-30%
Class C	Age class 20+ years, mid-seral open oak-hickory savannas and woodlands, canopy cover 21-60%, tree size class 9-21" DBH, maintained by surface fires every 5-15 years
Class D	Age class 20+ years, late seral closed canopy oak-hickory forest, canopy cover 61-80%, tree size class 9-21" DBH, surface fires every 10 years will maintain this class but a mixed fire will return to Class C
Dry-Mesic Mixed Oak Hardwood Forest	Occurs primarily on midslope positions, especially northeast-facing slopes; oak dominated but also includes mixed hardwoods.
Class A	Age class 0-2 years, herbaceous (grassland) maintained by frequent fire, herbaceous cover 0-100%
Class B	Age class 3-19 years, early tree regeneration phase including saplings <5" DBH, shrub cover 0-60%
Class C	Age class 20-100 years, open oak woodland, canopy cover 21-60%, tree size class 21-33" DBH, maintained by frequent surface fires
Class D	Age class 101+ years, closed oak forest, 61-80% canopy cover, tree size class 21-33" DBH, maintained by surface fires on average every 13 years
Class E	Class E: Age class 101+ years, mixed mesophytic forest resulting from absence of fire in excess of 70 years, maintained by gap-phase dynamics
Rolling Bottomlands Mixed Hardwood Forest	Occurs on mesic-to-wet, lower topographic positions encompassing broad-to-narrow valley floors and surrounding toeslopes.
Small Stream Riparian Forest	A matrix of uplands and wetlands found along creeks, small streams, and medium rivers with low to moderately high gradients and oxbows; flooding and scouring influence the system but the nature of the landscape prevents the kind of floodplain development found along larger rivers.
Large Floodplain & Riparian Forest	A complex of wetland and upland vegetation associated with medium to large rivers or streams where topography and alluvial processes have resulted in a well-developed floodplain.
Class A	Herbaceous mesic-to-wet grassland and meadows maintained by frequent fire and hydrologic influences
Class B	Early tree regeneration phase including saplings <5" DBH
Class C	Open-to-closed oak woodland and forest, maintained by periodic surface fires and hydrologic influences
Class D	Mixed mesophytic forest
Reclaimed Grassland	Formerly strip-mined lands that have been reclaimed and vegetated with herbaceous vegetation.

Table 11. Environmental specificity statements

Category	Environmental Specificity Definition
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	Unknown

Throughout the worksheets, different conservation categories are noted and taken into account. These conservation categories are applied to various species by various government and non-government entities. Table 12 explains the different NatureServe rankings. Table 13 explains the different State of Ohio species listing levels. Other categories include the Forest Service regional forest sensitive species designation and U.S. Fish & Wildlife Service species of concern designation.

Table 12. NatureServe rankings

Rank	Rank Definition
G1	Critically Imperiled Globally - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled Globally - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable Globally - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

Rank	Rank Definition
T#	Infraspecific Taxon (trinomial) Globally - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
G4	Apparently Secure Globally - At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	Secure Globally - At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
S1	Critically Imperiled in the State - At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2	Imperiled in the State - At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3	Vulnerable in the State - At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4	Apparently Secure in the State - At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5	Secure in the State - At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

Table 13. State of Ohio designations

Acronym	Conservation Categories
E	Endangered: A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes, such as habitat loss, pollution, predation, interspecific competition, or disease.
T	Threatened: A native species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in its becoming endangered.
SC	Species of Concern: A native species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern, but for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species, but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.
SGCN	State Action Plan Species of Greatest Conservation Need

Go to next page for worksheets.

Lichenous

Carolina Canoparmelia Lichen (*Canoparmelia caroliniana* (Nyl.) Elix & Hale[2])

Group: Lichen

Conservation Categories: NatureServe rank G3S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time.

Rationale for SCC Determination:

Ohio is the edge of its range. It is most common in the southeastern states.

Key ecosystem characteristic(s):

[2] All scientific and common names follow the United States Department of Agriculture Natural Resources Conservation Service PLANTS Database naming convention and taxonomic authority

Bark of trees in large, forested floodplains

Pink Dot Lichen (*Dibaeis absoluta* (Tuck.) Kalb & Gierl)

Group: Lichen

Conservation Categories: NatureServe rank G4S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

7

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time. However, rock climbing at recreation sites can pose a moderate threat of trampling.

Rationale for SCC Determination:

This lichen has a very specific habitat.

Key ecosystem characteristic(s):

Moist crevices of sandstone rocks/cliffs

Farinose Cartilage Lichen (*Ramalina farinacea* (L.) Ach.)

Group: Lichen

Conservation Categories: NatureServe rank G5S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

2

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time.

Rationale for SCC Determination:

Ohio is the edge of its range. It is most common in the northeastern states.

Key ecosystem characteristic(s):

Bark of trees in large, forested floodplains

Intermediate Cartilage Lichen (*Ramalina intermedia* (Delise ex Nyl.) Nyl.)

Group: Lichen

Conservation Categories: NatureServe rank G5S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

Zero currently recorded from the plan area, but known populations within 100 meters and predicted to occur in the Wayne National Forest as a result.

Population Occurrences in the State:

6

Habitat:

Dry Oak Forest (All classes)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time.

Rationale for SCC Determination:

The population is within about 100 meters of the Wayne National Forest and likely occurs within the boundaries of the national forest. It is most common in the Hocking Hills Region and was recently found in northeast Ohio.

Key ecosystem characteristic(s):

Dry sandstone outcrops

Cartilage Lichen (*Ramalina pollinaria* (Westr.) Ach.)

Group: Lichen

Conservation Categories: NatureServe rank G4S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

10

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession.

Rationale for SCC Determination:

This lichen has a very specific habitat.

Key ecosystem characteristic(s):

On sandstone

Texas Canoparmelia Lichen (*Canoparmelia texana* (Tuck.) Elix & Hale)

Group: Lichen

Conservation Categories: NatureServe rank G3S2

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

14

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest (Class B, C, D)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time.

Rationale for SCC Determination:

According to lichenologist Ray Showman, this species is not uncommon in southern Ohio and suitable habitat is not rare (personal communication, Showman, 2018).

Key ecosystem characteristic(s):

Bark of chestnut oaks

Showman's Hypotrachyna Lichen (*Hypotrachyna showmanii* Hale)

Group: Lichen

Conservation Categories: NatureServe rank G3G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

Unknown

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest (Class B, C, D)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats have been identified at this time.

Rationale for SCC Determination:

According to lichenologist Ray Showman, this species is not uncommon in southern Ohio and is under-reported in the literature (personal communication, Showman, 2018). It is recorded in at least nine counties in south-central Ohio.

Key ecosystem characteristic(s):

Bark of chestnut oak trees

Best Available Scientific Information

Ohio Department of Natural Resources. 2018. Ohio Rare Plant Abstracts. Columbus (OH): Ohio Department of Natural Resources.

Ohio Department of Natural Resources. 2020. Ohio Natural Heritage Database. Columbus (OH): Ohio Department of Natural Resources.

Showman RE, Flenniken DG. 2004. The macrolichens of Ohio. Columbus (OH): Ohio Biological Survey.

Showman, Ray. 2018. Personal Communication.

Nonvascular

Campylostelium Moss (*Campylostelium saxicola* (F. Weber & D. Mohr) Bruch & Schimp.)

Group: Moss

Conservation Categories: NatureServe rank G3S2; Ohio Threatened; Forest Service Regional Forest Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

6

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Severe changes in canopy caused by non-compatible land use.

Rationale for SCC Determination:

The NatureServe rank for this species is S2, it has Federal high priority for conservation, and it is listed as threatened in Ohio.

Key ecosystem characteristic(s):

Moist sandstone rocks/cliffs

Loeskeobryum Moss (*Loeskeobryum brevirostre* (Brid.) Fleisch.)

Group: Moss

Conservation Categories: NatureServe rank G5S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

1

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Severe changes in canopy caused by hemlock wooly adelgid, and non-compatible land uses. The population size of its current occurrence is unknown.

Rationale for SCC Determination:

This moss is state endangered with an S1 rank.

Key ecosystem characteristic(s):

Moist sandstone rocks/cliffs

Dichelyma Moss (*Dichelyma capillaceum* (With.) Myr.)

Group: Moss

Conservation Categories: NatureServe rank G5S1; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Sedimentation from severe flood events.

Rationale for SCC Determination:

This species has recently been discovered at a number of sites in northeastern Ohio that are not in the Ohio Natural Heritage Database (personal communication, Bissell J, 2018). The moss is likely overlooked and was downgraded from Ohio endangered to threatened in 2020. The three sites in the database are from southern Ohio.

Key ecosystem characteristic(s):

Base of shrubs in buttonbush swamps

Best Available Scientific Information

Ohio Department of Natural Resources. 2018. Ohio Rare Plant Abstracts. Columbus (OH): Ohio Department of Natural Resources.

Ohio Department of Natural Resources. 2020. Ohio Natural Heritage Database. Columbus (OH): Ohio Department of Natural Resources.

Vascular

Butternut (*Juglans cinerea* L.)

Group: Tree

Conservation Categories: NatureServe rank G4S4; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

18

Population Occurrences in the State:

321[3]

Habitat:

[3] Includes historical records.

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

While there are over 300 occurrences in the Ohio Natural Heritage Database (Ohio Department of Natural Resources 2020) with additional records not added, butternut canker has resulted in declines in this species throughout its range (Schultz 2003). Seedlings are extremely rare and, unlike American chestnut (*Castanea dentata*), resprouting from the base is extremely rare. Butternut also hybridizes with the introduced Japanese walnut (*Juglans ailantifolia*) (Hoban et al. 2009). Most of the 300 occurrences in the database have not been revisited in the last 15 years and long-term viability is considered poor.

Rationale for SCC Determination:

Federal high priority for conservation.

Key ecosystem characteristic(s):

None identified

White Fringetree (Chionanthus virginicus L.)

Group: Shrub, Tree

Conservation Categories: NatureServe rank G5S2; Ohio Potentially Threatened; Forest Service Regional Forest Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

6

Population Occurrences in the State:

20

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest (Class B, C); Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Emerald ash borer attacks this species. Some populations have already disappeared due to this threat. Individuals close to roads are often dug up for landscaping.

Rationale for SCC Determination:

Emerald ash borer is a serious threat to the long-term viability of this 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.

Key ecosystem characteristic(s):

None identified

Dwarf Hawthorn (*Crataegus uniflora* Münchh.)

Group: Shrub, Tree

Conservation Categories: NatureServe rank G5S2; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

5

Population Occurrences in the State:

17

Habitat:

Dry Oak Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Loss of habitat due to succession; too frequent fire intervals; non-native invasive species

Rationale for SCC Determination:

Habitat is rare. Susceptible to extirpation if habitat is not maintained.

Key ecosystem characteristic(s):

Barrens often on limestone-based soils

Umbrella-Tree (*Magnolia tripetala* (L.) L.)

Group: Tree

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

4

Population Occurrences in the State:

74

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Incompatible land uses

Rationale for SCC Determination:

Over 70 occurrences state-wide and no signs of decline. Recently found at new locations extending its range into southern Ohio. Locally common in Shawnee State Forest and Lake Katharine State Nature Preserve areas.

Key ecosystem characteristic(s):

None identified

Southern Red Oak (*Quercus falcata* Michx.)

Group: Tree

Conservation Categories: NatureServe rank G4S4; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

8

Population Occurrences in the State:

31

Habitat:

Dry Oak Forest (Class B, C, D)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Non-native invasive species

Rationale for SCC Determination:

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 northern edge of its range. Climate change modeling indicates a range expansion across all scenarios (Prasad et al. 2007).

Key ecosystem characteristic(s):

None identified

Pink Azalea (*Rhododendron periclymenoides* (Michx.) Shinners)

Group: Shrub

Conservation Categories: NatureServe rank G4S4; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

10

Population Occurrences in the State:

14

Habitat:

Dry Oak Forest (Class C, D); Dry-Mesic Mixed Oak Hardwood Forest (Class C, D, E)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This species is at the edge of its range in the plan area. Habitat loss due to succession threatens it.

Key ecosystem characteristic(s):

Acidic soils

Devil's-tongue (*Opuntia humifusa* (Raf.) Raf.)

Group: Shrub

Conservation Categories: NatureServeG5S3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

36

Habitat:

Dry Oak Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Ohio Department of Natural Resources lists this species as *O. cespitosa*, which is not recognized by USDA PLANTS database. Over 30 extant occurrences statewide, most occurring in northwest Ohio. The only occurrence in the Wayne grows along an old railroad bed. This population may be an escape from a local planting.

Key ecosystem characteristic(s):

Barrens

Pipsissewa (*Chimaphila umbellata* (L.) W.P.C. Barton)

Group: Subshrub

Conservation Categories: NatureServe rank G5S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

0

Population Occurrences in the State:

14[4]

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest: Dry/mesic oak forest [*upper and middle slopes*] (Class B, C, D); Rolling Bottomland Mixed Hardwood Forest: Dry/mesic oak forest [*lower slopes*] (Class B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Deer browse; non-native invasive species

Rationale for SCC Determination:

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. It is possible this species is now extirpated from southeast Ohio.

Key ecosystem characteristic(s):

None identified

Porter's Reedgrass (*Calamagrostis porteri* A. Gray ssp. *insperata* (Swallen) C.W. Greene)

Group: Graminoid

Conservation Categories: NatureServe rank G4S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

[4] Includes historic occurrences

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

20

Habitat:

Dry Oak Forest (Class A, B); Dry-Mesic Mixed Oak Hardwood Forest (A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

Fire or other disturbance is required to stimulate flowering/fruiting.

Threats Relevant In or To the Plan Area:

Over shading through succession is a major concern.

Rationale for SCC Determination:

This species is listed as threatened in Ohio and has a NatureServe rank of S2. It experiences poor sexual reproduction and is susceptible to extirpation if habitat is not maintained by prescribed fire, thinning, or a combination of both.

Key ecosystem characteristic(s):

Well-drained, typically acidic ridgetops and clifftops exposed to direct sun and semi-shade; does not extent into the adjacent forest

Giant Sedge (*Carex gigantea* Rudge)

Group: Graminoid

Conservation Categories: NatureServe rank G4S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

1

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest – Pin Oak Mixed Hardwood Depression Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Unauthorized off-highway vehicle use; non-native invasive species

Rationale for SCC Determination:

Population is the furthest east for its range. Habitat is rare in Ohio. Surveys have failed to find it in similar habitats in the Wayne or other sites in extreme southern Ohio.

Key ecosystem characteristic(s):

Vernal pools in flatwoods

Louisiana Sedge (*Carex louisianica* L.H. Bailey)

Group: Graminoid

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

6

Population Occurrences in the State:

10

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest – Pin Oak Mixed Hardwood Depression Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Unauthorized off-highway vehicle use; non-native invasive species

Rationale for SCC Determination:

Suitable habitat is rare. After its initial discovery at Lick Branch Special Interest Area, it has been found in similar habitats in the same general area along Symmes Creek. Searches outside of this area have been unsuccessful. The Wayne has 60% of the known populations in Ohio.

Key ecosystem characteristic(s):

Vernal pools in flatwoods

Appalachian Quillwort (*Isoetes engelmannii* A. Braun)

Group: Graminoid

Conservation Categories: NatureServe rank G4S1; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

5

Habitat:

Wetlands: Riverine, Lacustrine

Habitat Integrity Trend in Plan Area:

Moderate-High Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Deer browse; non-native invasive species

Rationale for SCC Determination:

Sensitive to changes in hydrology. It has become extirpated in northern Ohio.

Key ecosystem characteristic(s):

Shallow water of ponds and along riverine wetlands

Blackseed Speargrass (*Piptochaetium avenaceum* (L.) Parodi)

Group: Graminoid

Conservation Categories: NatureServe rank G5S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

2

Habitat:

Dry Oak Forest (Class A, B); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Primary concern is overshading by woody vegetation.

Rationale for SCC Determination:

This species is at the northern limit of its range and likely was never common in Ohio.

Key ecosystem characteristic(s):

Openings within dry and dry-mesic oak-dominated forests

Silver Plumegrass (*Saccharum alopecuroides* (L.) Nutt.)

Group: Graminoid

Conservation Categories: NatureServe rank G5S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Dry Oak Forest (Class A, B); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

At the edge of its range in southern Ohio. It may be benefitting from climate change. It is a recent new discovery in the Wayne National Forest.

Key ecosystem characteristic(s):

Edges of woodlands on acidic soils

Bushy Bluestem (*Andropogon glomeratus* (L.) W.P.C. Barton)

Group: Graminoid

Conservation Categories: NatureServe rank G5S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Dry Oak Forest (Class A); Dry-Mesic Mixed Oak Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

The only known site has been greatly altered and is likely extirpated from the Wayne. In Ohio, *A. glomeratus* has been documented in highly disturbed habitats, roadsides, and edges of thickets.

Key ecosystem characteristic(s):

Meadows along the edges of oak-dominated forests

Best Available Scientific Information:

Ohio Natural Heritage Database; Ohio Department of Natural Resources

Hirsute sedge (*Carex complanata* Torr. & Hook.)

Group: Graminoid

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

4

Population Occurrences in the State:

9

Habitat:

Dry Oak Forest (Class A, B); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

New populations are being found in south-central Ohio. Habitat is not rare in the Ironton Ranger District.

Key ecosystem characteristic(s):

None identified

Fringed Sedge (*Carex crintita* Lam. var. *brevicrinis* Fernald)

Group: Graminoid

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

9

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Unauthorized off-highway vehicle use; non-native invasive species

Rationale for SCC Determination:

This species is often overlooked due to its very similar appearance to the common *Carex crinita* var. *crinita.* It is likely more common than currently known. Habitat is not rare in the Ironton Ranger District.

Key ecosystem characteristic(s):

Edges of swamps in floodplain forests

Juniper Sedge (*Carex juniperorum* Catling, Reznicek & Crins)

Group: Graminoid

Conservation Categories: NatureServe rank G3S3; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

12

Population Occurrences in the State:

82

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Locally common in xeric limestone prairies in Adams County where most of the 82 recorded state occurrences are location. Scattered in barrens in south-central Ohio.

Key ecosystem characteristic(s):

Barrens

Best Available Scientific Information:

Ohio Natural Heritage Database

Reznicek's Sedge (*Carex reznicekii* Werier)

Group: Graminoid

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

12

Habitat:

Dry Oak Forest (Class A, B, C); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This is a recently described species and its range and abundance are still being determined. It has dropped from Ohio endangered to potentially threatened in 10 years. Based on the trend, it will likely be found in additional areas in southern Ohio. Its preferred habitat is frequent in south-central Ohio.

Key ecosystem characteristic(s):

None identified

Lined Sedge (*Carex striatula* Michx.)

Group: Graminoid

Conservation Categories: NatureServe rank G4S1; Ohio Extirpated; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

0

Population Occurrences in the State:

2

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Dry/mesic oak forest [*lower slopes*] (Class C), Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Non-native invasive species

Rationale for SCC Determination:

Ohio Department of Natural Resources has surveyed the site a couple times without success locating any plants. Species is now presumed extirpated in Ohio. They Wayne National Forest specimen was recently determined as *Carex laxiflora* by Jenna Dorey who is writing a new taxonomic treatment on the *C. laxiflora* 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 the Wayne National Forest.

Key ecosystem characteristic(s):

None identified

Whitehair Rosette Grass (*Dichanthelium villosissimum* (Nash) Freckman)

Group: Graminoid

Conservation Categories: NatureServe rank G5S2; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

17

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

New populations are being found in south-central Ohio. Habitat is not rare in the Ironton Ranger District.

Key ecosystem characteristic(s):

Well-drained, acidic soils

Cypress Panicgrass (*Dichanthelium dichotomum* (L.) Gould var. *dichotomum*)

Group: Graminoid

Conservation Categories: NatureServe rank GNS2; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

20

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest: Dry/mesic oak forest [*middle slopes*] (Class C, D); Rolling Bottomlands Mixed Hardwood Forest: Dry/mesic oak forest [*lower slopes*] (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

The Forest Service recognizes this as a variety, while the Ohio Department of Natural Resources currently accepts this as a separate species, *Dichanthelium yadkinense*. A number of new populations have been discovered in the last 15 years.

Key ecosystem characteristic(s):

Well-drained, acidic soils

Fewflower Nutrush (*Scleria pauciflora* Muhl. ex Willd.)

Group: Graminoid

Conservation Categories: NatureServe rank G5S3; Ohio Watch List

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

36

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession.

Rationale for SCC Determination:

Numerous new occurrences have been found within the last 10 years and was downgraded to "watch list" ranking by the Ohio Department of Natural Resources in 2020. It responds favorably to fire and often germinates from the seedbank after a fire (e.g., found at 2 sites in the Wayne after fire).

Key ecosystem characteristic(s):

Barrens

Whip Nutrush (*Scleria triglomerata* Michx.)

Group: Graminoid

Conservation Categories: NatureServe rank G5S3; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

3

Population Occurrences in the State:

48

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Northwest Ohio is this species' stronghold, but it is locally frequent in south-central Ohio. It responds favorably to fire like the other two nutrushes.

Key ecosystem characteristic(s):

Barrens

Cusp Dodder (*Cuscuta cuspidata* Engelm.)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Non-native invasive species

Rationale for SCC Determination:

Dodder seems to be rare throughout its range. Dodders are difficult to identify and may be more frequent that currently known.

Key ecosystem characteristic(s):

Often on asters

Veiny Pea (*Lathyrus venosus* Muhl. ex Willd.)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

5

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

All known populations add up to <20 individuals. These small populations have little recorded flowering stems, and it has poor long-term viability throughout Ohio range. Species is susceptible to extirpation if habitat is not maintained.

Key ecosystem characteristic(s):

Barrens

Purple Passionflower (*Passiflora incarnata* L.)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

10

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D), Large stream floodplain and riparian forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

There have been declines in populations along the Ohio River.

Key ecosystem characteristic(s):

Edges

Thicket Bean (*Phaseolus polystachios* (L.) Britton, Sterns & Poggenb.)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

5

Population Occurrences in the State:

23

Habitat:

Dry Oak Forest (Class A); Dry-Mesic Mixed Oak Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This species is ranked S3; however, suitable habitat is rare in the Wayne and is susceptible to extirpation if habitat is not maintained by prescribed fire, thinning, or a combination of both. Ohio Department of Natural Resources botanists have failed to find several populations in Ohio due to overshading from lack of disturbance.

Key ecosystem characteristic(s):

Openings within the oak-dominated systems, well-drained soils

Resurrection Fern (*Pleopeltis polypodioides* (L.) Andrews & Windham)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S3; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

18

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest (Class C, D)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Drying of habitat due to canopy loss

Rationale for SCC Determination:

Several new sites have been found in the last 10 years, possibly as a result of climate change. However, most populations are very small and can easily disappear.

Key ecosystem characteristic(s):

Dolomite, limestone, or sandstone rocks

Atlantic Pigeonwings (*Clitoria mariana* L.)

Group: Forb/herb, Vine

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

11

Population Occurrences in the State:

35

Habitat:

Dry Oak Forest (Class C); Dry-Mesic Mixed Oak Hardwood Forest (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

A species that requires open woodlands, edges. A disturbance-dependent species that is 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.

Key ecosystem characteristic(s):

None identified

Best Available Scientific Information:

Ohio Natural Heritage Database; Ohio Department of Natural Resources

Fernleaf Yellow False Foxglove (*Aureolaria pedicularia* (L.) Raf. var. *pedicularia*)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

3

Habitat:

Dry Oak Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

Parasitic on oaks

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; deer browse

Rationale for SCC Determination:

Wayne National Forest has the largest population in the state. It is susceptible to extirpation if habitat is not maintained by prescribed fire and/or thinning.

Key ecosystem characteristic(s):

Open woodlands

Forkleaf Toothwort (*Cardamine dissecta* (Leavenworth) Al-Shehbaz)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

35

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Hybridization; habitat loss due to incompatible land use

Rationale for SCC Determination:

Over 30 occurrences statewide; however, it is rare to find "pure" *C. dissecta* in Ohio. Many populations have plants with intermediate characteristics when growing with other toothworts (Johnson and Murray 1990; McCance and Burns 1984)

Key ecosystem characteristic(s):

None identified

Soft Thistle (*Cirsium carolinianum* (Walter) Fernald & B.G. Schub)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

4

Population Occurrences in the State:

15

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Suitable habitat is rare. Most populations in Ohio are small. Species may become S1 in the next 10 years.

Key ecosystem characteristic(s):

Barrens

Godfrey's Thoroughwort (*Eupatorium godfreyanum* Cronquist)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S1; Ohio Endangered

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

4

Habitat:

Dry Oak Forest (Class A, B); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Known from a few, small populations. The Wayne is at the northern edge of its range.

Key ecosystem characteristic(s):

Well-drained, acidic soils

Pink Thoroughwort (*Eupatorium incarnatum* (Walter) R.M. King & H. Rob)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

31

Habitat:

Dry Oak Forest (Class A); Dry-Mesic Mixed Oak Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession from lack of disturbance; non-native invasive species

Rationale for SCC Determination:

There have been steep declines in number and size of populations in the last 20 years. Early successional habitats are maturing, shading plants out.

Key ecosystem characteristic(s):

Well-drained, acidic soils

Plain Gentian (*Gentiana alba* Muhl. ex Nutt.)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

3

Population Occurrences in the State:

11

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Small (1 to 75 plants), isolated populations throughout its Ohio range.

Key ecosystem characteristic(s):

Barrens on limestone

Striped Gentian (*Gentiana villosa* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S1; Ohio Potentially Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

5

Population Occurrences in the State:

11

Habitat:

Dry Oak Forest (Class A); Dry-Mesic Mixed Oak Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

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 55 known sites. Four populations have been found in the Wayne since 2000.

Key ecosystem characteristic(s):

Openings

Littleflower Alumroot (*Heuchera parviflora* Bartlett)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S3; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

46

Population Occurrences in the State:

56

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Loss of canopy; illegal rock climbing

Rationale for SCC Determination:

Species is S3 and locally common; however, it is habitat specific and susceptible to extirpation if habitat is not maintained. The Wayne is at the northern limit of its range.

Key ecosystem characteristic(s):

Moist crevices of sandstone cliffs and rock shelters

Canadian Licorice-Root (*Ligusticum canadense* (L.) Britton)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

1

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Unauthorized off-highway vehicle use; non-native invasive species

Rationale for SCC Determination:

The Wayne has the only site (single record with a few individuals) and off-highway vehicles are frequent in the valley where the few plants were discovered. Southern Ohio is the northern limit of its range.

Key ecosystem characteristic(s):

None identified

Balsam Groundsel (*Packera paupercula* (Michx.) Á. Löve & D. Löve)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

24

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This species is ranked S3; however, suitable habitat is rare in the Wayne and is susceptible to extirpation if habitat is not maintained by prescribed fire and/or thinning. Dozens of acres are being lost every year due to limestone quarry activity in northern Ohio.

Key ecosystem characteristic(s):

Barrens on limestone

Pale Beardtongue (*Penstemon pallidus* Small)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

16

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Rare in the Wayne, and most populations in the Ohio area are small and along roadsides. Species is susceptible to extirpation if habitat if not maintained.

Key ecosystem characteristic(s):

Dry, open rocky areas on well-drained soils

Coville's Phacelia (*Phacelia covillei* S. Watson)

Group: Forb/herb

Conservation Categories: NatureServe rank G3S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

3

Habitat:

Dry Oak Forest (Class C); Dry-Mesic Mixed Oak Hardwood Forest: Dry/mesic oak forest [*upper and mid slopes*] (Class C); Rolling Bottomland Mixed Hardwood Forest: Dry/mesic oak forest [*lower slopes*] (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Primary concern is non-native invasive species

Rationale for SCC Determination:

The Wayne has two-thirds of the populations in Ohio, one of which is the largest population.

Key ecosystem characteristic(s):

Dry to mesic well-drained open woodlands and small stream terraces

Yellow Fringed Orchid (*Platanthera ciliaris* (L.) Lindl)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

20

Habitat:

Rolling Bottomland Mixed Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Habitat requires frequent management. Most of southern Ohio populations are a few individuals and some have become extirpated.

Key ecosystem characteristic(s):

Moist, acidic meadows; wet sand, boggy meadows

Procession Flower (*Polygala incarnata* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

9

Habitat:

Dry Oak Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

Recently found in the Wayne in a powerline right-of-way. Habitat is scarce in the Wayne.

Key ecosystem characteristic(s):

Woodland edges on acidic soils

Smooth Rock Skullcap (*Scutellaria saxatilis* Riddell)

Group: Forb/herb

Conservation Categories: NatureServe rank G3S2; Ohio Threatened; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

22

Population Occurrences in the State:

35

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Primary concern is damage from unauthorized off-highway vehicles and opening of the canopy. Non-native invasive species pose a threat. Climate change may be a long-term stressor as well.

Rationale for SCC Determination:

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.

Key ecosystem characteristic(s):

None identified

Anisescented Goldenrod (*Solidago odora* Aiton)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

4

Population Occurrences in the State:

40

Habitat:

Dry Oak Forest (Class C); Dry-Mesic Mixed Oak Hardwood Forest (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This species is 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 (Ohio Natural Heritage Database 2020). Ohio Department of Natural Resources surveys have found the 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 it not maintained by prescribed fires and/or thinning.

Key ecosystem characteristic(s):

Open woodlands

Eastern Featherbells (*Stenanthium gramineum* (Ker Gawl.) Morong)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

12

Population Occurrences in the State:

21

Habitat:

Dry Oak Forest (Class A); Dry-Mesic Mixed Oak Hardwood Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

The Wayne has more than half of the known populations in the state.

Key ecosystem characteristic(s):

Openings in woodlands

Greater Marsh St. Johnswort (*Triadenum walteri* (J.G. Gmel.) Gleason)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

11

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Non-native invasive species; changes in hydrology

Rationale for SCC Determination:

Species has been recently found in northeastern Ohio. Majority of Ohio's populations occur within the Symmes Creek watershed in southern Ohio.

Key ecosystem characteristic(s):

Swamp forests/edges of shrub swamps

Lesser Aromatica (*Ageratina aromatica* (L.) Spach)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S1; Ohio Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

7

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Known site is overgrown and it is likely extirpated. Wayne National Forest is at the northern limit of its range.

Rationale for SCC Determination:

Species is presumed extirpated in the Wayne. This species should be at other parts of the Wayne, however surveys have turned up no new sites.

Key ecosystem characteristic(s):

Barrens, edges, and open canopies

Deam's Threeseed Mercury (*Acalypha deamii* (Weath.) H.E. Ashles)

Group: Forb/herb

Conservation Categories: NatureServe rank G4S3; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

22

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

No serious threats, edge of its range

Rationale for SCC Determination:

This species was discovered to not be all uncommon in southwestern Ohio, where limestone based soils are frequent (Becus 2003). Quality habitat for this species is rare in the Wayne.

Key ecosystem characteristic(s):

Limestone/calcareous clay soils

Best Available Scientific Information:

Becus 2003; Ohio Natural Heritage Database

Clasping Milkweed (Asclepias amplexicaulis Sm.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

5

Population Occurrences in the State:

75

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Over 70 occurrences statewide; populations are small except in the Oak Openings region of northwest Ohio. New sites being discovered on an almost annual basis in the last 10 years.

Key ecosystem characteristic(s):

Openings

Redring Milkweed (*Asclepias variegata* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

7

Population Occurrences in the State:

45

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Over 40 occurrences statewide, but populations are small. A large number of sites were found last year in Jackson County.

Key ecosystem characteristic(s):

Openings

Sparselobe Grapefern (*Botrychium biternatum* (Sav.) Underw.)

Group: Forb/herb

Conservation Categories: NatureServeG5S1; State Endangered; Forest Service Regional Forester Sensitive Species for the Wayne National Forest

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

3

Population Occurrences in the State:

9[5]

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest (Class A, B); Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

All recent occurrences in the Wayne are based on observations without a voucher specimen to verify identification. The only specimen from the Wayne was noted as "*B. parallelum* 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. *Botrychium parallelum* is not a published name. Ohio is the edge of this species range.

Key ecosystem characteristic(s):

Early to mid-successional woods with other grape ferns

Spring Coralroot (*Corallorhiza wisteriana* Conrad)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

[5] Includes historic occurrences

25

Habitat:

Dry-Mesic Mixed Oak Hardwood Forest: Dry/mesic oak forest [*middle slopes*] (Class C); Rolling Bottomland Mixed Hardwood Forest: Dry/mesic oak forest [*lower slopes*] (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity; Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Incompatible land use; non-native invasive species

Rationale for SCC Determination:

New occurrences have been discovered in Athens County and a few other counties. Species is more common than thought.

Key ecosystem characteristic(s):

None identified

Tennessee Bladderfern (*Cystopteris tennesseensis* Shaver)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

0

Population Occurrences in the State:

27

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Sudden change in canopy cover

Rationale for SCC Determination:

One occurrence in Washington County is within a few hundred meters of the Wayne. This species is widespread in southeastern and southern Ohio. It is similar to the more common *C. tenuis* and therefore likely overlooked.

Key ecosystem characteristic(s):

Button Eryngo (*Eryngium yuccifolium* Michx.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

26

Habitat:

Dry Oak Forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

Species responds well to fire

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

This species is most common in the xeric limestone prairies of Adams County, Ohio. Over 20 occurrences statewide, and some sites have over 10,000 individuals.

Key ecosystem characteristic(s):

Barrens

Roundfruit Hedgehyssop (*Gratiola virginiana* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S2; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

16

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species

Rationale for SCC Determination:

This species is likely more common than reported; the only Wayne record is more than 20 years old and the population has not been found since. It is assumed to no longer be in the plan area.

Key ecosystem characteristic(s):

In swamps within floodplain forests

Short's Hedgehyssop (*Gratiola viscidula* Pennell)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

46

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class A, B)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; non-native invasive species; changes in hydrology

Rationale for SCC Determination:

Locally common along edges of swamps and marshes in south-central Ohio. Some populations number in the thousands of individuals, such as those at Lake Katharine State Nature Preserve in Jackson County. Ohio's plants have been split into a separate subspecies, subsp. *shortii* (Spooner 1984). This entity is no longer an excepted taxon.

Key ecosystem characteristic(s):

In swamps in floodplain forest

Spiked Crested Coralroot (*Hexalectris spicata* (Walter) Barnhart var. *spicata*)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

3

Population Occurrences in the State:

54

Habitat:

Dry Oak Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

Species responds well to fire

Threats Relevant In or To the Plan Area:

Unauthorized off-highway vehicle use; non-native invasive species

Rationale for SCC Determination:

This species is most common in and along edges of xeric limestone prairies in Adams County, Ohio. It can be locally common in that county. Suitable habitat is rare in the Wayne.

Key ecosystem characteristic(s):

On limestone based soils

Goldenseal (Hydrastis canadensis L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G4G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

Unknown

Population Occurrences in the State:

Unknown

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Collecting roots for the herbal trade

Rationale for SCC Determination:

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 it can be locally abundant. Ohio Natural Heritage Program does not track this species because of its high frequency.

Key ecosystem characteristic(s):

None identified

Dwarf violet iris (*Iris verna* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

4

Population Occurrences in the State:

49

Habitat:

Dry Oak Forest (Class C); Dry-Mesic Mixed Oak Hardwood Forest (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession; illegal off-highway vehicle use

Rationale for SCC Determination:

Locally frequent in Shawnee State Forest area in Scioto County.

Key ecosystem characteristic(s):

None identified

Ontario Blazing Star (*Liatris cylindracea* Michx.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

1

Population Occurrences in the State:

41[6]

Habitat:

Dry Oak Forest (Class A)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Species is locally common in the xeric limestone prairies of Adams County, OH. The only site in the Wayne was Buffalo Beats Research Natural Area, where it has not been seen since the 1980s. Majority of the populations (98%) occur outside the Wayne proclamation boundary.

Key ecosystem characteristic(s):

Prairies and barrens

Green Adder's-Mouth Orchid (*Malaxis unifolia* Michx.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

5

Population Occurrences in the State:

43

[6] Includes historic occurrences

Habitat:

Dry Oak Forest (Class C); Dry-Mesic Mixed Oak Hardwood Forest (Class C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Incompatible land use

Rationale for SCC Determination:

Over 40 occurrences statewide; most populations are small. Populations fluctuate year to year, making it difficult to see population 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.

Key ecosystem characteristic(s):

Open woods

American Ginseng (*Panax quinquefolius* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G3S4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

Unknown

Population Occurrences in the State:

Unknown

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Mixed mesophytic and cove forest (Class D)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Overcollection for herbal market; non-native invasive species

Rationale for SCC Determination:

This species is still frequent throughout the Wayne, and is still relatively common throughout its range in Ohio. It is not tracked by the Ohio Natural History Program. Large populations of 100+ are rare in southeast Ohio.

Key ecosystem characteristic(s):

None identified

Aromatic Aster (*Symphyotrichum oblongifolium* (Nutt.) G.L. Nesom)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

0

Population Occurrences in the State:

46

Habitat:

Dry Oak Forest (Class A, B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

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 Wayne. There are over 40 known occurrences in Ohio.

Key ecosystem characteristic(s):

Xeric limestone prairies and barrens

Lesser Marsh St. Johnswort (*Triadenum tubulosum* (Walter) Gleason)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

3

Population Occurrences in the State:

27

Habitat:

Rolling Bottomland Mixed Hardwood Forest: Large stream floodplain and riparian forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Changes in hydrology; non-native invasive species

Rationale for SCC Determination:

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.

Key ecosystem characteristic(s):

Swamp forests/edges of shrub swamps

Yellow Crownbeard (*Verbesina occidentalis* (L.) Walter)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

17

Population Occurrences in the State:

28

Habitat:

Dry Oak Forest (Class B, C); Dry-Mesic Mixed Oak Hardwood Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low-Moderate Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Habitat loss due to succession

Rationale for SCC Determination:

Additional occurrences have been discovered within the last 10 years. Some populations are large.

Key ecosystem characteristic(s):

Woodland edges

Bog White Violet (*Viola lanceolata* L.)

Group: Forb/herb

Conservation Categories: NatureServe rank G5S3; Ohio Potentially Threatened

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Population Occurrences in the Plan Area:

2

Population Occurrences in the State:

40

Habitat:

Rolling Bottomland Mixed Hardwood Forest (Class B, C)

Habitat Integrity Trend in Plan Area:

Low Integrity

Relevant Life History & Other Information:

None identified

Threats Relevant In or To the Plan Area:

Changes in hydrology

Rationale for SCC Determination:

This species is widespread and is most abundant in northwest Ohio. This species has colonized bog-like habitats created by unreclaimed strip mine areas in south-central Ohio. There are over 30 known extant occurrences in the state.

Key ecosystem characteristic(s):

Boggy habitats as a result of acid mine drainage

Best Available Scientific Information

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Appendix B. Potential Wildlife Species of Conservation Concern

The following worksheets identify all the wildlife species that were evaluated for potential species of conservation concern recommendation. Reviewers include Katrina Schultes (Forest Service – Wayne National Forest), Lynda Andrews (Forest Service – Wayne National Forest), Kyle Brooks (Forest Service – Wayne National Forest), Lisa Kluesner (Forest Service – Wayne National Forest), Reed Kuennen (Forest Service – Flathead National Forest), Nathan Schlater (Rural Action), and Tim Ferrell (Rural Action). All species that have been identified as potential species of conservation concern appear at the top of their taxa group (e.g., mammals, Lepidopterans, amphibians, etc.), and are also summarized in table 14.

Table 14. The potential recommended wildlife species of conservation concern.

Group	Common Name	Scientific Name	Recommended as Species of Conservation Concern
Mammals	Little Brown Bat	*Myotis lucifugus*	Yes
Mammals	Tri-Colored Bat	*Perimyotis subflavus*	Yes
Birds	Northern Bobwhite	*Colinus virginanus*	Yes
Birds	Ruffed Grouse	*Bonasa umbellus*	Yes
Birds	American Woodcock	*Scolopax minor*	Yes
Birds	Eastern Whip-Poor-Will	*Antrostomus vociferus*	Yes
Birds	Red-Headed Woodpecker	*Melanerpes erythrocephalus*	Yes
Birds	Cerulean Warbler	*Setophaga cerulea*	Yes
Birds	Prairie Warbler	*Setophaga discolor*	Yes
Birds	Eastern Meadowlark	*Sturnella magna*	Yes
Birds	Grasshopper Sparrow	*Ammodramus savannarum*	Yes
Birds	Henslow's Sparrow	*Ammodramus henslowii*	Yes
Reptiles	Timber Rattlesnake	*Crotalus horridus*	Yes
Amphibians	Green Salamander	*Aneides aeneus*	Yes
Amphibians	Four-Toed Salamander	*Hemidactylium scutatum*	Yes
Amphibians	Mud Salamander	*Pseudotriton montanus*	Yes
Fish	Streamline Chub	*Erimystax dissimilis*	Yes
Fish	[Western] Creek Chubsucker	*Erimyzon claviformis*	Yes
Aquatic Invertebrates (Mussel)	Little Spectaclecase	*Leaunio lienosus aquilonius*	Yes
Aquatic Invertebrates (Mussel)	Creek Heelsplitter	*Lasmigona compressa*	Yes
Terrestrial Invertebrates (Lepidopteran)	Monarch	*Danaus plexippus*	Yes

The habitats and habitat integrity trends used follow the ecosystem classifications and associated integrity ratings described in the *Terrestrial Ecosystems Supplemental Report* and the *Aquatic Ecosystems & Watersheds Supplemental Report*. All terrestrial species' habitats include the vegetation class each species is dependent upon. For some species, habitats are more specific than the ecosystems, so smaller classes are presented when appropriate. See table 15 for a breakdown of each terrestrial and aquatic ecosystem. In addition to detailing what the habitat is for each species, an environmental specificity statement is applied based on life history. See table 16 for an explanation of the different environmental specificity statements.

Table 15. Ecosystem types used in the species of conservation concern evaluation process (see *Terrestrial Ecosystems Supplemental Report* and *Aquatic Ecosystems & Watersheds Supplemental Report* for more details)

Term	Basic Descriptions
Primary Headwater Streams	The smallest streams, with average annual flows generally less than 2-5 cubic feet/second. They can be categorized as ephemeral, intermittent, perennial warmwater habitat, or perennial coldwater habitat.
Larger Streams & Rivers	Wadeable streams with pool depths greater than 40 cm, year-round flow, and drainage areas greater than 20 square miles; and larger rivers, or "boatable waters," usually larger than 5th order, too large to safely wade and must be accessed by boat.
Wetlands	Classified as either lacustrine (associated with large lake basins usually larger than 20 acres and shallow at the edges), riverine (contained within a channel and associated with flowing waters), or palustrine (associated with smaller basins or depressions, usually smaller than 20 acres with no wave action and depths less than 2 meters).
Lakes, Ponds & Reservoirs	Lakes are large inland filled basins that fed and drained by streams or rivers; ponds are smaller and shallower than lakes; reservoirs are human-made impoundments created by building a dam or otherwise altering a stream or river to fill a basin.
Groundwater-Dependent Systems	Localized points in aquatic ecosystems at which at which groundwater is discharged to the surface, and include springs and seeps. Springs are defined by flowing water at the point of discharge, while seeps are where water slowly discharges, forming a wet area at the surface.
Dry Oak Forest	Oak-dominated landtype occurring on rugged upland positions, primarily ridgetops and southwest-facing upper slopes.
Class A	Age class 0-3 years, herbaceous (grassland/savanna) maintained by frequent fire, herbaceous cover 0-100%
Class B	Age class 4-19 years, early tree regeneration phase including saplings <5" DBH, shrub cover 0-30%
Class C	Age class 20+ years, mid-seral open oak-hickory savannas and woodlands, canopy cover 21-60%, tree size class 9-21" DBH, maintained by surface fires every 5-15 years
Class D	Age class 20+ years, late seral closed canopy oak-hickory forest, canopy cover 61-80%, tree size class 9-21" DBH, surface fires every 10 years will maintain this class but a mixed fire will return to Class C
Dry-Mesic Mixed Oak Hardwood Forest	Occurs primarily on midslope positions, especially northeast-facing slopes; oak dominated but also includes mixed hardwoods.
Class A	Age class 0-2 years, herbaceous (grassland) maintained by frequent fire, herbaceous cover 0-100%
Class B	Age class 3-19 years, early tree regeneration phase including saplings <5" DBH, shrub cover 0-60%

Term	Basic Descriptions
Class C	Age class 20-100 years, open oak woodland, canopy cover 21-60%, tree size class 21-33" DBH, maintained by frequent surface fires
Class D	Age class 101+ years, closed oak forest, 61-80% canopy cover, tree size class 21-33" DBH, maintained by surface fires on average every 13 years
Class E	Class E: Age class 101+ years, mixed mesophytic forest resulting from absence of fire in excess of 70 years, maintained by gap-phase dynamics
Rolling Bottomlands Mixed Hardwood Forest	Occurs on mesic-to-wet, lower topographic positions encompassing broad-to-narrow valley floors and surrounding toeslopes.
Small Stream Riparian Forest	A matrix of uplands and wetlands found along creeks, small streams, and medium rivers with low to moderately high gradients and oxbows; flooding and scouring influence the system but the nature of the landscape prevents the kind of floodplain development found along larger rivers.
Large Floodplain & Riparian Forest	A complex of wetland and upland vegetation associated with medium to large rivers or streams where topography and alluvial processes have resulted in a well-developed floodplain.
Class A	Herbaceous mesic-to-wet grassland and meadows maintained by frequent fire and hydrologic influences
Class B	Early tree regeneration phase including saplings <5" DBH
Class C	Open-to-closed oak woodland and forest, maintained by periodic surface fires and hydrologic influences
Class D	Mixed mesophytic forest
Reclaimed Grassland	Formerly strip-mined lands that have been reclaimed and vegetated with herbaceous vegetation.

Table 16. Environmental specificity statements

Category	Environmental Specificity Definition
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).

Category	Environmental Specificity Definition
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	Unknown

Throughout the worksheets, different conservation categories are noted and taken into account. These conservation categories are applied to various species by various government and non-government entities. Table 17 explains the different NatureServe rankings. Table 18 explains the different State of Ohio species listing levels. Other categories include the Forest Service regional forest sensitive species designation and U.S. Fish & Wildlife Service species of concern designation.

Table 17. NatureServe rankings

Rank	Rank Definition
G1	Critically Imperiled Globally - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled Globally - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable Globally - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
T#	Infraspecific Taxon (trinomial) Globally - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
G4	Apparently Secure Globally - At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	Secure Globally - At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
S1	Critically Imperiled in the State - At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2	Imperiled in the State - At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3	Vulnerable in the State - At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4	Apparently Secure in the State - At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

Rank	Rank Definition
S5	Secure in the State - At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

Table 18. State of Ohio designations

Acronym	Conservation Categories
E	Endangered: A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes, such as habitat loss, pollution, predation, interspecific competition, or disease.
T	Threatened: A native species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in its becoming endangered.
SC	Species of Concern: A native species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern, but for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species, but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.
SGCN	State Action Plan Species of Greatest Conservation Need

Go to next page for worksheets.

Mammals

Little Brown Bat (*Myotis lucifugus*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 14 as mammal Species of Greatest Conservation Need; Wayne National Forest Regional Forester Sensitive Species; NatureServe rank G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 Ohio counties) (ODNR 2015). GIS observations are abundant and well-distributed in 23 HUCs across all three units of the Wayne. As documented by many bat surveys conducted with various methodologies across the seasons, this species is well-distributed and was abundant pre-white-nose syndrome. During summer mistnet surveys, it was captured most frequently in the Athens Unit. Brack et al. (2010) commented that abundance varies considerable from locality to locality but was overall common in Ohio.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015) and in the Wayne overall. Based on a 5 year pre-white-nose syndrome average compared to hibernaculum surveys in 2014 (post-white-nose syndrome), little brown Myotis bats have declined 98-99.5% statewide due to the novel disease (ODNR 2015).

Multiple surveys have been conducted in the Wayne including summer mist net surveys, summer acoustic transect surveys, fall swarming surveys, and winter surveys of the Lawrence County mine in the Ironton Unit (for more information, see the "Trends Since 2006" section about Indiana bats in the *At-Risk Species Supplemental Report*). Data and some trend analyses pre- and post-white-nose syndrome suggest that detections of this species have declined overall in the plan area (personal communication, Katrina Schultes, 2020). Observations decreased across the Athens and Ironton Units during summer mistnet surveys. However, they appear to have increased in the Marietta Unit, but both pre- and post-white-nose syndrome surveys on that unit were limited to one summer sampling season each (small sample sizes). Eastern myotid acoustic calls are not particularly distinguishable from each other and are often lumped together in call analyses. Trend analyses of acoustic transect data collected in the Wayne between 2009-2017 have not been completed, but a visual comparison of annual acoustic analysis

reports prepared by Bat Conservation International for the Forest Service suggest declines for all myotid detections from the pre- to post-white-nose syndrome period. Fall swarming capture surveys at abandoned mine openings from the Wayne indicate this species was well-distributed across the Athens and Ironton Units prior to white-nose syndrome (the Marietta Unit lacks underground mine habitat). Only Athens Unit sites were monitored post-white-nose syndrome, with observation-only (no capture) surveys of activity and all bat activity during swarming declined to "low" or none by 2015. The Lawrence County mine had a pre-white-nose syndrome average of about 1,000 little browns but dropped to zero in 2016 and has remained so through 2020. The other main bat hibernaculum in Ohio is the Preble County mine in western Ohio. That location experienced a 98% decline in little brown bat observations from a pre-white-nose syndrome average of 18,000 to post-white-nose syndrome count of fewer than 300 in 2016 (Seymour et al. 2020).

From an Ohio-wide analysis of summer bat surveys, the probability of observing at least one little brown bat per survey event has been declining at a statistically significant rate of approximately 9% per year between 2012-2017, which accounts for post-white-nose syndrome years in Ohio (Seymour et al. 2020).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Most typically roost in buildings and occasionally in bridge expansion joints or under sloughing bark on dead trees in summer; it is captured and forages most commonly along streams and near or over bodies of water (Brack et al. 2010). Also uses larger-sized bat houses. Hibernates in caves and mines.

Habitat Trend in Plan Area:

Stable. Low-Moderate to low terrestrial habitat integrity. Amount of forest in the Wayne is increasing, and forest succession is occurring (see *Wayne National Forest Assessment*). Habitat does not appear to be a limiting factor for this species, as populations prior to white-nose syndrome were likely stable or increasing.

Older buildings, houses, and barns are abundant across the 17-county study area and in and around the plan area. Forested areas with water and waterbodies (for foraging) are relatively abundant and stable. Abandoned mines are abundant across much of the Athens Unit and parts of the Ironton Unit, although they are all considered white-nose syndrome-positive.

Relevant Life History & Other Information:

A general summary of important life history considerations for white-nose syndrome-affected bats can be found in Johnson and King (2018). Little brown bats have a low reproductive rate, normally only one offspring per year. Pups are born between late May

and early July, but may have two under good conditions (e.g., available food and appropriate roost site). During the summer, females form large maternity colonies that can number in the hundreds, while males generally roost alone or in small groups.

Threats Relevant In or To the Plan Area:

A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Habitat - Forest management activities can result in changes to bat foraging and roosting habitat, both positive and negative. Mesophication of forests is changing understory conditions, tree species diversity, and forest types, affecting bat foraging and tree roosting success, as well as abundance of native insects for prey (see *Wayne National Forest Assessment*). Riparian corridors provide important bat habitat and account for 32,194 acres of the Wayne. National Forest System lands within riparian corridors are primarily forested, providing roosting and feeding habitat for a variety of bat species (USDA 2006). Standards and guidelines implemented across the Wayne to protect the federally endangered Indiana bat have likely benefitted other bat species.

Non-renewable energy - Some habitat has been lost, degraded, or fragmented, primarily through the disturbance of hibernation sites and land development. In the Wayne, closure or bat-gating of open mine portals has helped to protect bat habitat. Standards and guidelines reduce or eliminate disturbance and specify criteria for forest management within ¼-mile buffers at known Indiana bat hibernation and fall swarming sites, and limit removal of potentially suitable roost trees during the non-hibernation season. No surface occupancy stipulations for Federal minerals occur within ¼-mile of all known Indiana bat hibernacula. In addition, timing-controlled surface occupancy stipulations have been placed on Federal mineral leases to reduce impacts to potentially suitable roost trees during the non-hibernation season. These stipulations also benefit other bat species.

Wind energy facilities - Collision with wind turbine blades and other associated mortality at wind facilities are expected to increase due to ongoing operation without mandatory wildlife mitigations and future development of additional wind energy facilities within the range of eastern bat species (Arnett and Baerwald 2013; Frick et al. 2017b). However, development is not projected in the Wayne National Forest (planning record document E3 At-Risk Species—Federally Listed Species 2020). Migratory tree bats (e.g., hoary, eastern red, and silver-haired bats) are inordinately affected by wind energy facilities, representing 78% of cumulative fatalities that are estimated at 650,000 to 1.3 million killed between 2000 and 2012 (Arnett and Baerwald 2013). They are continuing to experience ongoing and high mortality rates each year. In contrast, "cave bats" (e.g., big brown, little brown, and tri-colored bats) are substantially less affected but may still experience populations effects over the long term as a result of ongoing, unmitigated operation of wind facilities and may further compound population declines caused by white-nose syndrome (Arnett and Baerwald 2013).

White-nose syndrome - The emergence of a novel fungal pathogen in Ohio in 2011 resulted in mass-mortalities of cave bats (those that hibernate in both natural caves and artificial mines) during the hibernation season within 3 years (see *Wayne National Forest Assessment*). The Wayne has no caves but has abandoned mines where these bat species congregated in the past. Currently, white-nose syndrome is not known to affect the "migratory tree bats" that do not frequent such underground hibernacula. Scientists agree that white-nose syndrome is the greatest threat to cave- and mine-hibernating bat populations in eastern North America at this time (Johnson and King 2018). The fungus itself remains present in all affected hibernacula as an environmental reservoir, despite the ongoing absence or notable reductions in numbers of hibernating bats (Frick et al. 2017a) and regardless of any land management activities occurring in the vicinity. The life history traits of some bat species may lower their risk of mortality and extirpation from white-nose syndrome. For example, use of non-cave-type hibernacula, roosting in low densities, lower hibernacula temperature preferences, length of hibernation, body size, and innate immune functions (Frank et al. 2019; Frick et al. 2017; Langwig et al. 2012; Langwig et al. 2016a and 2016b; Maher et al. 2012). Frank et al. (2019) found in a 9-year study that a population of little brown bats had evolved mechanisms to hibernate well in the presence of the fungus causing white-nose syndrome, thus reducing over-winter mortality. Frick et al. (2017a) documented evidence that big brown bats likely have inherent resistance or tolerance to white-nose syndrome and that little brown and tri-colored bats likely developed some tolerance and resistance post-infection. They found that the latter two species appear to have stabilized following steep initial declines, even if at low numbers; however, this has not been observed locally so far. There is currently no cure or established treatment for bats with white-nose syndrome (https://www.whitenosesyndrome.org/).

Rationale for SCC Determination:

There appears to be population declines of little brown bats in Ohio and the Wayne due to white-nose syndrome with no evidence of recovery as of 2019. It is too early to tell whether tolerance, resistance, or other adaptations will assist in recovery of this species range wide or in the Wayne and with slow reproductive rates of the species, it would be a slow recovery in any case. Declines may also be compounded by mortality at wind energy facilities. Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is identified as a potential species of conservation concern.

Tri-Colored Bat (*Perimyotis subflavus*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 7 as mammal Species of Greatest Conservation Need; U.S. Fish & Wildlife Service Species of Concern; Wayne National Forest Regional Forester Sensitive Species; NatureServe rank G2

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS observations are abundant and well-distributed in 28 HUCs across all three units of the Wayne. As documented by many bat surveys conducted with various methodologies across the seasons, this species is well-distributed, and prior to white-nose syndrome, it was semi-abundant during summer across all three units of the Wayne, especially the Ironton Unit, and quite common during fall swarming surveys in both the Athens and Ironton Units, with no swarming habitat available in the Marietta Unit.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Based on a 5 year pre-white-nose-syndrome average compared to hibernaculum surveys in 2014 (post-white-nose syndrome), tri-colored bats have seen a 97-98% decline statewide due to the novel disease (ODNR 2015).

Multiple surveys have been conducted in the Wayne including summer mist net surveys, summer acoustic transect surveys, fall swarming surveys, and winter surveys of the Lawrence County mine in the Ironton Unit (for more information, see the "Trends Since 2006" section about Indiana bats in the At-risk Species Supplemental Report). Data and analysis of trends pre- and post-white-nose syndrome suggest that detections of this species have declined overall in the plan area (personal communication, Katrina Schultes, 2020). Observations during summer mistnet surveys decreased substantially across the Athens and Ironton Units, but overall relative abundance declined slightly from 10% of bat captures pre-white-nose syndrome to 6% post-white-nose syndrome. Acoustic data suggest tri-colored bats are well-distributed but have declined overall post-white-nose syndrome across the plan area. Fall swarming capture surveys at abandoned mine openings from the Wayne indicate this species was well-distributed across the Athens and particularly the Ironton Unit prior to white-nose syndrome (the Marietta Unit lacks underground mine habitat). Only Athens Unit sites were monitored post-white-nose syndrome with observation-only (no capture) surveys of activity and all bat activity during swarming declined to "low" or none by 2015. The Lawrence County mine had pre-white-nose syndrome counts of around 100-200 tri-colored bats but dropped precipitously in 2014. Since then, there have continued to be up to 4 individuals total counted at this site during biennial surveys. The other main bat hibernaculum in Ohio is the Preble County mine in western Ohio. That location experienced a 99% decline in observations from a pre-white-nose syndrome average of 1300 to post-white-nose syndrome count of fewer than 20 in 2016 (Seymour et al. 2020).

From an Ohio-wide analysis of summer bat surveys, the probability of observing at least 1 tri-colored bat per survey event has been declining at a statistically significant rate of approximately 3% per year from 2012-2017, which accounts for post-white-nose syndrome years in Ohio (Seymour et al. 2020).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A-D); Dry-mesic Mixed Oak Hardwood Forest (Class A-E); Rolling Bottomlands Mixed Hardwood Forest (Class A D).

Generally hibernate alone, often scattered throughout a hibernaculum - in caves and mines (Brack et al. 2010). In the summer, females form small maternity colonies (2-25) and males roost alone. Most maternity roosts are in clusters of dead leaves in trees with 3-4 bats per cluster with the colony using several closely associated roosts (Brack et al. 2010). Maternity colonies are also occasionally associated with a building (Brack et al. 2010), such as under a porch roof or other more exposed areas of buildings (personal communication, Katrina Schultes, 2020). They feed in open forest areas that are near a source of water. Brack et al. (2010) characterized foraging habitat as "in deep wooded ravines with streams in the bottom." Sheets et al. (2013) report that this species is cluttered-adapted and hypothesized that, based on various studies from different geographic areas, they "may be a habitat generalist and will forage in habitats in different successional stages." They went on to suggest that different types of timber harvests are beneficial by creating a mosaic of different habitats with forested landscapes.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Amount of forest in the Wayne is increasing, and forest succession is occurring (see *Wayne National Forest Assessment*). Habitat does not appear to be a limiting factor for this species, as populations prior to white-nose syndrome were likely stable or increasing. However, the Wayne is currently comprised of mainly middle-aged mixed oak forests (see *Terrestrial Ecosystems Supplemental Report*) and in the future with no management intervention, oak-dominated ecosystems are projected to be less present across the landscape, due to issues with regeneration, oak diseases, competition with non-native trees and shrubs, and ecosystem changes due mesophication and a lack of landscape-scale disturbances, such as fire (2006 Forest Plan EIS).

Relevant Life History & Other Information:

A general summary of important life history considerations for white-nose syndromeaffected bats can be found in Johnson and King (2018). Tri-colored bats have a low reproductive rate, usually only two offspring per year. They are short-distance migrants between summer and winter habitat, so they will not be as well-distributed during summer where there is not nearby winter habitat (traditionally considered as caves and mines) (Brack et al. 2010). Summer roosts, in most cases, are in clusters of dead leaves (with a preference for oak in studies in Indiana and Arkansas) (Veilleux et al.

2003; Perry and Thill 2007) and show fidelity to relatively small roost areas within and between years (Veilleux and Veilleux 2004). This species is often the first to enter hibernation and the last to emerge in spring (Brack et al. 2010).

Threats Relevant In or To the Plan Area:

A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Habitat - Forest management activities can result in changes to bat foraging and roosting habitat, both positive and negative. Mesophication of forests is changing understory conditions, tree species diversity, and forest types, affecting bat foraging and tree roosting success, as well as abundance of native insects for prey (see *Wayne National Forest Assessment*). Riparian corridors provide important bat habitat and account for 32,194 acres of the Wayne. National forest system lands within riparian corridors are primarily forested, providing roosting and feeding habitat for a variety of bat species (USDA 2006). Forest-wide standards and guidelines implemented to protect the federally endangered Indiana bat have likely benefitted other bat species.

Non-renewable energy - Some habitat has been lost, degraded, or fragmented, primarily through the disturbance of hibernation sites and land development. In the Wayne, closure or bat-gating of open mine portals has helped to protect bat habitat. Standards and guidelines reduce or eliminate disturbance and specify criteria for forest management within ¼-mile buffers at known Indiana bat hibernation and fall swarming sites and limit removal of potentially suitable roost trees during the non-hibernation season. No surface occupancy stipulations for Federal minerals occur within ¼-mile of all known Indiana bat hibernacula. In addition, timing-controlled surface occupancy stipulations have been placed on Federal mineral leases to reduce impacts to potentially suitable roost trees during the non-hibernation season. These stipulations also benefit other bat species.

Wind energy facilities - Collision with wind turbine blades and other associated mortality at wind facilities are expected to increase due to ongoing operation without mandatory wildlife mitigations and future development of additional wind energy facilities within the range of eastern bat species (Arnett and Baerwald 2013; Frick et al. 2017b). However, development is not projected in the Wayne National Forest (planning record document E3 At-Risk Species—Federally Listed Species 2020). Migratory tree bats (e.g., hoary, eastern red, and silver-haired bats) are inordinately affected by wind energy facilities, representing 78% of cumulative fatalities that are estimated at 650,000 to 1.3 million killed between 2000 and 2012 (Arnett and Baerwald 2013). They are continuing to experience ongoing and high mortality rates each year. In contrast, "cave bats" (e.g., big brown, little brown, and tri-colored bats) are substantially less affected but may still experience populations effects over the long term as a result of ongoing, unmitigated operation of wind facilities and may further compound population declines caused by white-nose syndrome (Arnett and Baerwald 2013).

White-nose syndrome - The emergence of a novel fungal pathogen in Ohio in 2011 resulted in mass-mortalities of cave bats (those that hibernate in both natural caves and artificial mines) during the hibernation season within 3 years (see *Wayne National Forest Assessment*). The Wayne has no caves but has abandoned mines where these bat species congregated in the past. Currently, white-nose syndrome is not known to affect the "migratory tree bats" that do not frequent such underground hibernacula. Scientists agree that white-nose syndrome is the greatest threat to cave- and mine-hibernating bat populations in eastern North America at this time (Johnson and King 2018). The fungus itself remains present in all affected hibernacula as an environmental reservoir, despite the ongoing absence or notable reductions in numbers of hibernating bats (Frick et al. 2017a) and regardless of any land management activities occurring in the vicinity. The life history traits of some bat species may lower their risk of mortality and extirpation from white-nose syndrome. For example, use of non-cave-type hibernacula, roosting in low densities, lower hibernacula temperature preferences, length of hibernation, body size, and innate immune functions (Frank et al. 2019; Frick et al. 2017; Langwig et al. 2012; Langwig et al. 2016a and 2016b; Maher et al. 2012). Frank et al. (2019) found in a 9-year study that a population of little brown bats had evolved mechanisms to hibernate well in the presence of the fungus causing white-nose syndrome, thus reducing over-winter mortality. Frick et al. (2017a) documented evidence that big brown bats likely have inherent resistance or tolerance to white-nose syndrome and that little brown and tri-colored bats likely developed some tolerance and resistance post-infection. They found that the latter two species appear to have stabilized following steep initial declines, even if at low numbers; however, this has not been observed locally so far. There is currently no cure or established treatment for bats with white-nose syndrome (https://www.whitenosesyndrome.org/).

Rationale for SCC Determination:

There appears to be population declines of tri-colored bats in Ohio and the Wayne due to white-nose syndrome with no evidence of recovery as of 2019. It is too early to tell whether tolerance, resistance, or other adaptations will assist in recovery of this species range wide or in the Wayne and with slow reproductive rates of the species, it would be a slow recovery in any case. Declines may also be compounded by mortality at wind energy facilities, although not as likely, since this is a short-distance migrant. Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is identified as a potential species of conservation concern.

Big Brown Bat (*Eptesicus fuscus*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 14 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 Ohio counties) (ODNR 2015). GIS observations are abundant and well-distributed across 36 HUCs and all three units of the Wayne. Summer mistnet surveys and acoustic transect data also show that big browns were and continue to be common across the Wayne both prior to and after white-nose syndrome (personal communication, Katrina Schultes, 2020). It may be the most sedentary and residential of all bat species in Ohio, apparently not moving far between summer and winter habitats (Brack et al. 2010). Various authors have documented that big brown bats have remained common in forested landscapes post-white-nose syndrome (Ford et al. 2011; Francl et al. 2012; Reynolds et al. 2016; Thalken et al. 2018). Ford et al. (2011) suggested that they may experience an ecological release due to diminished competition for resources from other bat species impacted by white-nose syndrome.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Based on a 5 year pre-white-nose-syndrome average compared to hibernaculum surveys in 2014 (post-white-nose syndrome), big brown bats have declined approximately 40% (ODNR 2015). However, several experts agree that most big brown bats hibernate aboveground, either in buildings or on cliff lines, and they move around a lot in winter, including in and out of caves and mines, making counts for big brown bats in typical hibernacula highly variable. A perceived population decline in hibernacula from white-nose syndrome may, in fact, be normal variable use of any given site at any given time. Most winter cave and mine counts prior to white-nose syndrome did not document many big brown bats anyway. While apparent decreases in winter counts in Ohio's two main bat hibernacula (both abandoned mines) may suggest big brown bat population declines in the state (Seymour et al. 2020), these hibernaculum counts may not be a meaningful way to measure population trends for this species, since many are found hibernating aboveground (Brack et al. 2010; personal communication, Joseph Johnson, 2020; personal communication, Carl Herzog, 2020;). Furthermore, neither Johnson nor Herzog have seen many (if any) big brown bats with white-nose syndrome fungal growth and both point to emerging literature suggesting that big brown bats are more resistant or tolerant to the disease than other "cave bats," which is confirmed in Frick et al. (2017a). Francl et al. (2012) explain a number of factors that make big brown bats less susceptible to effects of white-nose syndrome: most likely overwinter in alternative hibernacula (as explained above), they have a tolerance for warmer hibernacula that are above the optimal range for the white-nose syndrome fungus, they typically hibernate alone or in small groups, and they are a larger-bodied bat capable of losing relatively more body mass during winter without mortality.

Herzog stated that in New York, big brown bats are the most commonly detected species in statewide summer mobile acoustic surveys which began in 2009 and may be increasing in the number detected per 100 km driven. Assessing Ohio-wide summer mist-net data from opportunistic, non-randomized surveys, big brown bats frequently had the highest probability of capture—both pre- and post-white-nose syndrome—and has remained high, but variable, since 2008 (Seymour et al. 2020).

In the Wayne National Forest (see all bat data summaries in the *At-Risk Supplemental Report* in the federally listed Indiana bat section "Trends since 2006"), based upon local summer bat surveys, relative abundance pre-white-nose syndrome (1997-2008) was 21.6% and post-white-nose syndrome (2014; smaller sample size) was 28.1%. Trend analyses of acoustic transect data collected in the Wayne from 2009-2017 have not been completed, but a visual comparison of annual acoustic analysis reports prepared by Bat Conservation International for the Forest Service suggests relatively stable detections for big brown bats for that period, including both before and after white-nose syndrome was detected in Ohio in March 2011. Big brown bats were not normally documented during fall swarming surveys at abandoned mine openings on the Wayne (personal communication, Katrina Schultes, 2020).

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s) including Dry Oak Forest (Class A-D); Dry-mesic Mixed Oak Hardwood Forest (Class A-E); and Rolling Bottomlands Mixed Hardwood Forest.

Predominant use of artificial or human-made environments for roosting and hibernation, including bat houses. Habitat generalist that forages in forests, riparian, agricultural, and suburban areas.

Habitat Trend in Plan Area:

Stable. Low-moderate to low terrestrial habitat integrity. Amount of forest in the Wayne is increasing, and forest succession is occurring (see *Wayne National Forest Assessment*). Older buildings, houses, and barns are abundant across the 17-county study area and around the plan area.

Relevant Life History & Other Information:

A general summary of important life history considerations for white-nose syndrome - affected bats can be found in Johnson and King (2018). Big brown bats have a low reproductive rate, with only two offspring per year in the East. They are fairly sedentary and probably remain within 50 km of birthplace (Barbour and Davis 1969). They rarely move more than 80 km between summer and winter roosts. They form maternity colonies up to a couple hundred individuals. They seem to prefer foraging among tree foliage rather than above or below the forest canopy (Schmidly 1991). Distance from day roosts to foraging areas averages about 1-2 km (Brigham 1991).

Threats Relevant In or To the Plan Area:

A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Habitat - Forest management activities can result in changes to bat foraging and roosting habitat, both positive and negative. Since big brown bats mainly rely on human-made roosts, there is a higher potential to affect this species' foraging habitat. Mesophication of forests is changing understory conditions, tree species diversity, and forest types, affecting bat foraging and tree roosting success, as well as abundance of native insects for prey (see *Wayne National Forest Assessment*). Riparian corridors provide important bat habitat and account for 32,194 acres of the Wayne. National Forest System lands within riparian corridors are primarily forested, providing roosting and feeding habitat for a variety of bat species (USDA 2006). Standards and guidelines implemented across the Wayne to protect the federally endangered Indiana bat have likely benefited other bat species.

Non-renewable energy - Some habitat has been lost, degraded, or fragmented, primarily through the disturbance of hibernation sites and land development. In the Wayne, closure or bat-gating of open mine portals has helped to protect bat habitat. Standards and guidelines reduce or eliminate disturbance and specify criteria for forest management within ¼-mile buffers at known Indiana bat hibernation and fall swarming sites and limit removal of potentially suitable roost trees during the non-hibernation season. No surface occupancy stipulations for Federal minerals occur within ¼-mile of all known Indiana bat hibernacula. In addition, timing-controlled surface occupancy stipulations have been placed on Federal mineral leases to reduce impacts to potentially suitable roost trees during the non-hibernation season. These stipulations also benefit other bat species.

Wind energy facilities - Collision with wind turbine blades and other associated mortality at wind facilities are expected to increase due to ongoing operation without mandatory wildlife mitigations and future development of additional wind energy facilities within the range of eastern bat species (Arnett and Baerwald 2013; Frick et al. 2017b). However, development is not projected in the Wayne National Forest (planning record document E3 At-Risk Species—Federally Listed Species 2020). Migratory tree bats (e.g., hoary, eastern red, and silver-haired bats) are inordinately affected by wind energy facilities, representing 78% of cumulative fatalities that are estimated at 650,000 to 1.3 million killed between 2000 and 2012 (Arnett and Baerwald 2013). They are continuing to experience ongoing and high mortality rates each year. In contrast, "cave bats" (e.g., big brown, little brown, and tri-colored bats) are substantially less affected but may still experience populations effects over the long term as a result of ongoing, unmitigated operation of wind facilities and may further compound population declines caused by white-nose syndrome (Arnett and Baerwald 2013).

White-nose syndrome - The emergence of a novel fungal pathogen in Ohio in 2011 resulted in mass-mortalities of cave bats (those that hibernate in both natural caves and artificial mines) during the hibernation season within 3 years (see *Wayne National Forest Assessment*). The Wayne has no caves but has abandoned mines where these bat species congregated in the past. Currently, white-nose syndrome is not known to affect the

"migratory tree bats" that do not frequent such underground hibernacula. Scientists agree that white-nose syndrome is the greatest threat to cave- and mine-hibernating bat populations in eastern North America at this time (Johnson and King 2018). The fungus itself remains present in all affected hibernacula as an environmental reservoir, despite the ongoing absence or notable reductions in numbers of hibernating bats (Frick et al. 2017a) and regardless of any land management activities occurring in the vicinity. The life history traits of some bat species may lower their risk of mortality and extirpation from white-nose syndrome. For example, use of non-cave-type hibernacula, roosting in low densities, lower hibernacula temperature preferences, length of hibernation, body size, and innate immune functions (Frank et al. 2019; Frick et al. 2017; Langwig et al. 2012; Langwig et al. 2016a and 2016b; Maher et al. 2012). Frank et al. (2019) found in a 9-year study that a population of little brown bats had evolved mechanisms to hibernate well in the presence of the fungus causing white-nose syndrome, thus reducing over-winter mortality. Frick et al. (2017a) documented evidence that big brown bats likely have inherent resistance or tolerance to white-nose syndrome and that little brown and tri-colored bats likely developed some tolerance and resistance post-infection. They found that the latter two species appear to have stabilized following steep initial declines, even if at low numbers; however, this has not been observed locally so far. There is currently no cure or established treatment for bats with white-nose syndrome (https://www.whitenosesyndrome.org/).

Rationale for SCC Determination:

In the Wayne, there is no evidence that big brown bats or their habitat are in decline at this time. Observations are abundant and have wide distribution. However, habitat integrity is only considered low to moderate. There is evidence that this species is not as susceptible to white-nose syndrome mortality as other cave bats. Furthermore, they are relatively sedentary and do not appear to be as prone to mortality at wind farms as some other species. Therefore, there is not a substantial concern for long-term persistence of this species in the Wayne at this time.

Evening Bat (*Nycticeius humeralis*)

Group: Mammals

Conservation Categories: State Special Interest Species; Ranked 5 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES[7] ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

[7] Considered transient during migration.

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is uncommon (6-10 counties) (ODNR 2015). Evening bats are rarely detected in Ohio, in part due to Ohio being on the northern edge of this species' range. This species has been captured only at one mine entrance during 3 fall swarming surveys in the Athens Unit (2007, 2009, and 2010); these were considered transient during the migration period, because the species was not captured during any other of the extensive summer or fall capture efforts conducted across the Wayne. Interestingly, they have been identified by automated software that analyzes acoustic transect data repeatedly across all units of the Wayne and across years. It remains unclear whether this species frequents the Wayne, given contradictory evidence between capture and acoustic surveys (personal communication, Katrina Schultes, 2020). Seymour et al. (2020) noted that evening bats made up less than 1% of summer bat captures in Ohio. There is evidence for expansion of the geographic distribution of the species along the northern limits of its range (Kaarakka 2018), which may be in response to climate change (Thalken et al. 2018).

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

In summer roost in tree hollows and buildings. Forage over open fields, agricultural areas, and woodlands (Brack et al. 2010). Have not been observed hibernating in caves/mines and apparently migrate to the south during winter; it is possible they hibernate in hollow trees and in the forest duff but have not be recorded in Ohio (Brack et al. 2010).

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Amount of forest in the Wayne is increasing, and forest succession is occurring (see *Assessment*). Buildings are common across the landscape in and around the plan area.

Relevant Life History & Other Information:

Female evening bats live in groups of about 30 in the summer where each female raises two offspring on average. This species has not been documented with the white-nose syndrome disease (https://www.whitenosesyndrome.org/static-page/bats-affected-by-wns).

Threats Relevant In or To the Plan Area:

Unknown. A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Rationale for SCC Determination:

There is insufficient information about evening bats in Ohio or elsewhere to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

Eastern Red Bat (*Lasiurus borealis*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 14 as mammal Species of Greatest Conservation Need; NatureServe rank G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it has unknown statewide occurrence (ODNR 2015). GIS records show observations are abundant and well-distributed across 35 HUCs and all three units of the Wayne. Summer mistnet surveys and acoustic transect data also show that this species was and is abundant and widespread both pre- and post-white-nose syndrome across the Wayne (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). Ohio Division of Wildlife states that surveys to determine status are needed. In general, little is known about overall red bat population status, structure, or trends, but there is a general expectation that populations are declining, possibly significantly (NatureServe 2020; Frick et al. 2017b; Pylant et al. 2016; Arnett and Baerwald 2013). Arnett and Baerwald (2013) reported that eastern red bats comprise one of the highest proportion of bats killed at wind turbines (22%) in the United States and Canada combined. "The threat of wind farm mortality is expected to greatly increase in the near future; reproductive rate of this species is relatively low, and its ability to sustain the current and anticipated level of wind-energy impact is doubtful" (NatureServe 2020).

General bat surveys have been conducted in the Wayne, including summer mist net surveys and summer acoustic transect surveys (for more information, see the "Trends

Since 2006" section about Indiana bats in the *At-Risk Species Supplemental Report*). Summer mist net surveys across the plan area show the relative abundance of eastern red bats has increased from pre-white-nose syndrome (1997-2008; 21%) to post-white-nose syndrome (2014; 35%), given that the overall species composition has changed due to white-nose syndrome effects (personal communication, Katrina Schultes, 2020). Eastern red bats do not appear to be affected by white-nose syndrome (see https://www.whitenosesyndrome.org/static-page/bats-affected-by-wns). Trend analyses of acoustic transect data collected in the Wayne between 2009-2017 have not been completed, but a visual comparison of annual acoustic analysis reports prepared by Bat Conservation International for the Forest Service suggests continued frequent yet variable detections through 2017 (personal communication, Katrina Schultes, 2020). For more information on bat sampling summaries, see the "Trends Since 2006" section about Indiana bats in the *At-Risk Species Supplemental Report*.

Assessing Ohio-wide summer mist-net data, the probability of capture for red bats both pre- and post-white-nose syndrome has remained high and variable since 2008. In fact, the odds of observing them post-white-nose syndrome have increased significantly compared to pre-white-nose syndrome (Seymour et al. 2020).

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class B, C, D); Dry-mesic Mixed Oak Hardwood Forest (Class B, C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class B, C, D).

Known as "migratory tree bats," they roost in tree and shrub foliage in a variety of forested and semi-forested areas, including developed areas with large trees (e.g., city parks) during summer (NatureServe). Most are thought to migrate south for the winter, but some individuals apparently winter as far north as southern Ohio, hibernating in the forest leaf litter and sometimes foraging during warm spells, as well as roosting in trees (Brack et al. 2010). They have been observed foraging in many habitat types, from working a circuit around urban street lights over a large parking lot to forested settings and over ponds (personal communication, Katrina Schultes, 2020).

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. The Wayne is currently comprised of mainly middle-aged mixed oak forests (see *Terrestrial Ecosystems Supplemental Report*). However, the Ohio Division of Wildlife states that surveys to determine basic ecological requirements, such as summer roost habitat characteristics, migration routes, and hibernacula, are needed.

Relevant Life History & Other Information:

Red bats are solitary foliage-roosting bats and sexes segregate. Frequent roost-switching. Females can have four to five young, but generally have two or three per year. They are adapted to survive drastic temperature changes. This species is unlikely to be affected by white-nose syndrome mortality, because it is not known to hibernate in mines or caves.

Threats Relevant In or To the Plan Area:

Little is known about mortality factors for this species (Arnett and Baerwald 2013). A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Direct mortality - Eastern red bats are highly susceptible to mortality at wind turbines (mainly due to direct strikes with blades). Estimates of total bat mortalities 2000-2011 for the USA and Canada combined were between 650,000 and 1.3 million, and bat mortality is expected to increase range wide with further development of the wind industry (Arnett and Baerwald 2013). However, development of wind energy is not projected to occur within the Wayne (planning record document E3 At Risk Species—Federally Listed Species 2020). The main concern would be potential for bats to be struck by wind turbines during migration to or from the Wayne, since there are no wind farms (current or planned) in the Wayne. However, little is known about eastern red bat migration patterns or population structure and status. In a regional study, Pylant et al. (2016) found that 57% of eastern red bat mortalities at wind energy facilities in the central Appalachian Mountains derived from non-local sources (i.e., they were migrants). Thus, sustained wind energy production and ongoing development of wind facilities may pose a substantial threat to red bat populations range wide, unless solutions are put into use (Arnett and Baerwald 2013, Frick et al. 2017b).

These bats also travel low over roads and suffer occasionally from vehicle collisions (personal communication, Katrina Schultes, 2020)).

Broadcast application of pesticides to combat forest/tree insect pests (especially caterpillars) may affect this species' moth-based diet (NatureServe).

Rationale for SCC Determination:

Insufficient information. Evidence range wide suggests potentially large population declines in eastern red bats; however, available survey data in Ohio and the Wayne show abundant observations and extensive distribution with no evidence of local population decline or decline in available habitat. Ohio Division of Wildlife says more data is needed to determine species status. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

Hoary Bat (*Lasiurus cinereus*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 9 as mammal Species of Greatest Conservation Need; NatureServe rank G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it has unknown statewide occurrence (ODNR 2015). Observed at multiple locations in northern half of Monroe County (2013-2015). GIS data shows scarce observations and has distribution in the Wayne in all 3 units. There are observations from 2002-2018 in 10 HUCS, not concentrated in any one HUC. Summer surveys (1997-2014) across the Wayne show hoary bats make up approximately 1% of relative abundance and were captured at low levels on all units (personal communication, Katrina Schultes, 2020). However, Brack et al. (2010) note that while this species has widespread occurrence across the continent and in Ohio, it is not known whether it is uncommon or just difficult to catch in typical net surveys, due to how high it flies. NatureServe (2020) noted: "This species is seasonally locally common in western and central North America, generally uncommon in the east," but "females dominate samples from eastern North America."

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). Ohio Division of Wildlife states that surveys to determine status are needed. In general, little is known about hoary bat population status, structure, or trends, but there is a general expectation that populations are declining, possibly significantly (NatureServe 2020; Frick et al. 2017b; Pylant et al. 2016; Arnett and Baerwald 2013). Arnett and Baerwald (2013) report that hoary bats comprise the highest proportion of bats killed at wind turbines (38%) in USA and Canada combined. "The threat of wind farm mortality is expected to greatly increase in the near future; reproductive rate of this species is relatively low, and its ability to sustain the current and anticipated level of wind-energy impact is doubtful" (NatureServe 2020).

General bat surveys have been conducted in the Wayne including summer mist net surveys and summer acoustic transect surveys (for more information, see the "Trends Since 2006" section about Indiana bats in the *At-Risk Species Supplemental Report*). In the Wayne, this species has only been documented at low levels during mistnet surveys but appears to be detected more commonly during acoustic surveys. Trend analyses of acoustic transect data collected in the Wayne from 2009-2017 have not been completed, but a visual comparison of annual acoustic analysis reports prepared by Bat Conservation International for the Forest Service suggests continued frequent yet variable detections through 2017 (personal communication, Katrina Schultes, 2020). Hoary bats do not appear to be affected by white-nose syndrome (https://www.whitenosesyndrome.org/static-page/bats-affected-by-wns).

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class A, B, C, D).

Known as "migratory tree bats," these bats in summer roost primarily in foliage of large deciduous or coniferous forests, often in areas with scattered trees or at the edges of clearings or in hedgerows, including areas altered by humans. Foraging habitat includes various open areas, including spaces over water and along riparian corridors. In spring and fall, they are thought to be long-distance migrators, although some hoary bats may hibernate rather than migrate. They may hibernate in various situations, such as on tree trunks, in a tree cavity, in a squirrel's nest, and in a clump of Spanish-moss (NatureServe 2020).

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Moderate terrestrial habitat integrity. The Wayne is currently comprised of mainly middle-aged mixed oak forests (see *Terrestrial Ecosystems Supplemental Report*). However, the Ohio Division of Wildlife states that surveys to determine basic ecological requirements, such as summer roost habitat characteristics, migration routes, and hibernacula, are needed.

Relevant Life History & Other Information:

Hoary bats are solitary foliage-roosting bats, except during migration they may travel in waves together. Some roosts may be used for weeks and movements are generally less than 100 m from the previous roost (NatureServe 2020). Usually have two offspring, but can have as many as four. They are adapted to survive drastic temperature changes. This species is unlikely to be affected by white-nose syndrome mortality, because it is not known to hibernate in mines or caves.

Threats Relevant In or To the Plan Area:

Little is known about mortality factors for this species (Arnett and Baerwald 2013). A general summary of threats and stressor to bats can be found in Johnson and King (2018).

Direct mortality - Hoary bats are highly susceptible to mortality at wind turbines (mainly due to direct strikes with blades). Estimates of total bat mortalities from 2000-2011 for the United States and Canada combined were between 650,000 and 1.3 million, and bat mortality is expected to increase range wide with further development of the wind industry (Arnett and Baerwald 2013). However, development of wind energy is not projected within the Wayne (planning record document E3 At Risk Species—Federally Listed Species 2020). The main concern would be potential for bats to be struck by wind turbines during migration to or from the Wayne, since there are no wind farms (current or planned) in the Wayne. However, little is known about hoary bat migration patterns or population structure and status. In a regional study, Pylant et al. (2016) found that 99% of hoary bat mortalities at wind energy facilities in the central Appalachian Mountains derived from local sources (i.e., they were not migrants). In contrast, Cryan et al. (2014) sampled hoary bats from across the USA and Canada, and their results show that any given bat during the migration season is likely to have originated from a broad area rather than from a localized area, meaning that fatalities at a turbine "have the potential to affect the entire continental population rather than subpopulations from certain geographic

regions." Thus, sustained wind energy production and ongoing development of wind facilities may pose a substantial threat to hoary bat populations range wide, unless solutions are put into use (Arnett and Baerwald 2013, Frick et al. 2017b).

Broadcast application of pesticides to combat forest/tree insect pests (especially caterpillars) may affect this species' moth-based diet (NatureServe).

Rationale for SCC Determination:

Insufficient information. Evidence range wide suggests potentially large population declines in hoary bats; however, available survey data in Ohio and the Wayne show abundant observations and extensive distribution with no evidence of local population decline or decline in available habitat. Ohio Division of Wildlife says more data is needed to determine species status. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

Southern Flying Squirrel (*Glaucomys volans*)

Group: Mammals

Conservation Categories: Ranked 9 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 Ohio counties) (ODNR 2015). It is the most common squirrel species in Ohio, but seldom seen because they are nocturnal. It is considered a common forest species in all units of the Wayne (personal communication, Katrina Schultes and Lynda Andrews, 2020).

Dr. Don Althoff from the University of Rio Grande has been studying southern flying squirrels in southern Ohio since 2013 (personal communication, Don Althoff, 2020). He confirmed that they are widely distributed in the region: "Find a woodlot--that is not overly isolated, has some pole- to saw-timber oaks and hickories and one is likely to find SFS [southern flying squirrels]." He has confirmed presence in various locations both monitoring a network of squirrel boxes and through acoustic recordings.

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). However, Dr. Althoff provided results of 7 years of monitoring of southern flying squirrels boxes (25 boxes per 12 to 14 sites) during winter in vicinity of the Wayne (although none were located on National Forest System lands), including in Athens, Gallia, Hocking, Jackson, and Vinton Counties. He reported that the overall trend suggests southern flying squirrel populations at each site appear to be stable but variable across the sites. His current working hypothesis is that fluctuation in annual hard mast production plays a significant role in the density of local southern flying squirrel populations in southeast Ohio. He reports that density is highest in younger to middle-aged hard mast-producing forest stands and decreases in less-productive, older forest.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class B, C, D); Dry-mesic Mixed Oak Hardwood Forest (Class B, C, D).

This species uses forests of deciduous or mixed deciduous-coniferous trees, containing modest amounts of hard mast-producing trees (particularly oaks) and tree cavities (personal communication, Don Althoff, 2020). They nest in the hollows of trees. They are omnivorous and typically eat nuts, seeds, fruits, moths, bark, mice, eggs, and insects. Dr. Althoff wrote that a general hypothesis is that southern flying squirrels are a middle-aged (or mid-successional stage) hardwood stand specialists. He means that they need pole- and saw-timber sized woodlots with some modest amounts of oak, hickory, buckeye, or walnut trees. They will likely be present in more mature, older growth stands, but likely in lower numbers because the older hard mast-producers are not as productive as the middle-aged trees.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity. The Wayne is currently comprised of mainly middle-aged mixed oak forests. According to the *Wayne National Forest Assessment*, "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, 3% of stands are less than 30 years of age, 68% of forested stands are aged 30 to 100 years, and 29% of stands aged 100 years and older" (Also see *Terrestrial Ecosystems Supplemental Report*). However, in the future with no management intervention, forests will become older and less productive, and oak-dominated ecosystems are projected to be less present across the landscape due to issues with regeneration, oak diseases, competition with non-native trees and shrubs, and ecosystem changes due mesophication and a lack of landscape-scale disturbances, such as fire (2006 Forest Plan EIS).

Dr. Althoff said he doubts 10-acre clearcuts within a 30-100 acre tract would have long-term negative impacts on southern flying squirrel abundance. But he countered that not cutting any portion of a 10-100 acre tract, thus allowing a large or majority of the tract to move to late successional or “climax” forest, would like result in low local southern flying squirrel numbers over time.

Relevant Life History & Other Information:

Dr. Althoff (personal communication, Don Althoff, 2020) has documented apparent inter-specific competitors mobbing released southern flying squirrels that are all also all cavity-nesters; competition for nest sites may be high. The local population likely has two litter periods (spring and summer) with each female producing one litter of usually 3-4 pups. He believes local populations would bounce back quickly from mortality events, so long as quality habitat is present and accessible.

Threats Relevant In or To the Plan Area:

Loss of and forest succession without regeneration of hard mast-producing (especially oak) forest.

Rationale for SCC Determination:

No evidence of downward trend in population or habitat and relatively high reproductive rate. Therefore, based on the information provided, there is not substantial concern for long-term persistence of southern flying squirrels in the plan area.

Pygmy Shrew (*Sorex hoyi*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 11 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS data from the Ohio Division of Wildlife (via Kate Parsons) shows 3 Athens Unit occurrences at one site near a wetland (2014-16), but none in other units. The State Wildlife Action Plan (ODNR 2015) says further research is needed to determine abundance and distribution of pygmy shrews.

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). No additional information about pygmy shrew populations for the Wayne or Ohio was available.

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class A-D); Dry-mesic Mixed Oak Hardwood Forest (Class A-E); Rolling Bottomlands Mixed Hardwood Forest (Class A-D).

Lives in a variety of habitats, including wooded and open areas, swamps, grassy clearings, and floodplains.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. General use of a variety of habitats.

Relevant Life History & Other Information:

Pygmy shrews have one litter per year, with three to eight young in a litter.

Threats Relevant In or To the Plan Area:

The State Wildlife Action Plan (ODNR 2015) says further research is needed to determine factors limiting populations of these small mammals.

Rationale for SCC Determination:

There is insufficient information about pygmy shrews in Ohio or elsewhere to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

Eastern Chipmunk (*Tamias striatus*)

Group: Mammals

Conservation Categories: Ranked 25 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 Ohio counties) (ODNR 2015). Ubiquitous and common in all habitat types in the Wayne (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). Population densities of chipmunks vary naturally with food abundance (NatureServe 2019). No additional information about chipmunk populations for the Wayne was available.

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Inhabits burrows that they dig and may extend several feet down in ground in deciduous forests and brushy areas; also use artificial/man-made environments. NatureServe: prefer deciduous woodlands with ample cover, such as brush piles/logs, rocky forested slopes, ravines. Also found in brushlands and hedgerows. Commonly climb trees and shrubs.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. General use of a variety of habitats.

Relevant Life History & Other Information:

Eastern chipmunks have 4-5 young that are born in each of two breeding seasons in an underground nest. Primarily vegetarian: nuts, seeds, fruits, bulbs, but also eat meat, eggs, and insects.

Threats Relevant In or To the Plan Area:

None identified.

Rationale for SCC Determination:

Habitat generalist found everywhere across the Wayne with no evidence found to suggest a downward trend in population or habitat and relatively high reproductive rate. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Bobcat (*Felis rufus*)

Group: Mammals

Conservation Categories: Ranked 25 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Many anecdotal observations of bobcats across the Wayne from trail cameras, hunter reports, and general observations document widespread occurrence across all three units of the Wayne (personal communication, Katrina Schultes, 2020). Wildlife Population Status Report: Summary of 2017 Bobcat Observations in Ohio (ODNR 2018) showed verified sightings in all counties associated with the Wayne and southeastern Ohio.

Population Trend Statewide and in the Plan Area:

Increasing (ODNR 2015). The Wildlife Population Status Report: Summary of 2017 Bobcat Observations in Ohio (ODNR 2018) reports "Overall, verified sightings have increased over the past decade. In July 2014, the bobcat was removed from the list of Ohio endangered and threatened species."

Anderson et al. (2015): "This trend has been attributed to increased habitat availability due to changing land-use practices (e.g., reversion of agricultural land and changes in farming practices) and more intensive harvest management at the state level (Roberts and Crimmins 2010)." Additionally: "Bobcat recovery in Ohio has occurred in conjunction with the reversion of the Ohio portion of the Western Allegheny Plateau ecoregion from farmland back to woodland (Hutchinson et al. 2003; Fig. 1b)."

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Uses variety of forest types. NatureServe (2019): Various habitats including deciduous-coniferous woodlands and forest edge, hardwood forests, swamps, forested river bottomlands, brushlands, and other areas with thick undergrowth. Large tracts of habitat are most favorable. When inactive, occupies rocky cleft, cave, hollow log, space under fallen tree, etc.; usually changes shelter daily. Young are born in a den in a hollow log, under a fallen tree, in a rock shelter, or similar site. In an unpublished Ohio Division of Wildlife study in Vinton County, most natal dens were in large, jumbled slash piles from timber harvesting with suitable nooks and crannies; also in a 28-inch diameter hollow log and in the base of a 15.5-inch diameter live, hollow tree (oak); 8 of 9 dens located were in recent (1-10 years old) even-aged harvest areas (personal communication, Cheryl Mollohan, 2015).

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity.

Relevant Life History & Other Information:

Bobcats typically have one litter of 1-6 kittens per year, but will produce a second if the first is lost. Territorial and elusive. Generalist carnivore; feeds on wide variety of prey, including insects, reptiles, amphibians, fish, birds, and mammals.

Threats Relevant In or To the Plan Area:

Threats include loss of forested habitat; human encroachment. Direct mortality due to vehicular collision.

Rationale for SCC Determination:

Bobcat population known to be increasing in Ohio and the Ohio Division of Wildlife is considering a proposal to allow legal trapping. Lives in variety of forest types and feeds on a variety of prey and habitat trend seems stable. Therefore, based on the information provided, there is not substantial concern for long-term persistence of this species in the plan area.

Pine [Woodland] Vole (*Microtus pinetorum*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 19 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). There was only one GIS observation in the Wayne in the Ironton Unit from 2004 with older, 1970s detections in the Athens Unit. It is a difficult species to detect.

Harder et al. (2014): regionally restricted distributions in Ohio to more forested regions (i.e., not northwest Ohio).

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). NatureServe: G5, but Ohio not ranked; secure in surrounding states except Michigan (vulnerable).

Harder et al. (2014) were surprised by "remarkably low numbers" captured during 2004-2005 study. "Even though 65 transects (9,750 trap nights) were placed in woodland habitat in the northeast, southeast, and southwest regions, only 5 Woodland Voles were captured," three (60%) of which were in the southeast region. They suggested that a more

species-targeted procedure (pitfall traps in subsurface burrows or along natural obstructions as opposed to general surface traplines) may have produced more captures. Prior to this study, species was considered to be of moderate abundance based on older literature (Gottschang 1981) and their historic relative abundance in the Ohio Wildlife Database managed by the Ohio Division of Wildlife. This one study within last 20 years suggests a population decline in Ohio, but more species-targeted surveys are required to have a higher level of certainty.

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E).

Lives in eastern forests in a wide variety of habitats, but in many areas prefers upland deciduous wooded areas with thick layers of leaves and loose soil; spends most of their time in shallow tunnel systems below the ground surface.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity. General use of a variety of habitats.

Relevant Life History & Other Information:

Pine voles have home ranges estimated at 0.1 ha (0.3 ac) and due to small body size, likely cannot disperse over large areas (i.e., over 5 km). Nests built beneath logs, stumps, below surface litter, or underground. Produce 1-4 litters per year, with an average of 3-5 young per litter. Mostly eat roosts, bulbs, tubers, fruits, and seeds. Gottschang (1981) quoted older literature saying "populations are very local, highly variable [or cyclic], and usually not evenly distributed throughout the habitat." Also noted that in wooded areas, runs are just below the top layer of leaves in the leaf mold, but their runways can be deeper.

Threats Relevant In or To the Plan Area:

Severe ground disturbance such as with mining. Prescribed fire could affect the species by removing surface duff, but to what extent this matters with a species that is capable of burrowing deeper is unclear.

Rationale for SCC Determination:

Contradictory and limited evidence about abundance and population trends. Ohio State Wildlife Action Plan committee suggested the species is common, while only known recent Ohio study (Harder et al. 2014) suggests formerly "moderately abundant" but with trapping results showing uncommon to rare. Gottschang (1981) considered it a cyclic species with local abundance possible, but more studies are needed to confirm present abundance and trends. Furthermore, considered "secure" in NatureServe for all surrounding states, except one (Michigan). In plan area, no evidence of downward trend in habitat, so theoretically, species could still be present and abundant but not sampled

adequately to make the determination. Species with relatively high reproductive rate but low dispersal capability. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

Smoky Shrew (*Sorex fumeus*)

Group: Mammals

Conservation Categories: State Species of Concern; Ranked 19 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015), but only in eastern half of Ohio (Harder et al. 2014). GIS observations show one location in Athens Unit (2014-16) in wetland habitat, two locations from 1995 in the Ironton Unit, and none in the Marietta Unit.

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). Harder et al. (2014) were surprised by the "remarkably low numbers" captured during 2004-5 study: 6 of 13 total captures were in southeast region (46%). Furthermore, they noted "Additional, targeted surveys designed to sample the restricted habitat of Smoky Shrews with pitfall trap arrays are needed to fully assess the status of the species in Ohio."

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry-mesic Mixed Oak Hardwood Forest (Class D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

These shrews generally live in thick, soft leaf mulch on the ground, where they burrow through surface duff and use the runways made by other species (Gottschang 1981). Nest sites are beneath stumps, rotted logs, or rocks (NatureServe). Harder et al. (2014) states their captures in "specialized habitat preference for shady, damp woods with leaf litter and decomposing logs" is consistent with Gottschang's (1981) description.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low Integrity. Habitat description suggests the smoky shrew would most likely be found on north/east aspects of middle- to older-aged forests

with dense canopy cover and more mesic conditions, which is common across the Wayne (see *Terrestrial Ecosystems Supplemental Report*).

Relevant Life History & Other Information:

Smoky shrews may produce more than one litter of 2-7 offspring each summer. Nest in stumps or logs and eat insects and other invertebrates.

Threats Relevant In or To the Plan Area:

Severe ground disturbance such as with mining. Prescribed fire could affect the species by removing surface duff but with specialized habitat preference for more mesic sites, it is less likely to be affected in those locations with low intensity, mosaic burning that is encouraged in the Wayne.

Rationale for SCC Determination:

Insufficient data for population distribution, abundance, and trends. Only known recent Ohio study (Harder et al. 2014) says: "Additional, targeted surveys designed to sample the restricted habitat of Smoky Shrews with pitfall trap arrays are needed to fully assess the status of the species in Ohio." In plan area, no evidence of downward trend in habitat, so theoretically, species could still be present and abundant but not sampled adequately to make the determination. Species with relatively high reproductive rate but low dispersal capability. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area.

American Black Bear (*Ursus americanus*)

Group: Mammals

Conservation Categories: State Endangered; Ranked 28 as mammal Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015); reported in 45 counties (Ohio Division of Wildlife species account). GIS data from the Ohio Division of Wildlife (via Kate Parsons) shows 6 different county occurrences in the Wayne, with multiple records. The 2019 Wildlife Population Status Report for black bear (ODNR 2019a) shows confirmed sighting in all counties that contain Wayne National Forest land, and the number of sightings continues to increase. However, the increasing number of sightings of a large mammal that is

known to wander long distances does not necessarily translate into increasing numbers of resident bears or the establishment of a viable population in Ohio. The Black Bear Bait Station Survey Report confirms that densities remain quite low across Ohio (ODNR 2019b).

Population Trend Statewide and in the Plan Area:

Increasing (ODNR 2015). However, the Wildlife Population Status Report (ODNR 2019) for black bear reports: "It is thought that the majority of bears seen in Ohio are young male bears dispersing from Pennsylvania and West Virginia. However, in the absence of a resident female, male bears are not likely to remain in an area for an extended period of time, so it is expected that most of these male bears do not ultimately remain in Ohio." Females are known from Ohio, but cases of reproduction are rare. There was a female with two cubs recorded in Lawrence County in 2015, but since then, the only known reproductive females are from outside the plan area (ODNR 2019b; personal communication, Ohio Department of Natural Resources Division of Wildlife, 2020). There is currently no evidence of black bears actively reproducing in the plan area. Dispersal and establishment in Ohio are occurring at their own pace. According to Rogers and Allen (1987), the minimum viable population size, as determined for use in a black bear habitat suitability index for the Upper Great Lakes region, was 50 adults, of which 30-40 would be females. Ohio does not currently have that many bears, especially not females. It is difficult to say at this time that the population is increasing in Ohio, despite an increasing number of sightings of what are likely dispersing males who do not necessarily remain in Ohio.

Habitat:

Broad environmental specificity: Generalist using broad-scale or diverse habitat(s). Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Black bears use large tracts of wooded habitats, ranging from swamps and wetlands to riparian areas, and dry upland hardwood and coniferous forests, but prefer mixed deciduous-coniferous forests; home range size varies considerably by location, sex, and quality (NatureServe 2020). Habitat needs vary seasonally and are strongly influenced by presence of food, so a diversity of forest age and size classes across the landscape is desirable (Prange 2018). Prange (2018) summarized other habitat needs for black bear, as follows: Forest interspersed with openings and clearings, such as recently disturbed habitats, affords soft mast and thick escape cover, as do riparian areas, while mature mast-bearing beech and especially oaks are important for pre-hibernation weight gain. Coarse woody debris on the forest floor is a source of log-dwelling ants and other insects for food. Adequate denning sites are crucial. Black bears will use cavities in large (>33 inches diameter at breast height) trees, rock crevices, brush piles, root excavations, underground burrows, caves, downed trees, or open-ground beds.

Habitat Trend in Plan Area:

Stable to increasing overall, but oak-dominated forests decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Since black bears depend on a combination of soft mast availability and mature oak-dominated forests for fall acorn mast for winter survival and successful reproduction (Reynolds-Hogland et al. 2007), it is imperative to counteract the mesophication and associated transitioning away from oak-dominated forests to more mesic forests happening in southeast Ohio.

Oaks and open woods, which support both hard- and soft-mast species, are declining in the Wayne. A comparison of forested stand data between 2006 and 2018 indicates dense, mature forests 80 years and older have increased 46% (USDA 2018). While the amount of mature forest habitat in the Wayne is increasing, "Oak woodlands, once comprising approximately 48% of the historical land base across the study area, now cover approximately 6%" (from *Wayne National Forest Assessment*). Since black bear depend on a combination of soft mast availability and mature oak-dominated forests for fall acorn mast for winter survival and successful reproduction (Reynolds-Hogland et al. 2007), open oak woodlands would be provide an optimal balance. While oak is present in the canopy and larger size classes, it is uncommon in the understory and mid-story—regeneration is not keeping up with changing conditions, and resulting mesophication will result in an overall loss of oak-dominated forest to more mesic forest types that do not produce the same quality or quantity of hard mast (acorns). Habitats also have low-moderate to low integrity due to lack of openings and a lack of regular disturbance—such as harvest and prescribed fire—to create openings, allow sunlight to the forest floor to encourage soft mast production, and assist with oak regeneration.

Relevant Life History & Other Information:

A black bear's first litter is generally only one cub, but 2-3 cubs are produced in subsequent litters; litters produced every other year. The young remain with the mother for the first year and a half of their lives. Secure, thermally protected, and undisturbed winter birthing sites are key to the viability and growth of black bear populations (Prange 2018). Grasses, forbs, berries, mast from oak, hickory, and beech trees, carrion, and insects are typical foods. Bears will also utilize agricultural crops. Black bears were extirpated from Ohio by 1850, but are dispersing naturally back from neighboring states as Ohio's forestland recover. The area requirements for this large mammal (≥116 mi^2 of unfragmented forest for a viable population; Rogers and Allen 1987) and the sensitivity to human-dominated landscapes may restrict establishment to the most rural, forested areas of Ohio (Prange 2018). It is a state endangered species provided full protection under the law as their population becomes established.

Threats Relevant In or To the Plan Area:

Threats include direct mortality due to human-bear conflicts and vehicle collisions. Changes in historic disturbance regimes are currently shifting forests from a disturbance-dependent climax community dominated by hard mast-bearing oaks to a mesophytic climax community dominated by shade tolerant species lacking the quantity and quality of hard mast will affect reproduction and survival. Fragmentation of mature forested

habitats by roads and human development and disturbance at den sites in winter are also a concern (Prange 2018).

Rationale for SCC Determination:

Sightings are increasing, but densities remain low and the establishment of a viable population through natural dispersal from neighboring states has not been confirmed. This species is protected by State law. Based on the information available, and especially because black bear are not fully established in the plan area, this species cannot be considered for potential species of conservation concern status at this time.

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Birds

Northern Bobwhite (*Colinus virginanus*)

Group: Birds

Conservation Categories: Ohio Species of Concern; Ranked 3 as bird Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G4G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. Wayne breeding bird surveys from 2003-2016 have occurrences mostly in the Ironton Unit, and in recent years almost exclusively in the large Cambria reclaimed strip-mine only; also occasionally in Athens Unit prior to 2012. No Marietta Unit breeding bird survey routes go through appropriate habitat. Ohio Breeding Bird Atlas shows they are most prevalent in southern Ohio counties (Ironton Unit), but strongest hold-outs mainly west of the plan area.

Population Trend Statewide and in the Plan Area:

Declining in Ohio. Populations of the northern bobwhite were decimated after severe winters in 1977 and 1978 (ODNR 2015), leaving only localized populations in southern and eastern counties (Rodewald et al. 2016). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 90% population decline, a statistically significant 65% decline in priority block occupancy across the state, and a significant 62% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. The species is hunted in 16 southern counties, 4 of which contain Wayne National Forest land, but interest in hunting northern bobwhites has also declined drastically (NBCI 2019).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Dry Oak Forest (Class A, B); Dry-mesic Mixed Oak Hardwood Forest (Class A, B); Reclaimed grassland.

Inhabits a wide variety of vegetation types; particularly early forest successional stages of mixed hardwood forests occurring in habitat mosaics, including woody edge habitats. In the Midwest and Northeast, associated principally with heterogeneous, patchy landscapes comprised of moderate amounts of row crops and grasslands and abundant woody edge (NatureServe 2019).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity. Grassland habitat was not evaluated. In the Wayne there is substantial under-representation of open, early successional classes (see *Wayne National Forest Assessment*). Many reclaimed strip-mine grasslands on the Wayne are or are becoming less open and suitable with the proliferation of trees and shrubs used to growing in poor soils, including non-natives like autumn olive and lespedeza (which is woody) and native pioneer species (e.g., black locust and Virginia pine; pers. comm. Katrina Schultes, Wildlife Biologist, Wayne National Forest, 2020).

Relevant Life History & Other Information:

Incurs high annual mortality resulting in a short life span and rapid population turnover (NatureServe 2019). Nests on the ground, typically within standing herbaceous vegetation within 15-20 meters of openings, such as roads or fields. Relatively high reproductive capacity: can produce up to three broods per season with average clutch size of 12-14 eggs. Incubation, by one or both sexes, begins after the last egg is laid and averages 23 days. One or both sexes brood the young for the first two weeks of life. Young are capable of flight about two weeks after hatching and both sexes are capable of breeding in the first year after hatching (NatureServe 2019). Outside the breeding season, Northern Bobwhites are gregarious and form coveys, generally consisting of 10-15 birds. Coveys occupy 3.3-20 hectares of habitat. Forage individually or in coveys by picking food items off the ground or from vegetation that can be reached from the ground; scratches through leaf litter and dry, dead vegetation. Known to eats seeds of at least 650

plant species, including agricultural crops. Arthropods are especially important (>80%) in the diet of chicks.

Threats Relevant In or To the Plan Area:

Habitat - Range wide, declines are thought to be the result of habitat loss associated with changing land use; particularly clean farming techniques, single crop production, plantation forestry, fire suppression, replacement of native-grass pasture with tall fescue, and over-grazing by cattle. This species responds well to management, so its restoration potential is good.

Landscape connectivity - An issue with apparently localized residual group's interspersed by less or non-suitable habitats (Rodewald et al. 2016).

Microhabitat conditions - Impacts from harsh winter conditions that often cause high mortality can be minimized by providing early-successional woody cover.

Hunting - mortality may be additive (NatureServe 2019).

Rationale for SCC Determination:

Downward population trend in Ohio and a significant decline in block occupancy in the Ohio Hills region. Loss of suitable habitat and lack of suitable forest age-class heterogeneity and quality grassland habitat, disjunct distribution, and limited landscape connectivity are current causes of declines in plan area; however, bobwhites show positive response to forest and grassland management. Therefore, there is substantial concern for long-term persistence of this species in the plan area, and it is recommended for consideration as a potential species of conservation concern at this time.

Ruffed Grouse (*Bonasa umbellus*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Periphery of Range (ODNR 2015). Rare in the Wayne; observations recorded in 9 HUCs in all three units, but in recent years the Marietta Unit has the most recorded activity with additional anecdotal clusters of observations from relatively limited areas in the Athens and Ironton Units (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Decreasing statewide. The ruffed grouse has declined dramatically since the early 1980s due to loss of early-successional habitat (ODNR 2015). The Ohio Department of Natural Resources statewide Ruffed Grouse Drumming Survey Routes show a dramatic declining trend both across the state (-92%) and regionally in southeastern Ohio (-85%; ODNR 2019). For comparison, the southeastern Ohio routes in and around the Wayne had an average of 27 drumming grouse per 100 stops in the 1970s, while by 2010-2019, they only had 4. The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a statistically significant 77% decline in priority block occupancy across the state and a significant 77% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas.

Species is a managed gamebird in Ohio.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Dry Oak Forest (Class A-D); Dry-mesic Mixed Oak Hardwood Forest (Class A-E); Rolling Bottomlands Mixed Hardwood Forest (Class A-D).

For adult summer and brood habitat, fall and winter cover, and drumming habitat, relies on a diversity of forest age classes juxtaposed within a mosaic including cuts of 5 to 20 acres of dense, young, ephemeral forest up to 10-15 years old and making up approximately 12% of the forest in heavily forested landscapes (Stoll et al. 1999). Brood rearing habitat includes high densities of woody stems and abundant ground cover for cover and food (NatureServe 2020). Selection cut harvests may be beneficial in riparian areas or other areas where understory development is desired yet even-age management is precluded (Dessecker and McAuley 2001). Drumming logs are typically found in dense sapling stands that afford protection from aerial predators while the male is drumming (ODNR 2012).

Habitat Trend in Plan Area:

Breeding habitat decreasing, low-moderate to low integrity. According to the *Wayne National Forest Assessment*, 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 on the Wayne National Forest by 93% (see *Wayne National Forest Assessment*). Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

Each hen has one brood per year, but they may re-nest and lay a smaller clutch of eggs (7 is average) if they first nest is destroyed. In the Central Hardwoods, home ranges for grouse may be up to 250 acres (NatureServe 2019). Ruffed grouse feed mostly on seeds, buds, flowers, berries, catkins, leaves, insects, spiders, and snails (ODNR 2012).

Threats Relevant In or To the Plan Area:

Habitat - Loss of young forest habitat due to succession and lack of fire, forest management, or regular large-scale natural disturbances negatively impacts this species. Quality brood habitat may be a limiting factor for ruffed grouse in the central Appalachians, which includes southeastern Ohio (Jones et al. 2008). Increasing the amount of early successional forest with downed logs is beneficial. Studies in southern Ohio indicate that early successional forest patches of at least 5-6 acres provide the most benefit to this species (USDA 2006; Stoll et al. 1999).

West Nile Virus - Mark Wiley (personal communication, Wiley, 2020) noted that while the declining grouse numbers in Ohio are primarily attributed to the loss or lack of young forest habitat, there is a growing concern about mortality associated with West Nile virus. However, rates of infection are currently unknown in Ohio and across the Appalachian range and are being studied to improve understanding of the contribution of disease to grouse declines. However, with no feasible options to directly mitigate the impacts of West Nile virus, state wildlife agencies advocate for larger, more resilient grouse populations associated with abundance of quality young forest habitat created by forest management. This is because where young forest is of high quality and highly abundant, grouse populations are more resilient to stressors like West Nile virus and can recover from annual losses, compared to those in marginal, isolated habitat (Williams 2019).

Rationale for SCC Determination:

There have been drastic population declines of ruffed grouse in Ohio and specifically in the plan area. They have very narrow environmental specificity and have experienced a loss of early successional forest breeding habitat, as well as a necessary juxtaposition of young and mature forests and specific required conditions. Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time. They should respond well to even-aged forest management.

American Woodcock (*Scolopax minor*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Remains widely distributed across Ohio, but are limited by suitable habitat (Rodewald et al. 2016). Common across all units of the Wayne, but not easily detected with typical breeding bird surveys; thus, it is not common in our occurrence database (personal communication, Katrina Schultes, 2020). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend data for the Wayne breeding bird surveys not completed.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a statistically significant 23% decline in priority block occupancy across the state and a significant 38% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. The North American Woodcock Singing Ground Survey results described in Rodewald et al. (2016) showed a population decline of 1.6% per year since 1968 for Ohio. NatureServe (2020) noted that range-wide, long- and short-term population declines are apparent. However, it was rated G5, because this species is estimated to number in the millions still despite the population declines.

Migrant game bird; harvest regulated by U.S. Fish & Wildlife Service.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A, B); Dry-mesic Mixed Oak Hardwood Forest (Class A, B); Rolling Bottomlands Mixed Hardwood Forest (Class A, B); Reclaimed grasslands.

This species prefers a combination of wet, early successional under-story and drier uplands. Woodcock habitat is characterized by moderate numbers of shrubs, seedling and sapling trees, interspersed with weedy or grassy openings. Young hardwood stands and old orchards near pastures or abandoned farmland are good roosting and feeding cover.

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Grassland habitat was not evaluated. The significant reduction in occupancy (-38%) in the Ohio Hills region is likely related to forest maturation; woodcock are limited by the availability

of forests with openings or forest cover interspersed with agricultural or early-successional forest (Rodewald et al. 2016). This species likely uses all ecological landtypes and extensive forested tracts are well-distributed across the Wayne; however, its need for early successional habitat suggests breeding habitat is decreasing and has low to low-moderate habitat integrity due to substantial under-representation of shrubby, early successional classes overall. According to the *Wayne National Forest Assessment*, 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

American woodcocks probably breed in every county, although highest populations occur in the northeast, north central, and central regions of Ohio. Courtship dances take place on bare soil or in short grass, close to woody cover. Good quality sites contain moist loam soils with plenty of earthworms, the woodcock's primary food. They feed during the day in spring and summer, and at night during the winter.

A specific interspersion of habitat types is required: associated with young, second-growth hardwoods and other early-successional habitats that are a result of periodic forest disturbance. Ideal habitat consists of young forests and abandoned farmland mixed with forested land. Home ranges are estimated around 100 acres (NatureServe 2019).

Threats Relevant In or To the Plan Area:

Habitat - Loss of habitat due to maturation of forests and lack of periodic disturbance to create forest openings and early successional forest habitat may limit woodcocks (Rodewald et al. 2016). Most likely threatened by a combination of hunting and habitat loss from reforestation, urbanization, and agriculture. Hunting may potentially have a significant impact when populations are reduced by adverse weather, but little is known; data do not indicate that hunting has played a major role in declines, but a better understanding of all the factors is needed. Because of its habitat requirements and unique behaviors, American woodcocks may be prone to over-harvest (NatureServe 2020).

Rationale for SCC Determination:

While American woodcocks are listed as stable in Ohio, the Ohio Breeding Bird Atlas calculated sizeable and statistically significant declines in occupancy overall and in the Ohio Hills region. NatureServe (2020) recognizes overall declines despite continued relative abundance across its range. Furthermore, the Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern and regional responsibility for this species. The habitat trend in the plan area is decreasing; 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%. It requires periodic disturbance of forested habitat to create openings and early successional forest, and is likely to benefit from active forest management for early successional forest

habitat as well as wildlife openings maintenance. Therefore, based on trends in Ohio and in the Wayne, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

It should be noted this species is still huntable, which is regulated by the U.S. Fish & Wildlife Service.

Eastern Whip-Poor-Will (*Antrostomus vociferus*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Occurs in all three units of the Wayne with many anecdotal observations recorded during other nocturnal surveys but as a non-target species; not entered into wildlife occurrence database. Official state surveys have been done opportunistically and have documented the species in the Athens and Ironton Units (personal communication, Katrina Schultes and Lynda Andrews, 2020). Southeast Ohio is in the core of the breeding range (Rodewald et al. 2016). This species is of high conservation concern throughout its breeding range and is a focus for multiple bird regions (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown, but suspected in decline and added to the Regional Forester Sensitive List list in 2017; less commonly heard singing now than 20 years ago (personal communication, Katrina Schultes and Lynda Andrews, 2020).

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend, but long-term national Breeding Bird Survey data indicated a 5.9% annual population decline in Ohio since the mid-1960s (Sauer et al. 2014, as cited in Rodewald et al. 2016). The Breeding Bird Atlas recorded a statistically significant 58% decline in priority block occupancy across the state and a significant 48% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. It must be noted that this is a difficult bird to detect without targeted nocturnal surveys accounting

for dependence on high levels of moonlight. However, declines within Ohio are consistent with decreases reported by second atlas project in several surrounding states and Ontario (Rodewald et al. 2016).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class D).

Associated with forested landscapes. Dry deciduous and mixed coniferous-deciduous with little or no underbrush and regular disturbances (e.g., timber harvest), and nesting locations typically provide a combination of shade, proximity to open areas for foraging, and sparse ground cover (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity. In the Wayne, there is a declining trend due to a substantial under-representation of early successional classes overall, succession to mature forests, and a lack of regular disturbance—such as harvest and prescribed fire—to create openings and younger patches. Rodewald et al. (2016) noted greater numbers found in areas of increased edge within forested landscapes, suggesting heavier silvicultural practices may benefit breeding. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

Lays eggs on ground in open site under trees or under bush, usually on a bed of dead leaves at woods edge or in open woodland. Clutch size is two. Incubation 17-20 days. Young tended mainly by female, male brings food. Young first fly at about 20 days. Eats moths and other insects caught in flight from perch or ground. Little information on home range or territory size. Strictly nocturnal.

Overwinters in Florida and sparingly along the southeastern and Gulf coastal plains and from southern Mexico to Costa Rica (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Forest succession changing pole-sized forest associated with this species into mature forest that lacks openings with sparse underbrush. Lack of regular disturbance. Little is known about its wintering habitat south of the United States (Rodewald et al. 2016).

Rationale for SCC Determination:

There is substantial concern for the species continued long-term persistence in the plan area based on long-term national Breeding Bird Survey data showing declining trends in

its regional, statewide, and range wide populations, decreasing habitat quality trends in the plan area, and negative responses to lack of management.

Red-Headed Woodpecker (*Melanerpes erythrocephalus*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Observations recorded in 5 HUCs in the Athens and Ironton Units of the Wayne, but it is also likely to be present in Marietta Unit, given scattered occurrences in the Ohio Breeding Bird Atlas II (Rodewald et al. 2016). However, appears to be relatively uncommon in the Ohio Hills region overall, compared to western and central Ohio according to the Breeding Bird Atlas.

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 49% population decline, a statistically significant 26% decline in priority block occupancy across the state and a significant 25% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. Populations have fluctuated dramatically over the last 200 years but have generally declined during the last 100 years across range, including Ohio. National Breeding Bird Survey data indicated 3% annual population declines between 1966 and 2011, representing a 75% decline in the statewide population (Sauer et al. 2014, as cited in Rodewald et al. 2016). These population declines are similar to trends in adjacent states.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class B, C); Dry-mesic Mixed Oak Hardwood Forest (Class B, C); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Breeds in open deciduous woodlands, including riparian woods, tree groves, tree rows, forest edges, parkland, oak savannah, and stands of dead trees killed by disease, insects,

or flooding (e.g., beaver ponds). They also breed in more-forested landscapes where there are sufficient canopy openings and open understory conditions (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Oaks and open woods are declining on the Wayne. A comparison of forested stand data between 2006 and 2018 indicates dense, mature forests 80 years and older have increased 46% (USDA 2018). While the amount of mature forest habitat in the Wayne is increasing, "Oak woodlands, once comprising approximately 48% of the historical land base across the study area, now cover approximately 6%" (from *Wayne National Forest Assessment*). While oak is present in the canopy and larger size classes, it is uncommon in the understory and mid-story—regeneration is not keeping up with changing conditions. Breeding habitat has low-moderate to low integrity due to lack of openings and a lack of regular disturbance—such as harvest and prescribed fire—to create openings.

Relevant Life History & Other Information:

Nests in hole excavated 2-25 meters above ground by both sexes in live tree or dead stub. Individuals typically nest in the same tree or cavity in successive years. Young are fed insects, worms, spiders, and berries (NatureServe 2019). Insectivorous in spring and summer when it hawks insects from high perches. During winter, relies primarily on beechnuts and acorns, and hard-mast availability influences the extent of annual migratory movements and local winter abundance (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Breeding habitat - In eastern North America, changes in historic disturbance regimes are currently shifting forests from a disturbance-dependent climax community dominated by oaks *(Quercus* spp.) to a mesophytic climax community dominated by shade tolerant species. According to the *Wayne National Forest Assessment*, the volume of white oak in Southeast Ohio declined by nearly 25% between 2006 and 2016. Reforestation to dense, middle-aged, closed canopy forest and fire suppression or other management have likely contributed to population declines of red-headed woodpeckers (Rodewald et al. 2016).

Rodewald et al. (2016) suggests that recent mass tree mortality (e.g., from introduced emerald ash borer) may temporarily increase local availability of snags for nesting; however, the multiple diseases and insects affecting oaks could strongly reduce a critical winter food supply. Long-term effects are unclear, as the longevity of snags for nesting and the future tree-species composition of woodlands is uncertain.

Rationale for SCC Determination:

There is substantial concern for the species continued long-term persistence in the plan area based on knowledge of significantly declining trends in its regional, statewide, and range wide population, declining habitat quality trends in the plan area, and uncertainty of favorable future tree-species composition in local forests due to lack of oak regeneration, climate change, and other factors.

Cerulean Warbler (*Setophaga cerulea*)

Group: Birds

Conservation Categories: U.S. Fish & Wildlife Service Species of Concern; State Species of Conservation Concern; Ranked 1 as bird Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio. The State Wildlife Action Plan (ODNR 2015) considers it "uncommon (6-10 counties)," which is in direct contrast to the Ohio Breeding Bird Atlas II (Rodewald et al. 2016) results, in which the species is distributed across much of Ohio, most commonly in the eastern half where densities are the highest. Thirteen percent of the global breeding population occurs in Ohio (PIFSC 2013, as cited in Rodewald et al. 2016), and the Wayne is in this core, where it is a common wood-warbler and widespread in mature deciduous forest—likely in every watershed—across all three units. The species is commonly recorded in local breeding bird surveys. The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Monitored as a Management Indicator Species, and trend data from the Wayne breeding bird surveys suggest modest declines across the plan area (2003-2016; USDA 2019).

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 60% population decline, a statistically significant 45% decline in priority block occupancy across the state and a significant 33% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data show a 3.1% per year population decline since the mid-1960s, representing a total population loss of 75% (Sauer et al. 2014, as cited in Rodewald et al. 2016). Cerulean warblers have been cited as one of the most imperiled eastern forest birds (NABCI 2009, as cited in Rodewald et al. 2016).

Considered vulnerable or imperiled in all but the core breeding range (NatureServe 2020).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D).

They prefer large tracts of mature deciduous woodlands (particularly oak-dominated forests) at least 50 to 75 acres in size for breeding. Preferentially favors large white oaks (*Quercus alba*) for nesting, is a canopy nester, and needs gaps in the canopy (Rodewald 2013; USDA 2006). Rodewald et al. (2016) also add that forested ridgetops with minor canopy disturbances are important and recent modeling efforts have identified both forest-patch size and percentage of forest in the landscape as important. Rodewald (2013) provided evidence that cerulean warblers preferentially locate territories near small-scale disturbances and noted that the presence of scattered regenerating clearcuts and interior edges (e.g., edges within larger expanses of mature forest) does not appear to affect either density or nesting success. Also forest structure that mimics old-growth forests may be important, such as lower tree densities and presence of canopy gaps and grapevines. Presence is also positively associated with northeast-facing slopes.

Research from Vitz and Rodewald (2006) in southeast Ohio suggest that regenerating clearcuts may also be important resources for mature-forest birds during the post-breeding period (including cerulean warblers), and forested landscapes containing a mosaic of successional stages may hold the most conservation promise for mature-forest birds.

Habitat Trend in Plan Area:

Mature forest is increasing; however, oak forests are declining. Low-Moderate Integrity; Low-Moderate Integrity. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*). "Oak woodlands, once comprising approximately 48% of the historical land base across the study area, now cover approximately 6%; herbaceous vegetation now comprises an estimated 0.031% of the study area, compared to 4.8% historically (see *Terrestrial Ecosystems Supplemental Report*)" (from *Wayne National Forest Assessment*). While oak is present in the canopy and larger size classes, it is uncommon in the understory and mid-story—regeneration is not keeping up with changing conditions. 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 (USDA 2006), which means there would likely be a lack of structural diversity and preferred canopy gaps.

Relevant Life History & Other Information:

Nearly confined to tall tree canopies, this species is often heard but rarely seen in summer. Usually only one brood of 4 eggs (3-5 possible) in a nest built in tree canopies, especially large trees where size is of primary importance and species is secondary

(NatureServe 2019). Although considered area-sensitive, this may be due to various factors that covary with fragment size, such as Brown-headed Cowbird (*Molothrus ater*) parasitism and predation, rather than particular behavioral aversion to small fragment size or to edges (Buehler et al. 2013).

This species migrates in winter to the Andes of South America at elevations that overlap with extensive coffee production (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Decline in habitat quality - Recent evidence suggests that events on breeding, stopover, and South American wintering grounds are implicated in the decline of this species (DOI 2012).

Breeding habitat - In eastern North America, changes in historic disturbance regimes are currently shifting forests from a disturbance-dependent climax community dominated by oaks *(Quercus* spp.) to a mesophytic climax community dominated by shade tolerant species. According to the *Wayne National Forest Assessment*, the volume of white oak in southeastern 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. According to the USDA (2006), oak will likely decline in National Forest System lands over the long-term, which is not favorable for cerulean warbler breeding habitat structure. Providing mature oak-dominated forests in tracts of 50-75 acres or more with canopy gaps and large oak trees is beneficial for breeding habitat. However, a subsequent southeastern Ohio study found that while short-term abundance was high in shelterwood harvest areas, short-term nesting success for mixed-oak canopy nesting species was low in shelterwood harvest units. In the mid-term, management for oak regeneration will typically remove all over-story trees later in the cutting cycle, initially resulting in loss of nesting substrates and hence breeding habitat for canopy songbirds. In the Wayne, these species include for yellow-throated vireos, cerulean warblers, and blue-gray gnatcatchers (Newell and Rodewald 2012). However, in the long-term (100-200 years), even-aged management may be necessary to retain oak ecosystems on the landscape, which may in turn aid in the long-term persistence of cerulean warblers and similar species.

Rationale for SCC Determination:

There is substantial concern for the species continued long-term persistence in the plan area based on knowledge of significant declining trends in its local, regional, statewide, and range wide populations, both short- and long-term decreasing habitat quality trends in the plan area, and threats to wintering habitat outside the plan area.

Prairie Warbler (*Setophaga discolor*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; NatureServe rank G5S

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada), with southern Ohio at the northern edge of its continuous range (i.e., spotty distribution occurs north all the way into Ontario); common in the state (11-29 counties) (ODNR 2015). Historically, prairie warblers did not occur in Ohio prior to widespread forest clearing (Rodewald et al. 2016). Now they are relatively common in suitable habitat during Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020). In the Ohio Breeding Bird Atlas II (Rodewald et al. 2016) results, the species is nearly confined to the Ohio Hills and southwest Ohio, and reaches its highest densities in more southern counties (Rodewald et al. 2016). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 62% population decline, a statistically significant 22% decline in priority block occupancy across the state (but mostly from the northern part) and a significant 19% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 3.9% annual population decline in Ohio since the mid-1960s and a widespread loss of 61% of the overall breeding population since 1966 (Sauer et al. 2014 as quoted in Rodewald et al. 2016). This species often cited as an example of alarming decline among Neotropical migrants (Nolan et al. 2014).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A); Dry-mesic Mixed Oak Hardwood Forest (Class A); Reclaimed Grassland.

Inhabits scrubby fields, locust groves in reclaimed strip mines, old clearcuts, and cedar groves. Nesting habitat is brushy second growth, dry scrub, pine barrens, burned-over areas, and early successional habitat. "Small patches of habitat may be suitable for breeding. Shrub-sapling habitats on reclaimed strip-mines in the Ohio Hills hold significant populations, as do abandoned pastures and regenerating clearcuts" (Rodewald

et al. 2016). Habitats tend to be ephemeral, so they need to be generated over space and time to keep this species on the landscape.

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity. Decreasing. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland- and shrubland-dependent species. This species likely uses all ecological landtypes, and extensive forested tracts are well-distributed across the Wayne; however, its need for dense, shrubby under- and mid-story habitat suggests breeding habitat is decreasing due to substantial under-representation of shrubby, early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%. Alternately, many reclaimed strip-mine grasslands in the Wayne are becoming less open (and more suitable) with the proliferation of trees and shrubs (personal communication, Katrina Schultes, 2020).

Relevant Life History & Other Information:

Nests with 3-5 eggs are placed low in shrubs or saplings. Diet is mainly insects and spiders; forages among bushes, fly-catches, hovers, and predominantly gleans prey from leaves and stems (NatureServe 2019). Since breeding habitat requires early successional habitat, which is often ephemeral, breeding locations naturally changes with time (Nolan et al. 2014).

Overwinters in Caribbean and peninsular Florida and along the Gulf coast of southern Mexico and Central America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - loss of early successional, shrubby habitat. A study of songbirds in mixed-oak forests in southeastern Ohio compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. Shrub-nesting species increased >100% several years post-harvesting. Shrub-nesting species were all positively associated with dense shrub and sapling regeneration that occurred post-disturbance after opening of the forest canopy, and overall density was 157% greater in shelterwood than reference stands (Newell and Rodewald 2012). A study of southeast Ohio bird communities in regenerating clearcuts 4-6 years post-harvest made the following findings: 1) Shrubland specialist species that avoided mature forest edge were blue-winged warbler, prairie warbler, yellow-breasted chat, and field sparrow; 2) There was no evidence of reduced avian productivity in small stands (4-8 ha) (Rodewald and Vitz 2005).

Parasitism - Brown-headed cowbird parasitism is a threat (NatureServe 2019).

Rationale for SCC Determination:

There is substantial concern for the species' continued long-term persistence in the plan area based on knowledge of declining trends in its regional, statewide, and range wide populations, habitat quality trends in the plan area, and responses to management. Prairie warblers are decreasing across their range and in Ohio and the Ohio Hills region. They are currently still fairly common in the plan area but are somewhat confined to limited reclaimed strip-mine shrubby grasslands. It is a shrub specialist with low to moderate habitat integrity that is likely to benefit from active forest management to create early successional forest habitat (Rodewald et al. 2016). A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland- and shrubland-dependent species, such as prairie warbler.

Eastern Meadowlark (*Sturnella magna*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Species is rare in the Wayne, but not uncommon in suitable habitat, such as reclaimed strip-mine grassland, mainly found in clusters in the Athens and Ironton Units (personal communication, Katrina Schultes, 2020). Breeding densities in Ohio were lowest across the plan area in the southern Ohio Hills region, which makes sense given the increasing forest cover (Rodewald et al. 2016) and hilly terrain less conducive to farming.

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a nearly 60% population decline, a statistically significant 6% decline in priority block occupancy across the state (primarily in heavily forested areas and urban areas) and a significant 6% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 4% annual population decline in Ohio 1966-2011 (Sauer et al. 2014 as quoted in Rodewald et al. 2016). NatureServe (2019)

noted national breeding bird survey data are showing some of the most consistent declines of any grassland bird in North America.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Reclaimed Grasslands.

Associated with grasslands such as lightly grazed pastures, hayfields, fallow fields, reclaimed strip-mine grasslands, and roadsides within agricultural and to a lesser extent more forested landscapes (Rodewald et al. 2016). These grasslands may be devoid of woody vegetation or support scattered bushes and small trees (area sensitivity was not mentioned.)

Habitat Trend in Plan Area:

Decreasing. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species. Herbaceous vegetation now comprises an estimated 0.031% of the study area, compared to 4.8% historically (see *Wayne National Forest Assessment*). Open habitats of sufficient size are limited in the plan area. Many reclaimed strip-mine grasslands in the Wayne are or are becoming less open and suitable with the proliferation of trees and shrubs used to growing in poor soils, including non-natives like autumn olive and lespedeza (which is woody) and native pioneer species (e.g., black locust and Virginia pine [personal communication Katrina Schultes, 2020]).

Relevant Life History & Other Information:

Nests on the ground, usually in shallow depressions under clumps of dense grasses. Nest construction does not normally begin until the second half of April and most clutches are produced during the first half of May and broods fledge in June. Produces two broods each year, and may re-nest if the first is destroyed. These birds are seen walking in grain fields and areas of short grass where they feed on insects in the summer and seeds in the winter.

Threats Relevant In or To the Plan Area:

Habitat - Disturbance (e.g., mowing, haying, tilling) of grassland habitats during the breeding season is a major factor in its decline. Also natural succession decreases grassland suitability (NatureServe 2019).

Parasitism - Nests widely parasitized by brown-headed cowbirds (NatureServe 2019).

Rationale for SCC Determination:

Most evidence suggests a steep downward trend in populations of eastern meadowlark in Ohio and across its range. Habitat for this species is uncommon in the plan area, and

prone to succession. In general, mowing, grazing, or burning may be needed to maintain habitat in the long term, but may be detrimental to local populations in the short term (e.g., species will use habitats 2-4 years after burning [NatureServe 2019]). Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Grasshopper Sparrow (*Ammodramus savannarum*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Species is rare in the Wayne, but Wayne breeding bird surveys from 2003-2016 suggest it is not uncommon in suitable habitat, such as reclaimed strip-mine grassland, mainly found in clusters in the Athens and Ironton Units (personal communication, Katrina Schultes, 2020). It is among the most widely distributed breeding sparrows in North America and is prevalent across western Ohio; in eastern Ohio, it seems correlated with presence of reclaimed strip-mine grasslands (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 74% population decline, a statistically significant 24% decline in priority block occupancy across the state in all regions and a significant 34% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 5.5% annual population decline in Ohio since the mid-1980s and even steeper declines in the 60s to 70s (Sauer et al. 2014 as quoted in Rodewald et al. 2016). Range wide declines were also noted around 4% per year since the 1960s (NatureServe 2019).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Reclaimed Grasslands.

Breeding grasshopper sparrows prefer tall-grass habitats such as hayfields, lightly grazed pastures, reclaimed strip mines, and fields bordering airports. They are also regularly found in clover and alfalfa hayfields, and fallow fields with an interspersion of weeds and grasses. An occupant of dry upland habitats, grasshopper sparrows inhabit medium-sized tracts of grasslands (at least greater than 25 acres, but possibly greater than 74 acres) and normally avoid narrow strips of grassy vegetation.

Habitat Trend in Plan Area:

Decreasing. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species. Herbaceous vegetation now comprises an estimated 0.031% of the 17-county study area, compared to 4.8% historically (see *Wayne National Forest Assessment*). Open habitats of sufficient size are limited in the plan area. Many reclaimed strip-mine grasslands in the Wayne are, or are becoming, less open and suitable with the proliferation of trees and shrubs used to growing in poor soils, including non-natives like autumn olive and lespedeza (which is woody) and native pioneer species (e.g., black locust and Virginia pine [personal communication, Katrina Schultes, 2020]). Rodewald et al. (2016) suggested declines happened due to agricultural intensification, resulting declines in fallow fields, and more frequent mowing of hayfields.

Relevant Life History & Other Information:

Grasshopper sparrows build their well-concealed nests on the ground in clumps of living grasses. Nest construction is most prevalent during May. Most first clutches of 3-6 eggs can be found between May and June. The eggs are incubated for 11-12 days and young fledge by June and July, 9 days after hatching. Re-nesting attempts and second broods are regularly noted. Average territory size is small (<2 ha). They typically eat insects and seeds (NatureServe 2019).

Overwinters in Texas, Florida, Mexico, and into Central America (NatureServe 2019). Management methods for this species include treating portions of large areas on a rotational schedule to provide a mosaic of successional stages. For instance, in areas >80 hectares, annually treated (burned, mowed, or grazed) subunits should be >30 hectares, or about 20-30% of the total area.

Threats Relevant In or To the Plan Area:

Habitat - Due to the disappearance and fragmentation of grasslands, grassland birds have declined more than any other group of birds in North America. Reforestation and mowing of habitat during the nesting season has caused declines (NatureServe 2019). Rodewald et al. (2016) suggested that eliminating or minimizing early-season hayfield mowing would allow fledging from nests and financial incentives may motivate farmers to leave a portion of land for wildlife.

Rationale for SCC Determination:

Grasshopper sparrows are experiencing declining population trends range wide, in Ohio, and in the Ohio Hills region. They have narrow environmental specificity and required habitat for this species is uncommon and prone to succession. In general, mowing, grazing, and burning may be needed to maintain habitat in the long term but may be detrimental to local populations in the short term (NatureServe 2019). Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Henslow's Sparrows (*Ammodramus henslowii*)

Group: Birds

Conservation Categories: Ohio Species of Concern; U.S. Fish & Wildlife Service Species of Concern; Ranked 1 as bird Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed in state (>30 counties) (ODNR 2015). Species is rare in the Wayne, but Wayne breeding bird surveys from 2003-2016 suggest it is not uncommon in suitable habitat, such as reclaimed strip-mine grassland, mainly found in clusters in the Athens and Ironton Units (personal communication, Katrina Schultes, 2020). It is uncommon throughout most of Ohio, and most of the occurrences are in the Ohio Hills region and just to the west in southern Ohio (Rodewald et al. 2016). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Monitored as a Management Indicator Species on the Wayne, trend data for the relatively small sample size for Wayne breeding bird surveys suggest an overall slightly declining trend in reclaimed strip-mine grasslands, their primary local habitat (2003-2016; USDA 2019). This trend is consistent with documented declining habitat suitability trends in suitable habitat (personal communication, Katrina Schultes, 2020). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend, but in contrast to the State Wildlife

Action Plan noted that "populations have strongly declined within Ohio and surrounding regions" (Rodewald et al. 2016). The Breeding Bird Atlas recorded a statistically significant 37% decline in priority block occupancy across the state and a significant 43% decline in the Ohio Hills region (where it is most common in Ohio) in the 25 years since first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 4% annual population decline in Ohio since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Reclaimed Grasslands.

In Ohio, breeds in larger overgrown meadows of dense grasses and forbs, mainly in sizeable reclaimed strip-mine grasslands (Rodewald et al. 2016). Hyde (1939) describes a variety of preferred habitats: upland weedy hayfields or pastures without shrubs, wet meadows, grassy fields, and sedgy hillsides with recently planted pine seedlings (*Pinus* spp.). They use unmowed hayfields or lightly (Skinner 1975) or moderately (Smith and Smith 1990) grazed pastures (NatureServe 2019). Area sensitivity suggests they need grassland patches at least 30 ha (74 ac) in size (NatureServe 2019).

Habitat Trend in Plan Area:

Decreasing. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species. Herbaceous vegetation now comprises an estimated 0.031% of the 17-county study area, compared to 4.8% historically (see *Wayne National Forest Assessment*). Open habitats of sufficient size are limited in the Wayne, but there is a network of sorts in southeastern Ohio of these reclaimed grasslands spanning private and state lands. However, they require occasional management intervention. Many of these grasslands in the Wayne are, or are becoming, less open and less suitable with the proliferation of trees and shrubs used to growing in poor soils, including non-natives like autumn olive and lespedeza (which is woody) and native pioneer species (e.g., black locust and Virginia pine [personal communication, Katrina Schultes, 2020]).

Rodewald et al. (2016) wrote that regional declines are "most likely because of increased agricultural intensification and the resulting declines in fallow fields," but locally, declines are mainly a result of declining habitat suitability in the reclaimed grassland tracts of sufficient size to harbor this species (personal communication, Katrina Schultes, 2020).

Relevant Life History & Other Information:

The nest is woven out of grass and is placed on the ground, usually concealed by taller grasses. Two broods of young per breeding season, perhaps three, are raised. Clutch size

is from three to five eggs that are incubated for 11 days. Young fledge 9-10 days after hatching. Eats insects and seeds (NatureServe 2019).

Non-Breeding Habitat is mainly southeastern United States, including coastal states from South Carolina south to Florida and west to Texas (NatureServe 2019).

Suggested management (NatureServe 2019): focus should be on patches equal to or larger than 74 acres (30 ha). "Management regimes that produce dense and moderately tall grassy vegetation (>30 cm) from mid-May through mid-August should be considered. In general, mowing, grazing, and/or burning may be needed to maintain habitat in the long term but may be detrimental to local populations in the short term. Woody species should be removed."

Threats Relevant In or To the Plan Area:

Habitat - Due to the disappearance and fragmentation of grasslands, grassland birds have declined more than any other group of birds in North America. Henslow's sparrow appears to be highly sensitive to habitat fragmentation and the size of the grassland tract. Outside of reclaimed mined lands, the Ohio landscape is unlikely to support large areas of native grassland habitat given current land ownership patterns and land-use practices (ODNR 2015). Succession to shrublands and forests is one of main ways to lose nesting suitability (NatureServe 2019).

Rationale for SCC Determination:

Very narrow environmental specificity. The most recent evidence (Ohio Breeding Bird Atlas from 2016, which is more recent than the Ohio State Wildlife Action Plan) suggests a significant downward trend in populations in Ohio and in the Ohio Hills region. Furthermore, the Wayne breeding bird surveys also suggest a local downward trend. The sparrow is known to be highly sensitive to the size of grassland habitat tracts, and suitable habitats of sufficient size are limited in the Wayne and prone to succession. In general, mowing, grazing, or burning may be needed to maintain habitat in the long term but may be detrimental to local populations in the short term (NatureServe 2019). A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species, such as Henslow's sparrow. Therefore, based on the population trend in Ohio and in the Wayne, and the declining trend in habitat suitability and the need for habitat management, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Northern Harrier (*Circus cyaneus*)

Group: Birds

Conservation Categories: Ohio State Endangered; Ranked 5 as bird Species of Greatest Conservation Need; U.S. Fish & Wildlife Service Species of Concern; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio. The center of range is in or near Ohio. Was once common across Ohio, but by the mid-1900s, they no longer bred in much of the state. It remains a very rare breeding species, and little is known about its populations. The Breeding Bird Atlas recorded few observations in or around the plan area (Rodewald et al. 2016). This species is more common in the Wayne during migration and winter.

Wayne breeding bird surveys from 2012-2014 showed 5 occurrences in the Ironton Unit in large Cambria reclaimed strip-mine, and 1 occurrence (2012) in reclaimed strip-mine in Athens Unit. No Marietta Unit breeding bird survey routes go through appropriate habitat.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). The Breeding Bird Atlas II (2006-2011) lists 71 possible nests, 9 probable, and 7 confirmed nests in Ohio (ODNR 2015). Continued monitoring is necessary to assess Ohio population status (ODNR 2015). Trend in the Wayne unknown; very few recorded on local breeding bird surveys and they are considered rare.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a non-significant 11% decline in priority block occupancy across the state and no change in the Ohio Hills region in the 25 years since first Breeding Bird Atlas.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Rolling Bottomlands Mixed Hardwood Forest (Class A); Reclaimed Grasslands.

Northern harriers are associated with large (greater than 55 ha, 136 ac) grasslands, wet meadows, wet prairies, pastures, hayfields, and reclaimed surface-mined lands.

Habitat Trend in Plan Area:

Decreasing. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species.

Herbaceous vegetation now comprises an estimated 0.031% of the 17-county study area, compared to 4.8% historically (see *Wayne National Forest Assessment*). Open habitats of sufficient size are limited in the plan area. Many reclaimed strip-mine grasslands in the Wayne are, or are becoming, less open and suitable with the proliferation of trees and shrubs.

Relevant Life History & Other Information:

Northern harriers often nest in loose colonies. The female builds a nest out of sticks on the ground, often on top of a mound. Breeding occurs from April through July, and the 3-5 eggs are incubated for 28-36 days. Young fledge 30-35 days after hatching. Harriers hunt low over grasslands and prefer to eat small mammals.

Threats Relevant In or To the Plan Area:

Habitat - Originally this species relied on the presence of wet meadows and large marshes, which were nearly all drained, but they adapted to a wider range of habitat types. However, due to the disappearance and fragmentation of grasslands, grassland birds have declined more than any other group of birds in North America. Appears to be highly sensitive to habitat fragmentation and the size of the grassland tract. Outside of reclaimed mined lands, the Ohio landscape is unlikely to support large areas of native (or non-native) grassland habitat given current land ownership patterns and land-use practices (ODNR 2015).

Rationale for SCC Determination:

While this species has been observed in the Wayne, it has not been documented breeding here, it was not likely common historically given the hilly nature of the area, and has been a very low-density resident in Ohio since the mid-1900s. This species has a very large breeding home range to sustain a viable breeding population and National Forest System lands generally have relatively small, scattered, and disconnected reclaimed strip-mined grasslands. Strip-mining is no longer a common occurrence. Therefore, it is unlikely that there will ever be sufficient habitat in the Wayne to support breeding. The Wayne may contribute to migratory stopover and wintering habitat, but not likely breeding habitat. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Black-Billed Cuckoo (*Coccyzus erythropthalmus*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) across 2/3 of eastern North America, which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Observations recorded in 15 HUCs in the Wayne. Most of observations in Aaron Creek-Symmes Creek, Camp Creek-Symmes Creek, and Greens Run-Sunday Creek HUCS.

Wayne breeding bird surveys from 2003-2016 recorded a total of 37 individuals across all units (most prevalent in Ironton Unit). Distribution appears to be somewhat localized.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend data for Wayne breeding bird surveys not completed.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. In early 1900s, the species was numerous in eastern Ohio but is now considered uncommon throughout much of its range. The Breeding Bird Atlas recorded a statistically significant 36% decline in priority block occupancy across the state, and a non-significant 3% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. According to the National Breeding Bird Survey data (as quoted in Rodewald et al. 2016), likely small sample sizes resulted in no available Ohio trend, but surrounding states all show fairly substantial annual declines of 2-6%. NatureServe (2020) states: "Large range but low numbers. Evidently has declined in central North America, but rangewide trend based on BBS data is stable."

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class B, C); Dry-mesic Mixed Oak Hardwood Forest (Class B); Rolling Bottomlands Mixed Hardwood Forest (Class B).

This species uses young, dense, shrubby habitat within forested landscapes or needs wooded corridors or woodlands for connectivity in more fragmented, agricultural landscapes (Rodewald et al. 2016). Usually found in edges and clearings of extensive tracts of young deciduous and mixed deciduous-coniferous woods where it uses dense shrub/sapling stands, forest edges, fencerows, often near marshes, lakes, and riparian areas; uses well-concealed nests in groves of trees, forest edges, moist thickets, overgrown, brushy pastures in deciduous or evergreen tree or shrub; is a low or ground-nesting species (Hughes 2018).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. This species likely uses all ecological landtypes and extensive forested tracts are well-distributed across the Wayne; however, its need for dense, shrubby under- and mid-story

habitat suggests breeding habitat is decreasing and has low to moderate habitat integrity due to substantial under-representation of shrubby, early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. 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%.

Relevant Life History & Other Information:

In winter migrates regularly through the southeastern United States; irregularly through Mexico and Middle America. They sometimes lay their eggs in other bird's nests and host raises the young cuckoos. Incubation of their 2-4 eggs lasts 10-13 days. Young fledge 7-9 days after hatching.

Well-known consumers of large, hairy caterpillars, including several detrimental forest pest species (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - More information needed on breeding and foraging ecology, and extent of wintering range and winter habitat parameters. Studies on the relative role of tropical deforestation compared with temperate habitat fragmentation are needed, as is response to various fire, logging, and grazing regimes (NatureServe Explorer 2019).

Pesticides - Sensitivity to most pesticides unknown, but needs further study because of reportedly strong reproductive response to irruptive insect populations and as an occasional brood parasite, relationship to host species needs better understanding (NatureServe Explorer 2019). Known to eat gypsy moth caterpillars (Rodewald et al. 2016), and effects on black-billed cuckoos of insecticide treatments to slow the spread of the non-native moth are unknown.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Broadly distributed but uncommon in the Wayne and across its range; there is some lack of knowledge and disagreement between sources about whether population trends are stable or decreasing in Ohio. There is an apparent lack of understanding about breeding ecology, status of populations and habitats during migration and winter, and subsequent effects on the species. Suitable habitat seems to be in decline in the plan area. Status of threats unknown at this time, although creation of early successional forest habitat through active forest management may favor this species.

Blue-Winged Warbler (*Vermivora cyanoptera*)

Group: Birds

Conservation Categories: Ranked 10 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) across eastern North America which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively abundant and commonly encountered in Wayne breeding bird surveys from 2003-2016 in suitable habitat across all units (personal communication, Katrina Schultes, 2020). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend data for Wayne breeding bird surveys not completed.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a statistically significant 33% decline in priority block occupancy across the state and a significant 12% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. The highest densities in the Breeding Bird Atlas were in the Ohio Hills. National breeding bird survey data indicate a 1.6% annual population decline in Ohio since the mid-1960s; however, survey-wide population appears stable (Sauer et al. 2014 as quoted in Rodewald et al. 2016) and NatureServe (2020) says "still common." Conservation concern is higher in (in descending order) Connecticut, New Jersey, Ohio, Kentucky, and Alabama, which are all states with higher area importance scores and greater population declines than other states in this species' range (Gill et al. 2001).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class B); Dry-mesic Mixed Oak Hardwood Forest (Class B); Rolling Bottomlands Mixed Hardwood Forest (Class B).

The blue-winged warbler occupies early-successional habitats associated with abandoned fields and harvested forest dominated by shrub-sapling stage vegetation, brushy woodland clearings, and the shrubby margins of woods (Rodewald et al. 2016; NatureServe 2019). They generally avoid fencerows and other narrow brushy corridors

bordered by open fields. This species prefers moist thickets, but will also occupy relatively dry hillsides (NatureServe 2019).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. This species likely uses all ecological landtypes and extensive forested tracts are well-distributed across the Wayne; however, its need for dense, shrubby under- and mid-story habitat suggests breeding habitat is decreasing and has low to moderate habitat integrity due to substantial under-representation of shrubby, early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

Clutch size is 4-7 (usually 5-6); incubation, by female, lasts about 10-12 days; young leave nest at 8-11 days; eats insects and spiders while hovering or hanging under leaves to snatch prey (NatureServe 2019).

Overwinters from Mexico to Panama (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Loss due to suburban development of old fields and shrublands, clearing/burning of successional shrublands for pasture/agriculture, and succession of shrublands to forest. In upland forest areas, rotational harvesting of timber could supply adequate habitat where appropriate as long as the required old-field/shrub component is available (NatureServe 2019). A study of SE Ohio bird communities in regenerating clearcuts 4-6 years post-harvest made the following findings: 1) shrubland specialist species that avoided mature forest edge were blue-winged warbler, prairie warbler, yellow-breasted chat, and field sparrow; and 2) there was no evidence of reduced avian productivity in small stands (4-8 ha) (Rodewald and Vitz 2005).

Brood parasitism and forest fragmentation: suffers 67% rate of parasitism by brown-headed cowbird in fragmented habitats in northeast Ohio (Rodewald et al. 2016).

Rationale for SCC Determination:

The species is currently still fairly common and abundant in the plan area with the highest densities recorded in the state in the vicinity of the Wayne, although declining trends have been documented in Ohio and the Ohio Hills region. However, the species appears to be stable across its broader range. Habitat quality trends in the plan area appear to be decreasing. It is a shrub specialist with low to moderate habitat integrity that is likely to benefit from active forest management to create early successional forest habitat, as well as feathering of edges, wildlife openings maintenance, and management

of utility rights-of-way and similar habitats (Rodewald et al. 2016). Habitat management done for other potential species of conservation concern will benefit this species. Therefore, based on the information provided, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Worm-Eating Warbler (*Helmitheros vermivorum*)

Group: Birds

Conservation Categories: Ranked 10 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Relatively abundant and commonly encountered in the Wayne breeding bird surveys from 2003-2016 in suitable habitat across all units (personal communication, Katrina Schultes, 2020). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Monitored as a Management Indicator Species, trend data for Wayne breeding bird surveys suggests a slight increase in the survey average across the Wayne from 2003-2016 (personal communication, Katrina Schultes, 2020). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 31% population increase and a statistically non-significant 13% decline in priority block occupancy across the state and a non-significant 17% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. The declines are mainly attributed to the northern Ohio Hills region, which is north of the plan area, compared to the highest densities that were recorded within the southern half of the Ohio Hills region and noted specifically in the vicinity of the Wayne and several state forests. National Breeding Bird Survey data indicate a 5% annual population increase in Ohio since the first Breeding Bird Atlas (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D).

Species is area-sensitive, requiring large tracts for breeding. Breeding pairs largely restricted to sites with steep slopes and well-developed understory vegetation within extensive areas of deciduous forest (Rodewald et al. 2016). Studies in other states suggest that forest tracts of 300 ha or more may be needed; reported as absent or with low population density in forest tracts smaller than about 20-70 ha. It is unknown whether individuals nesting at small sites contribute offspring to future generations.

Habitat Trend in Plan Area:

Stable to increasing. Low-Moderate Integrity; Low-Moderate Integrity. Forest habitat continues to increase and age within the Wayne. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% and make up nearly half of national forest system lands (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*). The requirement for minimum sized 50-acre areas of mature forest for this species is not uncommon in the forested context of southeast Ohio. Furthermore, the preferred upland landtypes were modeled as average to slightly above average in connectedness, suggesting presence of large areas of suitable habitat meeting the species' area requirements (greater than or equal to 50 acres) (see *Terrestrial Ecosystems Supplemental Report*).

Relevant Life History & Other Information:

Worm-eating warblers nest on the ground in moss or dead leaves. The 3-6 eggs are white with brown spots and incubated for 13 days. Young fledge 10 days after hatching (NatureServe 2019). Understory trees and shrubs suspend clusters of dead leaves that are used extensively for foraging of arthropods (Rodewald et al. 2016).

Overwinters from Mexico to Panama and in the Greater Antilles (Rodewald et al. 2016). Conserving large tracts of mature forest with variable topography should benefit species (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Large contiguous areas with a minimum of non-forested edge produce the highest densities of breeding individuals and increase reproductive success by decreasing cowbird parasitism and nest predation. Further studies are required to assess effects of various logging practices on both wintering and breeding grounds. However, this warbler probably is tolerant of many different forest management and logging practices; selective logging and thinning "over-mature" trees may create favorable conditions; may nest in clearcut areas as young as 7 years old where several hardwoods have been left standing in the clearcuts (NatureServe 2019). A study of songbirds in mixed-oak forests in southeastern Ohio compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. In the short-term, several midstory and ground-

nesting species were 26–73% less abundant in shelterwood than unharvested stands (Newell and Rodewald 2012).

Rationale for SCC Determination:

Stable to increasing in Ohio and in the Wayne, with the highest densities in the state recorded in close association with the southern Ohio Hills region, which includes the plan area. Size of contiguous habitat tracts needed in the Wayne is unknown, but habitat appears to be abundant, has broad distribution, and has moderate to high integrity. Noted likely tolerant to many types of forest management activities but may be more affected by even-aged management, although more studies may be warranted (NatureServe 2019). Therefore, based on the information provided, there is not substantial concern for long-term persistence of this species in the plan area.

Great Egret (*Ardea alba*)

Group: Birds

Conservation Categories: Ohio Species of Concern; Ranked 10 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). One to 2 observations recorded in a few HUCs in all three units of the Wayne, but not usually during breeding season and no nesting observed. Only 1 observation anywhere near the Wayne recorded in the Ohio Breeding Bird Atlas II (2006-2011) in Gallia County near the Lawrence County line (Rodewald et al. 2016). Within Ohio, breeding great egrets have been largely confined to the western Lake Erie basin.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend data for Wayne breeding bird surveys not completed.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend or to calculate a change in priority block occupancy across the state or in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. Overall, breeding pairs in Ohio increased nearly sevenfold since the first atlas, but none were recorded in the vicinity of the Wayne. The Breeding Bird Atlas notes populations are increasing and the outlook for the species in Ohio is positive.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Wetlands and directly adjacent Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class A, B, C).

Preferred habitat includes shallow water of marshes, ditches, wet fields, and river edges, where they eat frogs, snakes, crayfish, fish, mice, crickets, and aquatic insects. According to Rodewald et al. (2016), species requires suitable aquatic foraging habitat neared wooded islands (or other undisturbed sites) where colonies can thrive.

Habitat Trend in Plan Area:

Apparently stable. Moderate-High Integrity and Low Integrity. However, habitat with the needed specificity and requirements may be limited in the Wayne.

Relevant Life History & Other Information:

Great egrets normally nest in the tallest available vegetation. However, on islands where only shrubby vegetation is available, they have been found nesting on or near the ground. Egret nests are rather bulky stick platforms that may be used for several years. The first clutches are laid during the second half of April with most laid by mid-May. Clutches consist of 3-4 eggs and are incubated for 23-24 days. The first young hatch during the second half of May and early June and become independent by mid-July (NatureServe 2019). They may nest within great blue herons or other heron colonies (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Water pollution and disturbance by humans.

Rationale for SCC Determination:

Stable to increasing statewide. While observed in the Wayne, breeding great egrets in Ohio have been largely confined to the western Lake Erie basin. A few individuals appearing once in a while may be more transient across the plan area. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Wood Thrush (*Hylocichla mustelina*)

Group: Birds

Conservation Categories: Ranked 24 as bird Species of Greatest Conservation Need; NatureServe G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Among the most abundant and commonly encountered species (one of the top 5) during Wayne breeding bird surveys from 2003-2016 across all units (personal communication, Katrina Schultes, 2020). Approximately 5% of the global wood thrush population nests in Ohio (Rodewald et al. 2016). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend data for the Wayne breeding bird surveys not completed.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a statistically significant 4% decline in priority block occupancy across the state and no change in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. National Breeding Bird Survey data indicate substantial variability in abundance within Ohio with no overall change in the statewide population over the last 45 years; however, survey-wide population appears to have declined by 2% per year since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry-mesic Mixed Oak Hardwood Forest (Class D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Deciduous or mixed forests with a dense, closed tree canopy and a fairly well-developed deciduous understory, especially where moist, especially bottomlands and other rich hardwood forests; also frequents pine forests with a deciduous understory and well-wooded residential areas; forages mainly on or near ground (NatureServe 2019).

Habitat Trend in Plan Area:

Increasing. Low-Moderate Integrity; Low Integrity. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*).

Relevant Life History & Other Information:

The three or four eggs are laid in a grass-lined nest of mud and twigs placed low in the fork of a bush or sapling. Young fledge 12 days after hatching. Eats insects and other invertebrates (e.g., snails) and small fruits; forages mainly on or near ground, sometimes in tree foliage (NatureServe 2019).

Overwinters from southern Mexico through Central America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - A study of songbirds in mixed-oak forests in southeastern Ohio, compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. In the short-term, several mid-story and ground-nesting species were 26-73% less abundant in shelterwood than unharvested stands (Newell and Rodewald 2012). Loss and fragmentation of forested habitat in other regions has caused increased rates of nest predation and brood parasitism. In some areas of the Midwest, for example, thrushes are producing more cowbirds than thrushes, and avian nest predators such as grackles and crows are a serious threat. Management recommendations are that forests be left unfragmented and low-volume selective cutting be used as an alternative to clear cutting where possible (NatureServe 2019).

Tropical deforestation may also be a major threat to this species (NatureServe 2019).

Rationale for SCC Determination:

Despite apparent declines on regional and global scales, wood thrush are abundant with broad distribution in the Wayne. There was no downward trend in Ohio Hills occupancy or the plan area. Finally, national breeding bird survey data for Ohio show stable trends over the last 45 years. Furthermore, found in a wide variety of habitat types and there is an increasing trend in suitable habitat with moderate to high integrity, although they may not respond well to even-aged management techniques. Therefore, based on the information provided, there is not substantial concern for long-term persistence of this species in the plan area.

Louisiana Waterthrush (*Parkesia motacilla*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need, but added to list because of research and management activities that need to be conducted under the State Wildlife Action Plan; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Although not overly common in Wayne breeding bird surveys from 2003-2016, this species is broadly distributed in all three units and often encountered in suitable habitat (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Monitored as a Management Indicator Species, trend data from Wayne breeding bird surveys show a flat survey average at a relatively low level of detection, likely because standard road and trail surveys do not sample this species well, unless it crosses the obligate riparian forest habitat (personal communication, Katrina Schultes, 2020).

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a non-significant 10% decline in priority block occupancy across the state and a statistically significant 17% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. More than half of priority block records occurred in the Ohio Hills region, indicating the plan area's relative importance to this species in Ohio. Since the mid-1960s, national Breeding Bird Survey results show a relatively stable population across Ohio and the species' range (Sauer et al. 2014, as cited in Rodewald et al. 2016).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Primary Headwater Streams; Rolling Bottomlands Mixed Hardwood Forest: Small Stream & Riparian Forest (Class C, D).

Breeds in moist forest, woodland, and ravines along streams with abundant forest cover; mature deciduous and mixed floodplain and swamp forests. Prefers areas with moderate to sparse undergrowth near rapid-flowing water of hill and mountain streams. Nests on the ground along stream banks, hidden in the underbrush or among the roots of fallen trees, in crevices or raised sites in tree roots, or in rock walls of ravines over water. In migration and winter, also in riparian woodland, scrub, and thickets, generally near running water; avoids extensive openings and still water (NatureServe 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Low Integrity.

Relevant Life History & Other Information:

Clutch size is 4-6; young tended by both parents; one brood per year; and breeds earlier in year than most other warblers (NatureServe 2019). In Ohio, migrants return by late March and are rare outside this area. The nest of this bird is placed in small hollow or cavity on stream bank, under fallen log, or within roots of an upturned tree. Eats

primarily aquatic macroinvertebrates taken directly from the water; as such, several studies have indicated this species serves as a good indicator of stream ecosystem health (Rodewald et al. 2016). Overwinters from Mexico through Central America and throughout the Caribbean.

Threats Relevant In or To the Plan Area:

Habitat - Main threats are loss and degradation of mature headwater riparian forest habitat and water quality. Management should focus on protecting core wooded riparian habitat, including establishment or maintenance of riparian forest cover at least 60 meters (200 feet) wide to support successful breeders (Rodewald et al. 2016). Little information is currently available on habitat use, behavior, and population ecology in the wintering range. Effects of brown-headed cowbird (*Molothrus ater*) parasitism also need to be further studied (NatureServe2019).

Rationale for SCC Determination:

There is insufficient or inconsistent scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Louisiana waterthrush are relatively abundant with broad distribution in the Wayne and considered stable in Ohio, but showed statistically significant declines within the Ohio Hills region, which partially overlaps the plan area. Habitats used by this species are stable and have moderate to high integrity. There is some contradictory evidence as to population trend in the plan area due to survey methods and lack of habitat-targeted efforts. Rodewald et al. (2016) noted that national breeding bird survey data may be misleading, because this species is not sampled well by roadside surveys and the Breeding Bird Atlas itself did not detect enough to generate population estimates or a density map. Furthermore, they report that targeted surveys of riparian forest habitats are needed to properly assess population trends.

Sharp-Shinned Hawk (*Accipiter striatus*)

Group: Birds

Conservation Categories: State Species of Concern; Ranked 10 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively uncommon but not rare;

observations recorded in 11 HUCs in all three units of the Wayne and occasionally documented during Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020). Ohio is at the southeastern extent of the species' core breeding range (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend data for the Wayne breeding bird surveys is not available. This species is secretive and infrequently recorded on standardized surveys (Rodewald et al. 2016). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a non-significant 18% decline in priority block occupancy across the state and a non-significant 9% decline in the Ohio Hills region in the 25 years since first Breeding Bird Atlas. Rodewald et al. (2016) suggest that regional population trends may be better indexed by hawk migration count data: in 1994-2004, migratory populations in northeast United States declined by nearly 4% annually, but simultaneously Christmas Bird Count data showed increasing numbers over-wintering north of hawk watch sites, so perhaps they just are not migrating.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Sharp-shinned hawks are associated with a variety of forests including open woodland, coniferous, mixed, or deciduous. Young and dense mixed or coniferous woodlands are preferred for nesting. They can also be seen in agricultural and suburban areas, where they may hunt other birds at bird feeders.

Habitat Trend in Plan Area:

Stable. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. A variety of forest types and ages are available, but younger age classes that seem to be preferred for nesting are limited.

Relevant Life History & Other Information:

Nests are platforms made of twigs and bark and are usually placed in a conifer, high off the ground. Both parents care for the young, with the male providing most of the food. Peak breeding activity occurs from March to June, and the 4-5 eggs are laid. The young fledge 21-32 days after hatching.

Threats Relevant In or To the Plan Area:

Window and vehicle collision mortalities are high for this raptor (Rodewald et al. 2016).

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Species status is unclear and difficult to determine. Rodewald et al. (2016) says the size and status of the breeding population are poorly known and targeted surveys of raptors in Ohio are needed to better understand their distribution, habitat associations, and population dynamics.

Prothonotary Warbler (*Protonotaria citrea*)

Group: Birds

Conservation Categories: U.S. Fish & Wildlife Service Species of Concern; State Species of Concern; Ranked 10 as bird Species of Greatest Conservation Need; NatureServe G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively uncommon with localized breeding across Ohio and rather restricted observations in the Ohio Hills region in general (Rodewald et al. 2016). Observations recorded in 7 HUCs in all three units of the Wayne, and regularly recorded in low numbers in suitable habitat during the Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Unknown trend in Ohio (ODNR 2015). Sample sizes are relatively small, and trend data for Wayne breeding bird surveys not available.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a non-significant 3% increase in priority block occupancy across the state and a non-significant 43% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. State distribution was similar between the two atlases, although the population was likely significantly larger in the latter as a result of increased nest box availability. In other parts of Ohio, nest box campaigns in suitable habitat documented significant local increases in nesting territories (Rodewald et al. 2016).

Populations appear secure in the heart of its southeastern United States range, while more vulnerable in outlying portions of the range, such as Ohio and other more northerly locations (NatureServe 2019).

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class C, D).

Ohio's only cavity-nesting warbler, this species is an inhabitant of wooded swamps. Overall, this species is uncommon, and not found away from breeding sites.

Habitat Trend in Plan Area:

Apparently stable. Low Integrity. However, nesting success dependent on suitable cavities or nest boxes near water, for which abundance or limitation is unknown. Apparently responds well to nest box programs in suitable habitat.

Relevant Life History & Other Information:

Typically, individual females produce 1-2 broods per year. Both parents feed the young. While most of nest in natural cavities in dead trees, they readily use appropriate nest boxes placed in suitable habitat. Reproductive success in natural cavities appears to be significantly lower than in nest-boxes in some areas, probably due to regional differences in competition from house wrens (*Troglodytes aedon*). Accurate measures of population densities from census techniques are rare for this species because few studies of this nature occur in swamp forests. Their diet consists of insects and snails.

Overwinters in coastal regions of the Caribbean, southern Mexico, and Central America (Rodewald et al. 2016). This species lives in mangrove forest on its wintering grounds, but mangrove habitats are being lost (NatureServe 2019).

Threats Relevant In or To the Plan Area:

Habitat - Availability and competition (especially from house wrens) for nest cavities in suitable habitat may be the primary limiting factor; cowbird parasitism may be a lesser threat. Loss of cavity trees in riparian areas.

Rationale for SCC Determination:

There is insufficient or inconsistent scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. There is an unknown species trend in Ohio and in the plan area for prothonotary warbler; it is widespread but not common. The Breeding Bird Atlas recorded a statistically non-significant occupancy increase statewide but a likewise non-significant decline in the Ohio Hills region, which overlaps with the plan area. It is difficult to accurately predict the trend in the plan area, due to relatively low sample sizes, partly because surveys must occur in suitable habitat for it to be recorded. NatureServe (2019) provided data suggesting highly variable population trends across the species' range but summarized that the species is experiencing an overall population decline of 30-50% and there are concerns over loss of overwintering habitat. Wetland habitat trends are apparently stable in the plan area with moderate to high integrity. Cavity habitat may be a

limiting factor, but species also appears to respond positively to nest box campaigns in suitable habitat from which they may experience significant localized increases.

Acadian Flycatcher (*Empidonax virescens*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Among the most abundant and commonly encountered species (one of the top 10) during Wayne breeding bird surveys from 2003-2016 across all units (personal communication, Katrina Schultes, 2020). Highest densities in Ohio occur within the Ohio Hills region and Ohio supports an estimated 6% of the worldwide breeding population, so it has high stewardship responsibility. However, they are expected to remain common in eastern forests into the near future (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 17% population decline, a statistically significant 8% decline in priority block occupancy across the state and no change in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 0.9% annual population decline in Ohio since the mid-1960s, which may be attributed to the loss of wooded habitats in more agricultural parts of Ohio (Sauer et al. 2014 as quoted in Rodewald et al. 2016), and NatureServe (2020) reports that Breeding Bird Survey data show signs of gradual decline range-wide.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Occurs in mature deciduous forests that have a dense canopy and a well-developed understory, often along streams or within hemlock ravines (Rodewald et al. 2016). It is

most abundant in the heavily forested areas of eastern Ohio. This species is area-sensitive and avoids edge habitats and will not be found in woods less than 25-30 acres in extent.

Habitat Trend in Plan Area:

Stable to increasing. Low Integrity. Forest habitat continues to increase and age within the Wayne. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% and make up nearly half of national forest system lands (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*). The requirement for minimum sized 30-acre areas of mature forest for this species is not uncommon in the forested context of southeast Ohio. However, the preferred bottomland landtypes were modeled as slightly below average in connectedness, suggesting there may be fewer appropriately-sized tracts of suitable habitat to meet the species' area requirements (greater than or equal to 30 acres) (see *Terrestrial Ecosystems Supplemental Report*).

Relevant Life History & Other Information:

Breeding pairs exhibit a decided preference for the interiors of extensive woodlands. Peak breeding activity occurs from April to July. The nests are normally placed at heights of 10-20 feet in the mid-story, suspended from the outer limbs of saplings overhanging small streams or ravines. Two broods are typical in a year.

Overwinters from Nicaragua south to Ecuador (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat fragmentation - A study of songbirds in mixed-oak forests in southeastern Ohio, compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. In the short-term, several midstory and ground-nesting species were 26–73% less abundant in shelterwood than unharvested stands (Newell and Rodewald 2012).

Parasitism - Brown-headed cowbirds frequently parasitize this species (Rodewald et al. 2016).

Overwintering habitat - They are vulnerable to loss of forest habitat on their overwintering grounds in Central and South America (Rodewald et al. 2016).

Rationale for SCC Determination:

There is not substantial concern for long-term persistence of Acadian flycatchers in the plan area, because population trends are stable in southeastern Ohio and in the Wayne. In fact, the highest densities in the state were recorded in close association with the southern Ohio Hills region, which includes the plan area. There is broad distribution in the Wayne with abundant habitat that has moderate to high integrity. The overall amount of mature forest habitat in the Wayne is known to be increasing and it is likely that the patch size of mature forest is also increasing, but is currently unknown. Apparently the species will

tolerate light selection cutting, although timber harvesting that opens up the canopy would be detrimental (NatureServe 2019).

Wood Duck (*Aix sponsa*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively abundant and commonly encountered across the Wayne and on breeding bird surveys from 2003-2016 in suitable habitat across all units (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a non-significant 6% decline in priority block occupancy across the state (mainly in the northern half) and a non-significant 1% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 2% annual population increase survey-wide since the mid-1960s, but Ohio sample sizes were insufficient for trend analysis (Sauer et al. 2014 as quoted in Rodewald et al. 2016). Nest box programs and reforestation of the state halted declines. Species is hunted statewide.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers; Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class B, C, D).

As their name implies, wood ducks prefer mature riparian corridors along streams, quiet backwaters of lakes and ponds bordered by large trees, and secluded wooded swamps as habitats for raising young. Nesting in cavities enable them to breed in areas lacking suitable ground cover. Most nests are adjacent to or over water (NatureServe 2019). Ideal habitat includes wetlands that contain a mix of herbaceous vegetation, shrubs, mature trees, and approximately 25% open water (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Apparently stable. Wetlands in the Wayne have moderate to high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). However, nesting success dependent on suitable cavities or nest boxes near water, for which abundance or limitation is unknown, in addition habitat integrity for rolling bottomlands is low. Apparently responds well to nest box programs in suitable habitat.

Relevant Life History & Other Information:

The first broods normally appear during the first half of May. The young leave the nest soon after hatching, jumping from the nesting cavity to the ground. Nine to 14 eggs are incubated for 25-35 days. They often feed on acorn, berries, and grapes on the forest floors (NatureServe 2019).

Overwinters in southeastern United States (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Loss of cavity trees in riparian and wetland areas.

Rationale for SCC Determination:

Wood duck abundance appears to be relatively stable in Ohio and in the plan area, and they are relatively common and broadly distributed in the Wayne. They have moderate environmental specificity and their habitat trends also appear stable. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Great Blue Heron (*Ardea herodias*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively abundant and commonly encountered during Wayne breeding bird surveys from 2003-2016 in suitable habitat across all units (personal communication, Katrina Schultes, 2020).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a statistically significant 82% increase in priority block occupancy across the state and a non-significant 71% increase in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 1.8% annual population increase in Ohio since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers; Rolling Bottomlands Mixed Hardwood Forest: Large Stream & Riparian Forest (Class C, D).

Prefers shallow water areas with trees for nesting nearby. Great blue herons may be found along the banks of rivers or at the shores of major waterways. Most migrate to warmer areas with unfrozen waters in the winter and they return to Ohio as soon as the ice melts, although some may remain year-round in places where water remains open.

Habitat Trend in Plan Area:

Apparently stable. Moderate-High Integrity; Low Integrity.

Relevant Life History & Other Information:

Colonial nesters, with 10 to 75 pairs nesting in one location. Both the male and the female will incubate the eggs. In Ohio breeding occurs generally from the end of March through mid-April. Once the young herons hatch in May, they are altricial, or helpless. The young birds will have matured enough to leave the nest after about 60 days. Herons produce eggs once a year, but they will re-nest if a clutch is destroyed. Herons feed during both day and night and eat fish, snakes, frogs, crustaceans, birds, small mammals, and insects.

Threats Relevant In or To the Plan Area:

Habitat - Water pollution.

Rationale for SCC Determination:

Great blue heron abundance appears to be increasing in Ohio and the plan area, and they are relatively common and broadly distributed in the Wayne. They have moderate environmental specificity and their habitat trends also appear stable. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Yellow-Billed Cuckoo (*Coccyzus americanus*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Relatively abundant and broadly distributed in Wayne breeding bird surveys from 2003-2016 across all units (personal communication, Katrina Schultes, 2020). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) found the highest densities in the state in the southern half of the Ohio Hills region (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a statistically significant 8% decline in priority block occupancy across the state (mainly in western portions with agricultural intensification) and no change in the Ohio Hills region, where there are the highest densities, in the 25 years since the first Breeding Bird Atlas. Furthermore, it significantly increased by 31% in northeastern Ohio and 43% in Pennsylvania. National Breeding Bird Survey data indicate a 1.6% annual population decline survey-wide since the mid-1960s, but stable populations for Ohio (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class B, C); Dry-mesic Mixed Oak Hardwood Forest (Class B, C); Rolling Bottomlands Mixed Hardwood Forest (B, C).

Open forest with dense shrubby clearings, forest edges, overgrown orchards, farmland woodlots, and dense riparian habitat (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Stable to Decreasing. This species likely uses all ecological landtypes, and extensive forested tracts are well-distributed across the Wayne; however, its need for openings with dense, shrubby under- and mid-story habitat suggests breeding habitat is decreasing and has low to moderate habitat integrity due to substantial under-representation of shrubby, early successional classes overall. However, this may be offset by the species use of

shrubby edges, which are common in the patchwork ownership pattern around the plan area.

Relevant Life History & Other Information:

Nests are built in bushes or small saplings. Breeding activity peaks in May. Both parents incubate the 3 or 4 eggs for 9-11 days, and brood and feed the chicks. The young fledge 7 or 8 days after hatching. Occasionally parasitize other species' nests but it is more typical to parasitize nests of their own species. They eat insects such as caterpillars (including spiny and hairy ones that are inedible to other birds), grasshoppers, and crickets.

Overwinters in southern Central America into South America (NatureServe 2019).

Threats Relevant In or To the Plan Area:

Habitat - Main threats are habitat fragmentation and degradation of riparian woodland due to agricultural and residential development. They are highly vulnerable to continued tropical deforestation, but direct effects on population numbers not yet quantified (NatureServe 2019).

Rationale for SCC Determination:

Populations appear stable overall in Ohio and in southeastern Ohio, where the bulk of the Ohio population resides. The species is relatively common and broadly distributed in the Wayne and with its broad environmental specificity, habitat is likely still abundant. Although habitat may possibly decline in the long term, the effects are uncertain, considering the species' use of edge, which is provided by all lands in the plan area. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Great Crested Flycatcher (*Myiarchus chrinitus*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Although not overly common during the Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020), this species is broadly distributed with observations recorded in 20 HUCs across

all three units of the Wayne. Ohio is in the center of the breeding range, and the species is considered common and widespread in Ohio (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 25% population decline, a statistically significant 8% decline in priority block occupancy across the state and a significant 13% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 1.3% annual population decline in Ohio since the mid-1960s. Furthermore, survey-wide trends suggested no change in overall populations, but results were regionally variable; many states in the northern Appalachians have shown declines similar to those for Ohio, while populations have increased within the southeastern coastal areas (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Rolling Bottomlands Mixed Hardwood Forest (Class C).

Inhabits all types of deciduous forests, but generally are more common in riparian woodlands and less common in continuous, closed-canopy forests in Ohio. Occupied woodlands often contain canopy gaps or clearings, or a relatively open understory, which may facilitate foraging (Rodewald et al. 2016). This species may benefit from forest fragmentation because it favors forest edge habitats and may make use of suburban woodlots, parks, and clearing and edges of wooded areas (NatureServe 2019).

Habitat Trend in Plan Area:

Stable to declining. Widespread forest maturation in the Ohio Hills may have closed favored canopy gaps (Rodewald et al. 2016). However, this could be offset by a general use of forest edge, which is common in the plan area. The habitat integrity of Rolling Bottomlands Mixed Hardwood Forest (class C, D) is low.

Relevant Life History & Other Information:

This bird typically nests in cavities and can sometimes be enticed to use appropriate nest boxes. The nest itself is bulky and lined with any kind of available material. Four to eight eggs are laid and incubated for 13-15 days. Young fledge 12-21 days after hatching. They usually fly out from exposed perches to capture insects on the wing and then return to the perch to eat, but may also eat fruit (NatureServe 2019).

Most overwinter from southern Mexico south to northern South America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Even though this bird appears to favor open woods, specific effects caused by habitat alterations are unclear. Possible effects include increased nest predation by edge species and nest competition. It is relatively unmolested by the brown-headed cowbird because of its hole-nesting habit. However, European starlings are an aggressive competitor for nest sites. Little is known of the relationship between the flycatcher and its habitat features, especially where habitat manipulations are occurring. Pin-pointing specific threats affecting this species is difficult due to this lack of information (NatureServe 2020).

Rationale for SCC Determination:

There is insufficient or inconsistent scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Great crested flycatcher is still considered widespread and abundant, not only in Ohio, but across its range, even while it has shown relatively significant local declines in Ohio and across the Ohio Hills region. There seems to be a lot of variability in abundance and trends across its range, making it difficult to ascertain whether there is a cause for concern, but the second Ohio Breeding Bird Atlas and NatureServe both noted that the species is currently still common and widespread. Although habitat may possibly decline in the long term, the effects are uncertain, considering the species use of edge, which is provided by all lands in the plan area.

Yellow-Throated Vireo (*Vireo flavifrons*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Although not overly common in Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020), this species is broadly distributed with observations recorded in 23 HUCs in the Wayne in all three units. The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) notes that the species has a history of being widespread but nowhere abundant with the highest densities recorded in the Ohio Hills region of Ohio (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. The Breeding Bird Atlas recorded a non-significant 2% decline in priority block occupancy across the state and a non-significant 1% increase in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 1.4% annual population increase in Ohio since the mid-1960s. This represents an overall population increase of 42% in Ohio between atlas periods, which is also consistent with survey-wide population trends (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Dry Oak Forest (Class C, D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Rodewald et al. (2016) described this vireo as a habitat specialist that occupies both mature upland and bottomland forests, specifically at habitat edges, forest gaps, or areas with unevenness in the canopy foliage, such as along ridges or steep slopes. Most abundant in mature woods but also occurs in medium-aged forests and some pioneer stands; requires a high, partially open canopy and prefers woods with an intermediate tree density (NatureServe 2019). Newell and Rodewald (2012) found that densities of canopy-nesting species that are typically associated with mature forest, like yellow-throated vireo, were 31-98% higher in shelterwood than unharvested reference stands; however, nesting success seemed to be low (Rodewald 2013).

Habitat Trend in Plan Area:

Mature forest is increasing; however, oak forests are declining. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*). Breeding habitat has low-moderate to low integrity due to low structural diversity and lack of partially open canopies and canopy gaps. The vertical structure of these forest stands generally exhibits one tree age class as a result of past management (USDA 2006).

Relevant Life History & Other Information:

Spends most of its time in forest canopies. Nests are built high in the sub-canopy in a forked branch of a tree. It is usually made of mosses, grass, and spider web silk. Three to five eggs are incubated for two weeks, and the young fledge two weeks after hatching. Insectivorous, often taking larger caterpillars gleaned from branches more than leaves (Rodewald et al. 2016).

Overwinters in mature tropical forests from eastern Mexico south to northern South America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - In eastern North America, changes in historic disturbance regimes are currently shifting forests from a disturbance-dependent climax community dominated by oaks *(Quercus* spp.) to a mesophytic climax community dominated by shade tolerant species. Management for oak regeneration will typically remove all over-story trees later in the cutting cycle, initially resulting in loss of nesting substrates and hence breeding habitat for canopy songbirds. In the Wayne, these include yellow-throated vireos, cerulean warblers, and blue-gray gnatcatchers (Newell and Rodewald 2012). Extensive clear-cutting will adversely affect species, but practices that create smaller openings within forest stands may actually benefit the species in some cases by creating preferred habitat; in northwest Arkansas, significantly higher numbers were recorded on forest plots receiving both group selection and single-tree selection cutting than on mature forest control plots (NatureServe 2019).

Overwintering Habitat - continued loss of tropical forest could ultimately have negative effects (Rodewald et al. 2016).

Rationale for SCC Determination:

Although not overly abundant anywhere, yellow-throated vireos are broadly distributed and populations are stable to increasing in Ohio and range-wide. They have narrow environmental specificity, preferring mature forests with open canopies and gaps, but apparently have some tolerance for a wider variety of forest types. The second Ohio Breeding Bird Atlas stated that the consistent, long-term population increases in both Ohio and at regional scales bodes well for this species in Ohio. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Blue-Gray Gnatcatcher (*Polioptila caerulea*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Among the most abundant and commonly

encountered species (one of the top 15) on Wayne breeding bird surveys from 2003-2016 across all units (personal communication, Katrina Schultes, 2020). The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) found they reach their highest densities in Ohio across the plan area (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 16% population decline, a non-significant 1% decline in priority block occupancy across the state and a statistically significant 7% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate relatively stable populations in Ohio since the mid-1960s. Overall, populations are stable or increasing, except within the Appalachian Mountains, which have been declining at a rate of 1% per year (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Prefers mesic woodlands, often near canopy gaps, and will use larger tracts of forest as well as more fragmented park woodlots and even wooded suburban areas where enough tree cover exists (Rodewald et al. 2016). Newell and Rodewald (2012) found that densities of canopy-nesting species that are typically associated with mature forest, like blue-gray gnatcatchers, were 31-98% higher in shelterwood than unharvested reference stands; however, nesting success seemed to be low (Rodewald 2013).

Habitat Trend in Plan Area:

While the amount of mature forest habitat in the Wayne is increasing, dense mesophytic forest is replacing the once common open oak woodlands. While oak is present in the canopy and larger size classes, it is uncommon in the understory and mid-story—regeneration is not keeping up with changing conditions. Breeding habitat has low-moderate to low 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 (USDA 2006).

Relevant Life History & Other Information:

Gnatcatchers usually begin nesting in the month of April or May. Nest building and incubation is done by both the male and the female. Clutch sizes range from 3 to 5 eggs and incubation lasts 2 weeks. Usually, two broods are produced each season. It returns from its tropical wintering grounds in late March. They typically eat small insects and spiders.

Threats Relevant In or To the Plan Area:

Habitat - In eastern North America, changes in historic disturbance regimes are currently shifting forests from a disturbance-dependent climax community dominated by oaks (Quercus spp.) to a mesophytic climax community dominated by shade tolerant species. Management for oak regeneration will typically remove all over-story trees later in the cutting cycle, initially resulting in loss of nesting substrates and hence breeding habitat for canopy songbirds. In the Wayne, these include yellow-throated vireos, cerulean warblers, and blue-gray gnatcatchers (Newell and Rodewald 2012).

Parasitism - Brown-headed cowbirds can have severe consequences on annual productivity, and localized population declines may be related to nest failures resulting from parasitism (Kershner and Ellison 2012).

Rationale for SCC Determination:

Common, abundant, and broadly distributed in the Wayne and across much of its range, with stable populations trends in Ohio and across most of its range. Although the Appalachian populations may be declining, Ohio populations within the region still contain high breeding densities and our eastern neighbors in Pennsylvania and New York show breeding bird atlas block expansions. Finally, given the use of fragmented and suburban woodlots, in addition to heavily forested areas, so long as it has gaps or edges, this suggests that the species will continue to thrive in Ohio (Rodewald et al. 2016). Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Black-and-White Warbler (*Mniotilta varia*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Although not overly abundant on Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020), this species is broadly distributed in mature forest habitat with observations recorded in 25 HUCs in the Wayne in all three units. The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) found the highest densities in the state in the southern half of the Ohio Hills region (specifically noting the Wayne; Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) did not have enough data to estimate a state population trend. However, the Breeding Bird Atlas did record a non-significant 14% decline in priority block occupancy across the state (mainly in northcentral Ohio) but a statistically significant 26% increase in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 1.6% annual population decline in the Appalachian Mountains (including southeastern Ohio) and 0.7% survey-wide annual decline since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class C-D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E).

Typically found in mature deciduous or mixed forests with dense understory vegetation (Rodewald et al. 2016). Exhibit some area-sensitivity for heavily forested areas and have declined where forest fragmentation is more severe, but they do use a variety of forest habitats from mid- to late-successional stages. The presence of leaf litter is important for nesting. Research from Vitz and Rodewald (2006) in southeast Ohio suggest that regenerating clearcuts may also be important resources for mature-forest birds during the post-breeding period (including this warbler), and forested landscapes containing a mosaic of successional stages may hold the most conservation promise for mature-forest birds.

Habitat Trend in Plan Area:

The forest integrity for Dry Oak and Dry-mesic Mixed Oak Hardwood is low-moderate to low. However there is indication that older forest stands are increasing. A comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*).

Relevant Life History & Other Information:

The nest is built on the ground at the base of a tree or stump. A typical clutch has 4-5 eggs incubated for 10-12 days and the young fledge just 8-12 days after hatching. Creeps up and down tree trunks and around large limbs in search of insects.

Overwinters from southern Texas, Florida, and the Caribbean to northern South America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Expansion of non-native invasive earthworms could negatively affect nesting success of this ground-nesting forest bird, because the worms cause reductions in litter depth (Rodewald et al. 2016). NatureServe (2019) suggested that forest management techniques that greatly reduce canopy cover threaten this species in the short-term. However, Rodewald (2013) reported that black-and-white warblers used both mature, unharvested oak-hickory forest and shelterwood harvests (50% stocking, 2-5 years post-harvest), but once the shelterwood over-story trees are removed, this would be unsuitable habitat until it again reached at least a mid-successional stage. Prescribed fire would reduce leaf litter until next leaf fall, affecting this litter-dependent, ground-nesting bird (personal communication, Katrina Schultes, 2020).

Rationale for SCC Determination:

Black-and-white warblers are considered abundant and increasing across the Ohio Hills region of Ohio and they are broadly distributed in the Wayne. They have broad environmental specificity and their favored mature forest habitat is increasing on the Wayne. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

American Redstart (*Setophaga ruticilla*)

Group: Birds

Conservation Categories: Ranked 38 as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Abundant and broadly distributed on Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020) with observations recorded in 25 HUCs in the Wayne in all three units. While Ohio lies central to the breeding range, it is outside of the nearest centers of abundance in the Appalachian Mountains and northern Great Lakes (Sauer et al. 2014, as cited in Rodewald et al. 2016). Still, breeding density in Ohio is highest in the Ohio Hills region and in the northeast corner of the state (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 52% population increase, a non-significant 5% decline in priority block occupancy across the state and a statistically significant 30% increase in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 2.2% annual population increase in Ohio but a 1.5% annual decrease survey-wide since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016). The atlas notes that the breeding distribution in Ohio has fluctuated over time, so redistributions in population may reflect changing patterns of forestation and land use.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class C-D); Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E).

Considered area-sensitive in parts of its range for tracts more than 4,000 ha (9,900 ac), but breeding in a wide variety of moist deciduous habitats that have abundant shrubs or saplings, ranging from treefall gaps in mature forest, to shrubby, second-growth woodlands, to willow-alder thickets. Maintenance of deciduous forest cover in various stages of ecological succession is beneficial (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Decreasing in the Wayne due to succession to mature forests and a lack of regular disturbance to create patches of young forest. This species likely uses Dry-Mesic Mixed Oak Forest and Rolling Bottomland Mixed Hardwood Forest landtypes, and extensive forested tracts are well-distributed across the Wayne; however, its need for early successional forest habitat suggests breeding habitat is decreasing and has low to moderate habitat integrity due to substantial under-representation of early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

The American redstart's nest is a cup made of bark shreds, plant fibers, and spider web lined with fine grass and hair. It is usually placed near a branching vertical stem of a sapling or small tree in the forest under- or mid-story. Incubation lasts 12 days and clutches consist of 4 eggs. Young are fully fledged 9 days after hatching. They typically eat insects.

Overwinters from coastal and southern Mexico and the Caribbean south through Central America to northern South America (Rodewald et al. 2016).

Threats Relevant In or To the Plan Area:

Habitat - Forest fragmentation and lack of early successional age classes reduces nesting habitat. Although uncertain, ongoing tropical deforestation may adversely affect populations (Rodewald et al. 2016).

Parasitism - Increased brown-headed cowbird parasitism resulting from forest fragmentation is a threat (NatureServe 2019).

Rationale for SCC Determination:

American redstarts are abundant and broadly distributed in the Wayne, and populations are stable or increasing in Ohio and the plan area. They have moderate environmental specificity with a potentially low to moderate habitat integrity due to substantial under-representation of early successional classes. This may be offset by the ability to use a fairly wide variety of forest types, especially middle-aged mesic ones that tend to naturally have more well-developed mid- and understories without specific management. Therefore, there is not substantial concern for long-term persistence of this species in the plan area. This species may respond well to forest management.

Yellow-Breasted Chat (*Icteria virens*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Abundant and broadly distributed on Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020) with observations recorded in 25 HUCs in the Wayne in all three units. The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) found the highest densities in the state in the southern half of the Ohio Hills region (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Decreasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 48% population decline, a statistically significant 27% decline in priority block occupancy across the state (mainly associated with the northern glaciated regions) and a significant 7% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National

Breeding Bird Survey data indicate a 2.9% annual population decline in Ohio since the mid-1960s and mirrors that in the Appalachian region (Sauer et al. 2014 as quoted in Rodewald et al. 2016). Declines appear to be directly tied to maturing forests and loss of early successional habitats that were common in the early 1900s, which was a period of forest regrowth after widespread deforestation (Rodewald et al. 2016). They have a large breeding range in North America, being numerous and fairly common in many areas, although population trends vary among regions, with declines evident in several eastern states (most likely related to reforestation and maturation). However, the overall the population is relatively stable (NatureServe 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A, B); Dry-mesic Mixed Oak Hardwood Forest (Class A, B); Rolling Bottomlands Mixed Hardwood Forest (Class A, B).

Structurally diverse shrub-sapling habitats, including those associated with regenerating clearcuts, abandoned fields, forest edges, fencerows, open forest, and powerline corridors. Often choose larger patches of dense vegetation for nest sites. Adapted to exploiting patchy, ephemeral breeding habitats that include a mix of shrubs and saplings that are often suitable for fewer than 10 years. Rodewald et al. (2016) went on to say that "habitat can be created through timber harvesting, agricultural set-aside programs, and removal of trees from powerline corridors," and noted that land managers should incorporate creation of early-successional shrubland into land management plans.

Habitat Trend in Plan Area:

Decreasing. Habitat integrity is low-moderate to low. This species likely uses all ecological landtypes and larger-sized suitable tracts, but its need for structurally diverse shrub-sapling habitats suggests breeding habitat is decreasing and has low to moderate habitat integrity due to substantial under-representation of shrubby, early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%. However, these declines may be offset by many reclaimed strip-mine grasslands in the Wayne becoming more shrubby with the proliferation of trees and shrubs and little recent management (personal communication, Katrina Schultes, 2020).

Relevant Life History & Other Information:

Nests are built in the cover of dense bushes and are made of bark, grass, and leaves. Three to six eggs are incubated for 11 days, and the young fledge 8 days after hatching. Warblers feed almost entirely on insects gleaned from leaves and twigs; also eat fruits.

Overwinters in southern Mexico, Central America, and in limited numbers in Florida.

Threats Relevant In or To the Plan Area:

A study of southeast Ohio bird communities in regenerating clearcuts 4-6 years post-harvest made the following findings: 1) Shrubland specialist species that avoided mature forest edge were blue-winged warbler, prairie warbler, yellow-breasted chat, and field sparrow, and 2) There was no evidence of reduced avian productivity in small stands (4-8 ha) (Rodewald and Vitz 2005).

Rationale for SCC Determination:

Chats are relatively common and broadly distributed in the Wayne. They have a large breeding range in North America, being numerous and fairly common in many areas, and the overall the population is relatively stable, despite recorded declines in a few areas. They have moderate environmental specificity, but—because the species is adapted to exploiting patchy, short-lived habitats—restoration potential with suitable habitat creation is considered high (i.e., they respond well to forest management for early successional habitats). Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Chimney Swift (*Chaetura pelagica*)

Group: Bird

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Somewhat common species recorded in all 3 units during Wayne breeding bird surveys from 2003-2016 (personal communication, Katrina Schultes, 2020). Breeding densities are highest in association with major cities in Ohio and are least, in general, in the southern half of the Ohio Hills region and the plan area where there are fewer population centers (Rodewald et al. 2016). Ohio is estimated to contain 5.8% of the global breeding population and ranks fourth among states and provinces in overall population size, and thus, carries management responsibility (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 24% population decline, a statistically significant 6% decline in priority block occupancy across the state and a significant 7% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. Despite a widespread availability of preferred nest sites (chimneys), National Breeding Bird Survey data indicate a consistent long-term population decline across eastern North America (2.3%) and Ohio (1.1%) annually since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Almost exclusively nests and roosts in chimneys. One recent observer in a relatively rural area (Vinton Furnace State Forest) saw a few swifts repeatedly enter a large hollow tree (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Potentially declining. Rodewald et al. (2016) suggested that the number of large, open-brick chimneys has decreased through capping and because newer homes typically have chimneys with flues that are too narrow for nesting. Interestingly, the plan area is in an economically depressed area, and a lot of older houses (and therefore suitable chimney styles) still dot the landscape, although not in high densities and capping has become common practice (personal communication, Katrina Schultes, 2020).

Relevant Life History & Other Information:

They spend the vast majority of time on the wing, and form large roosting colonies in favored chimneys. Nest is secured to the wall of a chimney or the inside of a hollow tree. Birds other than the breeding pair will help feed and care for young. Clutch sizes range from 4-7 eggs, and young fledge 14-19 days after hatching. A trans-Gulf migrant; the vast majority of individuals apparently cross the Gulf of Mexico between the United States and Mexico. Migrates northward, often in small flocks, through North America from mid-March through May and southward in August and September. Specializes on small aerial insects.

Threats Relevant In or To the Plan Area:

Habitat - Loss of suitable nest sites due to chimney capping and unsuitable styles used on newer houses (Rodewald et al. 2016).

Prey - Regional decreases in insect abundance due to acid deposition, climate change, or application of pesticides (Rodewald et al. 2016).

Rationale for SCC Determination:

Loss of suitable nesting substrate was cited as the most important factor in the decline of populations of chimney swifts across eastern North America and Ohio. However, because of their overwhelming dependence on human-made environments (i.e., chimneys), their nesting habitat is not affected by national forest management. Threats to insects they feed

upon are not a specific concern in the Wayne. They are still relatively common and broadly distributed in the plan area. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Hooded Warbler (*Setophaga citrina*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Among the most abundant and commonly encountered species (one of the top 10) on Wayne breeding bird surveys from 2003-2016 across all units (personal communication, Katrina Schultes, 2020). Appears to be increasing throughout most of the breeding range, except at the southeastern extent, which could indicate sensitivity to climate change. In Ohio, breeding densities highest in the Ohio Hills region and specifically in counties associated with the plan area.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 70% population increase, a statistically significant 22% increase in priority block occupancy across the state and a significant 35% increase in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 5.1% annual population increase in Ohio since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Rolling Bottomlands Mixed Hardwood Forest (Class A-D).

Nests in understory of deciduous forest, especially along streams and ravine edges, and thickets in riverine forests. Inhabits both young and mature forests but is most abundant in the latter. A dense shrub layer and scant ground cover are important (NatureServe 2019).

Habitat Trend in Plan Area:

Low habitat integrity. However, mature forests are increasing; a comparison of forested stand data between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*).

Relevant Life History & Other Information:

Nest placed low in a shrub. The eggs are incubated for 12 days and young fledge 8-9 days after hatching. Eats wide variety of insects and spiders; gleans and fly-catches in undergrowth, rarely moves more than 4.5 m above ground when foraging (NatureServe 2019).

Overwinters in southern Mexico and Central America (NatureServe 2019).

Threats Relevant In or To the Plan Area:

A study of songbirds in mixed-oak forests in southeastern Ohio, compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. A common species in late-successional forest at their upland sites, the hooded warbler was 26% more abundant in shelterwoods than in reference stands (Newell and Rodewald 2012).

Habitat - Degradation at breeding sites and habitat loss and degradation at migration stopover sites and on the wintering grounds are potential threats (NatureServe 2019).

Rationale for SCC Determination:

Hooded warblers have a large eastern North American range, are broadly distributed, are among the most abundant species in the plan area, and appear to be increasing throughout most of the breeding range, including southeastern Ohio. They have broad environmental specificity, favored mature forests are increasing in the Wayne, and species responds positively to management. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Field Sparrow (*Spizella pusilla*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Abundant and broadly distributed on Wayne breeding bird surveys from 2003-2016 in all three units (personal communication, Katrina Schultes, 2020). Conversion of forests to agriculture and subsequently farmstead abandonment created extensive breeding habitat, but population declines began with reforestation and maturation; however, species is still extremely abundant state and range wide (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 51% population decline, a statistically significant 3% decline in priority block occupancy across the state and a non-significant 1% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 2.9% annual population decline since the mid-1960s and note that it is a continuation of the trend begun in the mid-1900s with reforestation (Sauer et al. 2014 as quoted in Rodewald et al. 2016). Population declines are most likely related to reforestation and forest maturation (NatureServe 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A, B); Dry-mesic Mixed Oak Hardwood Forest (Class A, B); Rolling Bottomlands Mixed Hardwood Forest (Class A, B); Reclaimed grasslands.

Occupies a wide variety of brushy, early successional habitats, including deciduous forest edge, hedgerows, shelterbelts, and orchards. They frequent abandoned fields and cutover hillsides where dense herbaceous vegetation is interspersed with brushy tangles and scattered saplings; however, more than 75% shrub cover may be too dense. Structural diversity, plant species richness, and vegetation patchiness also seemed to be important (NatureServe 2019).

Habitat Trend in Plan Area:

Decreasing. Low-Moderate Integrity; Low-Moderate Integrity; Low Integrity. Grassland habitat was not evaluated. Grassland habitats were historically scarce in the Wayne due to natural factors, but exist now from past mining operations. A Grassland and Forest Mosaic Management Area is included in the current 2006 Wayne Forest Plan with an emphasis on providing habitat for grassland-dependent species. This species likely uses all ecological landtypes and larger-sized suitable tracts, but its need for structurally diverse shrubland habitats suggests breeding habitat is decreasing and has low to low-moderate habitat integrity due to substantial under-representation of young (less than 10 years old) shrubby, early successional classes overall. According to the *Wayne National*

Forest Assessment (2020), 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%. 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%. However, these declines may be offset by many reclaimed strip-mine grasslands in the Wayne becoming more shrubby with the proliferation of trees and shrubs and little recent management (personal communication, Katrina Schultes, 2020).

Relevant Life History & Other Information:

Nest is usually on the ground hidden in a clump of grass or weeds. The 3-5 eggs are incubated for 10-17 days. Most first clutches are produced by mid-May and broods fledge 7-8 days after hatching. Most pairs are double-brooded, and some pairs in the southern Ohio counties could raise three broods annually. They feed on seeds and insects.

Threats Relevant In or To the Plan Area:

Habitat - "High-quality breeding habitat is often ephemeral due to forest succession, although wildfire suppression and reduction in the use of controlled burning have further reduced the availability of early-successional habitat on the landscape" (Rodewald et al. 2016). A study of southeast Ohio bird communities in regenerating clearcuts 4-6 years post-harvest made the following findings: 1) Shrubland specialist species that avoided mature forest edge were blue-winged warbler, prairie warbler, yellow-breasted chat, and field sparrow, and 2) There was no evidence of reduced avian productivity in small stands (4-8 ha) (Rodewald and Vitz 2005).

Parasitism - Brown-headed cowbird parasitism is a threat (NatureServe 2019).

Rationale for SCC Determination:

Moderate environmental specificity. Relatively common and broadly distributed on the Wayne, although overall populations have experienced declines from all-time highs associated with farm abandonment and before recovery of Ohio's forests. Has a relatively large breeding range in North America and still numerous and fairly common in many areas, although declines are most likely related to reforestation and forest maturation. Because the species is adapted to exploiting patchy, short-lived habitats and it appears to respond well to management, restoration potential should be relatively high. Therefore, there is not substantial concern for long-term persistence of this species in the plan area and it is not recommended for consideration as a potential species of conservation concern at this time.

Kentucky Warbler (*Geothlypis formosa*)

Group: Birds

Conservation Categories: Not ranked as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Although not overly common on Wayne breeding bird surveys from 2003-2016, this species is broadly distributed and sometimes locally common (personal communication, Katrina Schultes, 2020). In fact, it is considered locally abundant where there is suitable habitat (NatureServe 2019). The extensive forest coverage in the Ohio Hills region and southwestern Ohio nearly mark the northern edge of the breeding range. The highest densities in Ohio also coincided with large contiguous woodlands, especially those subjected to logging or natural disturbances, and the Wayne was noted for its high conservation importance (Rodewald et al. 2016). The Priority Species in Partners-in-Flight plan identifies the Ohio Hills Physiographic Ecoregion as "high" for both the level of continental concern (i.e., large-scale population declines) and regional responsibility (i.e., high proportion of the global population residing in a particular ecoregion; Rodewald 2013).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015).

The Ohio Breeding Bird Atlas II (Rodewald et al. 2016) recorded a 38% population decline, a statistically significant 31% decline in priority block occupancy across the state and a significant 15% decline in the Ohio Hills region in the 25 years since the first Breeding Bird Atlas. National Breeding Bird Survey data indicate a 2% annual population decline in Ohio and a 1% survey-wide since the mid-1960s (Sauer et al. 2014 as quoted in Rodewald et al. 2016).

Overall range wide, population data seem to present a confusing array of increases and decreases, and range expansions and retreats. One researcher suggested that since about 1980, the continent-wide population of Kentucky Warblers has been slowly decreasing, although local increases and range expansions seem to be occurring. This is tempered by increasing trends of parcelization for summer homes in the more southerly core of the breeding range (NatureServe 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry-mesic Mixed Oak Hardwood Forest (Class E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Humid deciduous forest, dense second growth, swamps. Occurs in stands of various ages but is most common in medium-aged forests. Prefers forests with a slightly open canopy,

dense understory, and well-developed ground cover (NatureServe 2019). In Virginia, a long-term study determined that cove hardwoods and areas with streams were selected and oak-hickory over-story were avoided (McShea et al. 1995, as cited by NatureServe (2019)). Rodewald et al. (2016) also noted "nesting locations are areas with well-developed ground cover, shrubs, and saplings associated with forest edges, forest canopy gaps, and second-growth thickets." Furthermore, "Kentucky warblers are area-sensitive and blocks of suitable habitat over 1,200 acres are associated with higher nest success."

Habitat Trend in Plan Area:

Decreasing in the Wayne due to succession to mature forests and a lack of regular disturbance to create openings and younger patches. Rodewald et al. (2016) noted forested landscapes that are subjected to regular logging or natural disturbances often contain dense successional habitat suitable for breeding. This species likely uses Dry-Mesic Mixed Oak Forest and Rolling Bottomland Mixed Hardwood Forest landtypes and extensive forested tracts are well-distributed across the Wayne; however, its need for dense understory suggests breeding habitat may be decreasing and has low to low-moderate habitat integrity due to substantial under-representation of early successional classes overall. According to the *Wayne National Forest Assessment* (2020), 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%. Ohio's total forest cover has increased since the 1980s, but the amount of young forest habitat within the state's forested land has decreased by more than 65%.

Relevant Life History & Other Information:

Four to five eggs are found in a nest of dead leaves and grass placed on or near the ground in dense growth, usually at the base of a shrub. The eggs are incubated for 12-13 days and young fledge 8-10 days after hatching (Rodewald et al. 2016). Insectivore feeding from the ground.

Threats Relevant In or To the Plan Area:

Habitat - A well-developed understory is essential, so anything that removes it may reduce nesting success, such as high deer densities. Because these birds are tolerant of openings in the canopy, harvesting techniques such as group selection, small or narrow clearcuts, thinning of "overmature" trees, and selection cutting are acceptable practices (NatureServe 2019). A study of songbirds in mixed-oak forests in southeastern Ohio, compared shelterwoods recently harvested to 50% stocking and closed-canopy mature second-growth. Shrub-nesting species increased >100% several years post-harvesting. Shrub-nesting species were all positively associated with dense shrub and sapling regeneration that occurred post-disturbance after opening of the forest canopy, and overall density was 157% greater in shelterwood than reference stands (Newell and Rodewald 2012).

Forest Fragmentation - Area-sensitive and blocks of suitable habitat over 1,200 acres are associated with higher nest success (Rodewald et al. 2016).

Rationale for SCC Determination:

At this time, there is not substantial concern for long-term persistence of this species in the plan area and it is not recommended for consideration as a potential species of conservation concern. The species has an overall broad range, of which Ohio is on the periphery of its breeding range. There are somewhat variable range wide population trends overall with range expansions and retreats that do not clearly point to an overall declining trend. However, there appear to be moderate declines in Ohio in the Ohio Hills region encompassing the Wayne, which is part of the Physiographic Ecoregion that is considered as "high" for both the level of continental concern and regional responsibility by Partners-in-Flight. Although not overly common on Wayne breeding bird surveys from 2003-2016, this species is broadly distributed and sometimes locally common. The species has moderate environmental specificity and quality habitat appears to be decreasing in the Wayne due to succession to mature forests and a lack of regular disturbance, such as timber harvesting. This species is area-sensitive and blocks of suitable habitat over 1,200 acres are associated with higher nest success (Rodewald et al. 2016). Kentucky warblers should respond well to moderate amounts of forest management, and management for other potential species of conservation concern will likely benefit this species.

Common Raven (*Corvus corax*)

Group: Birds

Conservation Categories: Not listed as bird Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Geographically and ecologically one of the most widespread naturally occurring birds in the world, but was extirpated from much of the eastern United States with deforestation in the late 1800s. Eastern Ohio is now at the periphery of the locally expanding range and repatriated ravens remain rare in Ohio and in the Wayne (Rodewald et al. 2016). Currently one known occupied location exists in Washington County in extreme eastern Ohio where nesting is suspected (personal communication, Katrina Schultes, 2020), which is three counties south of the first nest reported within Ohio in over 100 years (Rodewald et al. 2016).

Population Trend Statewide and in the Plan Area:

Range expansions and population increases occurring. National Breeding Bird Survey data indicate increasing population trends within North America, particularly in regions adjacent to Ohio, including a 4.5% annual population increase in the Appalachian Mountains since the mid-1960s (Sauer et al. 2014, as quoted in Rodewald et al. 2016).

Habitat:

Environmental specificity for Ohio currently unknown. Uses a wide range of habitats across the global range, but requires cliff faces, large trees, or other structures for nest placement. In the Northeast and the Appalachians, they typically occupy heavily forested regions and are more reclusive than in the West (Rodewald et al. 2016).

Habitat Trend in Plan Area:

Unknown. Not enough known about them in Ohio to know exactly what habitat components ravens will use.

Relevant Life History & Other Information:

Clutch size is 3-7 (usually 3-6). Incubation is entirely or mostly by female (fed by male), 18-21 days. Young are tended by both parents, leave nest in 5-6 weeks. When food supply is limited, smallest chick often does not survive. Young remain with parents for several weeks after fledging.

Threats Relevant In or To the Plan Area:

Unknown.

Rationale for SCC Determination:

Ohio is periphery of expansive and expanding range, where common ravens are returning on their own from neighboring states to former range. Not enough is yet known about the population, its habitat needs, or limiting factors in Ohio.

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Reptiles

Timber Rattlesnake (*Crotalus horridus*)

Group: Reptiles

Conservation Categories: Ohio Endangered; U.S. Fish & Wildlife Service Species of Concern; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; Ranked #18 as reptile Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Disappearing or has disappeared from many portions of the northern edge of its range. Ohio is on the northern periphery of the timber rattlesnake's Midwestern range, where it was historically found throughout all of southern and eastern Ohio up to Lake Erie. However, today the timber rattlesnake is only known from a handful of Ohio counties (6-10 counties) in southern Ohio (ODNR 2015). The Ironton Unit and Athens Unit each have one known population, both small.

Population Trend Statewide and in the Plan Area:

Extremely rare and declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Generally speaking, they inhabit dry areas of Dry Oak Forests (class B, C) and Dry-Mesic Mixed Oak Hardwood Forests (class B, C, D), especially in such areas that are also rocky.

It is important to note the thermal components of their habitat; females need to consistently maintain a higher temperature when gestating. This means there must be enough canopy gaps to allow for sunlight to hit the forest floor and create appropriate thermal habitat. Such features are present in open oak woodlands and also more mature forested areas that support structural heterogeneity. Hibernacula are typically located in a rocky area where underground crevices provide retreats for overwintering, such as a fissure in a ledge, a crevice between ledge and ground, and talus (rock slide) below a cliff.

Habitat Trend in Plan Area:

Decreasing. This is specifically pertinent regarding the thermal components of their habitat. One study conducted in the Wayne showed that the closed-canopied forests of the Wayne often failed to provide adequate thermal resources for gestating females (Sisson 2017). A comparison of forested stand data for the Wayne between 2006 and 2018 indicates mature forests 80 years and older have increased 46% (USDA 2018). Forest age class distribution, based on plot surveys, indicates that 29% of forest stands are aged 100 years and older (see *Wayne National Forest Assessment*). While the amount of mature forest habitat in the Wayne is increasing, open oak woodlands—once comprising approximately 48% of the historical land base across the 17-county study are—are decreasing. Habitat integrity of preferred habitat is low-moderate.

Relevant Life History & Other Information:

Timber rattlesnakes emerge from their dens in spring and disperse to the surrounding hillsides. Males and non-pregnant females may move more than a mile from the den, while gravid (pregnant) females usually remain much closer. Reproductive potential is low with females not maturing until in their sixth year, giving birth to around 10 offspring but only every four years. Will climb into trees and shrubs.

Threats Relevant In or To the Plan Area:

Habitat - Loss or degradation of habitat is a threat, especially the loss of thermal resources that inhibit reproduction. Fragmentation of habitat or populations can result in deaths (especially by cars) and also hardships to breeding. Low populations can suffer from inbreeding depressions and a lack of genetic diversity, making them less resilient, or cause them to lose viability all together.

Direct mortality - Persecution by humans is a threat, especially given the private properties scattered throughout the Wayne (poaching/illegal killings of timber rattlesnakes by people are known to occur in Ohio).

Disease - As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

This species is exceedingly rare in Ohio, and the Wayne harbors two of the handful of known populations left in the state. This species faces a multitude of threats, with habitat loss and degradation (especially with regards to thermal resources) being the most pressing. Its habitat is known to be declining in the Wayne. There is a high concern for this species to persist long term in the plan area, and its restricted Ohio range as a whole. Therefore, this species is identified as a potential species of conservation concern.

Eastern Box Turtle (*Terrapene carolina carolina*)

Group: Reptiles

Conservation Categories: Ohio Species of Concern; Ranked #13 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Distributed widely across Ohio, but broken into two range segments: one across northwest and northcentral Ohio, and the

rest across southern and central Ohio (ODNR 2015). Many populations in north central, western, and northeast Ohio have become extirpated due to intensive development. Most populations nowadays are centered in southern Ohio, where they remain fairly common to common. Common and widely distributed in the Wayne. Many observations across all three units of the Wayne.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Rolling Bottomlands Mixed Hardwood Forest (Class A-D).

Eastern box turtles inhabit forests, fields, forest-brush, and forest-field ecotones. Weigand (2018) wrote that Eastern Box Turtles inhabit "forested regions at a macrohabitat level, [and] edge habitat at a microhabitat level." Weigand (2018) tracked Eastern Box Turtles in the Athens Unit of the Wayne and found that individuals selected areas with more herbaceous cover, a denser understory, and more woody debris, and avoided areas with high canopy closure. During the heat of summer, eastern box turtles spend the day hidden in the mud, beneath decaying leaves, or hidden under dense vegetation, venturing out only during early morning or evening. They can successfully hibernate in sites that may experience subfreezing temperatures. For shelter, they burrow into loose soil, debris, mud, old stump holes, or under leaf litter.

Habitat Trend in Plan Area:

Stable to declining. Forests in the Wayne are becoming denser and more shaded. Edge-like habitats, old fields, and thickets are currently not as common as they were historically (see *Terrestrial Ecosystems Supplemental Report*). Aquatic habitat believed to be stable in the Wayne (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Rolling Bottomlands Mixed Hardwood Forest (Class A-D) habitat integrity is low.

Relevant Life History & Other Information:

Although thought of as a terrestrial turtle, they do spend a good amount of time in water, especially within the mud in ponds and vernal pools (Donaldson and Echternacht 2005). Minimum natural longevity is 45-50 years (NatureServe 2020). Home ranges overlap; non-territorial. In Maryland, females moved to nesting areas that were several hundred meters from the center of their bottomland non-nesting range (Stickel 1989). Their slow reproductive rate increases recovery time for this species (ODNR 2015). Egg laying sites often are sandy or loamy soils in open areas. Young are primarily invertivorous; adults are opportunistic omnivores, eating various plants (including fruits), fungi, snails and other invertebrates, carrion, and rarely small vertebrates. Brumates and aestivates.

Threats Relevant In or To the Plan Area:

Direct mortality - Collecting for the illegal pet trade can lower populations. The greatest threat for remaining viable populations of eastern box turtles in Ohio comes in the form of car strikes, which maim and kill countless box turtles each year in Ohio.

Habitat - Loss, degradation, or fragmentation of habitat can cause population decreases or extirpations, as well as inhibit gene flow which lowers resilience.

Diseases - Ranavirus is a concern (Adamovicz et al. 2018).

Rationale for SCC Determination:

Eastern box turtles are not as widely distributed nor as abundant as they once were, but are still common and widespread in southeast Ohio at this time, and especially in the Wayne. Various threats, most notably car strikes in the plan area, and their long lives and slow reproductive potential may erode their recovery potential if significant losses continue over time. However, the amount and extent of threats in the Wayne are currently unknown. Although habitat may possibly decline in the long term, the effects are uncertain considering the species use of edge provided by all lands in and around the plan area. Therefore, this species is not recommended for consideration as a potential species of conservation concern at this time.

Broad-Headed Skink (*Plestiodon laticeps*)

Group: Reptiles

Conservation Categories: Ranked #12 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Mexico) which includes Ohio. Southern Ohio is at the very northern periphery of this species' range, and this species is consequently uncommon (recorded in only a few counties) and populations are highly scattered (ODNR 2015). Has been recorded in the Ironton Unit of the Wayne. Could possibly inhabit the Athens Unit, but no observations have been documented.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. This species occupies open forests and woodlands, specifically Dry Oak Forest (C); Dry-mesic Mixed Oak Hardwood Forest (C-D).

These lizards are semi-arboreal and prefer spending time in large trees with holes, in which they hide. Appropriate trees will often have dense vegetation around the bottom for further shelter options.

Habitat Trend in Plan Area:

Decreasing. Dry Oak Forest (C) and Dry-mesic Mixed Oak Hardwood Forest (C-D) habitat integrity is low to moderate. Although trees are getting larger in numerous areas of the Wayne, the forests are also becoming denser and more shaded (see T*errestrial Ecosystems Supplemental Report*).

Relevant Life History & Other Information:

The largest skink species in Ohio. It is very difficult to tell males of this species and the common five-lined skink (*Plestiodon fasciatus*) apart without having the individual in-hand to count the labial scales. Size alone cannot be used (they overlap to a degree). Reproduction occurs in the spring, and eggs are laid in a nest in a rotting stump, dead tree, or under rocks and leaf litter.

Threats Relevant In or To the Plan Area:

No major threats have been identified. Mesophication of the forests is a concern. The species is tolerant of moderate habitat alteration, such as temporary changes from logging or partial clearing, to more long-term non-intensive disturbances (e.g., rural residential development) (NatureServe 2020).

Rationale for SCC Determination:

Globally speaking, this is a common species that is secure in its future. In Ohio, this species is uncommon with scattered populations, including some in the Ironton Unit of the Wayne. This, however, is a function of southern Ohio being at the very northern edge of its range, and not a function of threats or other such actions. There are no current pressing threats to this species here, and this species is tolerant of low- and medium-intensity disturbances. Because of this, there is no concern for its long term persistence in the plan area. As such, it does not qualify as a species of conservation concern.

Rough Greensnake (*Opheodrys aestivus*)

Group: Reptiles

Conservation Categories: Ohio Species of Concern; Ranked #3 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Mexico) which includes Ohio. Southern Ohio is at the very northern periphery of this species' range. In Ohio, is has only been recorded in a handful of southern counties (<5 counties) (ODNR 2015). It inhabits portions of the Ironton Unit in the Wayne, where it can be locally common. In general, it is uncommon and scattered across its limited Ohio range.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest, Large Stream Floodplain & Riparian Forest (Class B, C, D).

Inhabits forested riparian corridors most commonly, especially within dense vegetation (e.g., vines, shrubs, trees) near water. Often found in forest edges or in fairly open forests, and also overgrown pastures and thickets. It is mostly arboreal, but less so in spring and fall. It occupies vegetation above ground at night in warmer months; underground in cold weather; burrowing in soil, fallen logs, or debris.

Habitat Trend in Plan Area:

Stable to decreasing. Riparian areas in rolling bottomland mixed hardwood forests are stable in the plan area, but have low integrity. Early successional habitats such as thickets and old fields are decreasing and uncommon.

Relevant Life History & Other Information:

A very secretive and difficult to find snake. Spends most of its time in dense vegetation off the ground. Has very effective camouflage. Adults have relatively low survivorship. Eggs are laid under objects in damp areas, in rotting logs, or in tree hollows. This species is an insectivore.

Threats Relevant In or To the Plan Area:

No major threats are known. Locally, clearing of wooded wetlands and wooded borders of aquatic habitats is a potential threat, as is pesticide application if used in such habitats. Road mortality is a concern. As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

This species is uncommon and scattered because the Ohio populations sit at the very northern periphery of this species' global range. However, there are no pressing and direct threats to this species. Because of this, there is no concern for this species' long term persistence in the plan area. As such, it does not qualify as a species of conservation concern.

Eastern Black Kingsnake (*Lampropeltis nigra* [formerly *Lampropeltis getula nigra*])

Group: Reptiles

Conservation Categories: Ohio Species of Concern; Ranked #13 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Extreme southern Ohio is at the very northern periphery of this species' range. Known from 4 counties in Ohio (ODNR 2015). Found in the Ironton Unit of the Wayne, where it has been widely recorded. However, it will not occur in the Athens or Marietta Units, as these areas lay outside of the known range. There is a lack of knowledge regarding site-specific distributions in the Wayne.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown. There is a lack of knowledge regarding population dynamics in the Wayne.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class C); Dry-mesic Mixed Oak Hardwood Forest (Class C, D); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Across their range, the Eastern Black Kingsnake inhabits everything from rocky and dry hills, to open woodlands, to mesic bottomlands. The Ohio Department of Natural Resources records that in Ohio, this species shows "a marked preference for the Scioto and Ohio River bottomlands" (ODNR 2015). This is a highly nocturnal snake, spending the daylight hours under cover objects (e.g., rocks, logs, trash, etc.).

Habitat Trend in Plan Area:

Apparently stable, but vulnerable. Rolling bottomland mixed hardwood forests have low-moderate to low integrity, for example.

Relevant Life History & Other Information:

An uncommon southern Ohio specialty. Originally a subspecies of the Eastern Kingsnake (*Lampropeltis getula*), it was elevated to its own species status several years ago.

Threats Relevant In or To the Plan Area:

No major threats identified. As with all snakes, road mortality is a concern. As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

This species is uncommon across southeast Ohio, and was probably not very common to begin with. Currently, there is a lack of knowledge regarding population dynamics in the Wayne, site-specific distributions, and other information that is needed to evaluate whether there is a concern for long-term persistence. Because there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term, this species cannot be identified as a species of conservation concern.

Eastern Hog-Nosed Snake (*Heterodon platirhinos*)

Group: Reptiles

Conservation Categories: Ohio Species of Concern; Ranked #5 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Two distinct distributions in Ohio; one in northwest Ohio associated with the Oak Openings Region, and the other more broadly across southern Ohio. In total, records from over 30 counties (ODNR 2015). Uncommon in the Wayne. Known from the Athens Unit and throughout the Ironton Unit. There is a lack of knowledge regarding site-specific distributions in the Wayne.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown. There is a lack of knowledge regarding population dynamics in the Wayne.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Inhabits Dry Oak Forest (Class C) with dry, sandy soils. Forest edges are also appropriate.

Habitat Trend in Plan Area:

Decreasing, but specific habitat conditions were never that common to begin with. Oak woodland habitat much less common than historically and is of low-moderate integrity. However, sandy soils are in general not that common across the plan area; most soils are clay-heavy.

Relevant Life History & Other Information:

Probably was never a common snake in southeast Ohio due to the uncommonness of sandy-soiled oak woodlands. This type of habitat is mostly centered in northwest Ohio. Eastern hog-nosed snakes are tied closely to their main prey: toads. In Ohio, these are primarily the sandy-soil loving Fowler's toad, but also American toads. This snake mates in the spring and fall, and lays 4-61 eggs in June or July. The eggs are usually laid in a shallow cavity in loose or sandy soil after a 39-45-day gestational period. There is no parental care involved. Eggs are laid in nests a few inches below the ground surface or in rotting wood.

Threats Relevant In or To the Plan Area:

Habitat loss in the form of oak woodlands in places with sandy soils converting to closed-canopied forests. Because hog-nosed snakes eat primarily toads, any losses in the toad populations will result in losses in the hog-nosed populations. As with many snake species, road mortality is a concern. As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

This species is uncommon across southeast Ohio, but was probably not very common to begin with. Currently, there is a lack of knowledge regarding population dynamics in the Wayne, site-specific distributions, and other information that is needed to evaluate whether there is a concern for long-term persistence. Because there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term, this species cannot be identified as a species of conservation concern.

Northern Copperhead (*Agkistrodon contortrix mokasen*)

Group: Reptiles

Conservation Categories: Ranked #17 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Southern Ohio is on the periphery of its range. Broadly distributed through southern Ohio (recorded from more than 30 counties) (ODNR 2015). Recorded broadly and commonly throughout the Ironton and Athens Units. No specific records from the Marietta Unit, but due to its broad distribution and abundance across the rest of the plan area and Ohio, this species is no doubt present in the Marietta Unit.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forests (class C); Dry-Mesic Mixed Oak Hardwood Forests (class C); Rolling Bottomland Mixed Hardwoods.

The copperhead will reside in a variety of forested areas; however, in Ohio they prefer hillsides with rock outcrops and loose rock cover objects in dry oak forest and dry-mesic mixed oak hardwood forest. Semi-open woodland habitats are preferred due to thermal resources. They also show a preference for moist habitats.

Habitat Trend in Plan Area:

Stable, but preferred habitat types are less than historically available (see *Terrestrial Ecosystems Supplemental Report*) and of low-moderate integrity.

Relevant Life History & Other Information:

Are known in the Wayne to be locally abundant. Active on the surface from early April to early November. Overwinters underground in hibernacula such as crevices in rocks, in stumps, building foundations, and the likes. Like many snakes in Ohio, Copperheads are diurnal during the spring and fall, and become nocturnal during the heat of the summer months. Peak breeding activity occurs at two distinct times: late August-October and February-April. The females only breed once every other year. Females have an 8-acre home range while the males have a 24-acre home range. Feeds primarily on small mammals, small birds, and arthropods.

Threats Relevant In or To the Plan Area:

No major threats in the plan area. Historically, some populations in the northern section of their Ohio range undoubtedly experienced significant declines, particularly in intensely cultivated areas. More broadly, threats include habitat destruction or degradation (e.g., decline of oak woodlands) and human persecution. As with many snake species, road mortality is a concern. As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

A common, widespread snake found throughout the Wayne and southeast Ohio as a whole. There are no pressing and direct threats to this species in this region. Because of this, there is no concern regarding this species' long term persistence in the plan area.

Northern Black Racer (*Coluber constrictor constrictor*)

Group: Reptiles

Conservation Categories: Ranked #8 as reptile Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

The black racer has an extensive range (Canada, throughout conterminous United States, down through Guatemala) which includes Ohio. Broadly distributed throughout Ohio (>60 counties) (ODNR 2015). Two subspecies in Ohio, with southeast Ohio having the *C. constrictor constrictor* subspecies. Widespread and common throughout southern and southeastern Ohio. Recorded from multiple sites across all three units of the Wayne.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class A, B, C); and Dry-mesic Mixed Oak Hardwood Forest (Class A, B, C).

Generally speaking, inhabits relatively open and sunny areas with abundant access to cover. Such appropriate habitats include forest edges, open oak woodlands, early-successional forest, old fields, prairies, grasslands, and similar. Spends time under or

inside cover objects (fallen logs, snags, crevices, etc.). Overwinters in a protected, temperature-stable hibernaculum, such as underground.

Habitat Trend in Plan Area:

Decreasing. Open oak woodlands, early-successional forest, and old fields are currently not as common as they were historically (see *Terrestrial Ecosystems Supplemental Report*) and are of low-moderate integrity.

Relevant Life History & Other Information:

A relatively fast-moving snake that will climb trees. Individuals feed on nestling and fledgling birds, eggs, small mammals, other reptiles, and large arthropods. Adults often hibernate communally, sometimes partly submerged in water. Eggs are laid in underground tunnels or burrows, rotting stumps, sawdust piles, or under rocks. Oviposition sites may be up to at least several hundred meters from the usual home range.

Threats Relevant In or To the Plan Area:

No major threats in the plan area. More broadly, threats include habitat destruction or degradation (e.g., loss of more open woodlands and early-successional habitat), human persecution, and pesticide residue on arthropods consumed by black racers. As with many snake species, road mortality is a concern. As with all snakes in Ohio, snake fungal disease is a rising concern (Lorch et al. 2016).

Rationale for SCC Determination:

This is a common and widely distributed generalist species in the Wayne National Forest and southern Ohio as a whole. There are no pressing and direct threats to this species in this region, and even the decline in more open habitat in the Wayne National Forest is somewhat offset by the numerous edge habitats present throughout the proclamation boundary between National Forest System lands and lands of other ownership. Because of this, there is no concern regarding this species' long term persistence in the plan area.

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Amphibians

Green Salamander (*Aneides aeneus*)

Group: Amphibians

Conservation Categories: Ohio Endangered; Ranked 6 as amphibian Species of Greatest Conservation Need; U.S. Fish & Wildlife Service Species of Concern; NatureServe G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Ohio sits on the northwest edge of range, with the Ohio populations disjunct and genetically isolated by the Ohio River from the rest of the global population. Ohio populations are in a few isolated locations (ODNR 2015) in 3 counties within 7 miles of the Ohio River. These secretive salamanders are rare in Ohio. There are several observations from one HUC-12 in the Wayne: six

salamanders found in one fissure in one location in 2006, three salamanders in two rock crevices in 2012, one in a fissure in 2013, and one in two fissures in 2017.

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in Wayne unknown. Better information on current status is needed.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Dry-mesic Mixed Oak Hardwood Forest (Class D, E); Rolling Bottomlands Mixed Hardwood Forest: Appalachian-Alleghenian Sandstone Dry Cliff Vegetation (Class D).

An "extreme habitat specialist" (Wells 2007). Completely terrestrial and fundamentally tied to shaded, moist (but not wet) sandstone and limestone rock outcrops and ledges embedded within mature deciduous forests. In the Wayne National Forest, they appear to only use sandstone rock outcrops. The rock outcrops must have suitable moist crevices for this species to retreat into, and cannot be sheer walls of unbroken rock. Will venture out of rock retreats on humid and moist nights, including on the ground and onto and up trees. Has been known to be found underneath peeling bark of standing dead or downed trees, especially in historic records. Sometimes reaches high population densities in logged areas where the tops are left.

Habitat Trend in Plan Area:

Stable, low-moderate to low integrity (ODNR 2015).

Relevant Life History & Other Information:

Green Salamanders are great climbers, and will venture out onto rock faces at night, or, on cool moist nights, away from the rock face and up into trees. They are the most arboreal of Ohio's salamanders. Generally stays within a few dozen meters of their "home" rock outcrop, but will venture between rock outcrops. Eggs are placed in moist crevices without moss. Can be difficult to detect, even when visiting a known site. Hafer (1992), for example, had 1 detection per every 5 site visits. Prior attempts to model appropriate habitat distribution throughout Lawrence, Scioto, and Adams Counties, based on microhabitat features where known populations have occurred, found that areas meeting model parameters were located throughout the western Ironton Unit (Lipps 2005). However, when searching those potential sites for absence or presence, the only new populations found were near the Ohio River (within 7 miles) (Lipps 2005). Other searches have turned up fruitless. As such, the southwest section of the Ironton Unit will certainly be the only place in the Wayne to harbor this species. As a note, recent work has called into question whether the green salamander is one species or a complex of multiple, yet undescribed species (Patton et al. 2019).

Threats Relevant In or To the Plan Area:

Habitat - Because this species has such a narrow habitat breadth, the most pressing threats to the populations in the plan area and in Ohio involve degradation or destruction of its habitat. Such examples would include temperature increases or moisture regime changes stemming from deforestation around inhabited rock outcrops, and alterations or modifications of the rock outcrops themselves (e.g., removal for mineral development or removal for road creation). Climate change poses a threat by changing microhabitat features such as temperature and moisture.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Ohio's populations of green salamanders are noteworthy. Not only are they exceedingly rare in the state, but these populations comprise a disjunct and apparently genetically isolated population compared to the rest of this species' range. The Wayne harbors some of the few known individuals of this noteworthy population. However, their extreme environmental specificity puts this species at a much heightened risk of extirpation from not only the Wayne, but Ohio as a whole. The multitude of threats this species faces calls into question their long-term persistence in the plan area and immediate surrounding area. Therefore, this species is identified as a potential species of conservation concern.

Four-Toed Salamander (*Hemidactylium scutatum*)

Group: Amphibians

Conservation Categories: Ohio Species of Concern; Ranked 11 as amphibian Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Populations are highly scattered and disjunct across the global range. The Ohio range is also scattered, with clusters in the southeast and northeast portions of the state (>30 counties). Uncommon statewide, and their secretive nature makes it difficult to accurately assess abundance. Found in one locality in the northeast Marietta Unit and many localities throughout the Ironton Unit.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Groundwater-Dependent Systems; Wetlands; Primary Headwater Streams.

Four-toed salamanders can be found associated with a wide variety of small wetland habitats embedded within mature forests with relatively closed or closed canopies. Breeding takes place within or on the edge of wetlands that typically contain a large amount of moss, typically *Sphagnum* spp. or *Thuidium* spp. Such appropriate wetlands include seeps and springs with moss on the edges, vernal pools with moss, ephemeral pools with mossy hummocks, bottomland swamps with mossy hummocks, around slow-moving primary headwater streams with abundant moss, and more. Larvae are aquatic and live in the slow-moving water associated with wetland in which the eggs were placed near. Outside of breeding, adults spend their time in mature deciduous or coniferous forests within a few hundred meters of their breeding habitat. They will spend time under cover objects, such as logs, and underground within burrows.

Habitat Trend in Plan Area:

Probably stable. Although wetland ecosystems as a whole have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*), we do not have more than anecdotal data about how often said wetlands have large amounts of moss associated with them. Groundwater-dependent systems are not evaluated for habitat integrity. Regarding terrestrial habitat, current terrestrial ecosystems have an overrepresentation of closed canopy classes compared to historic, more open conditions, which likely benefits the species (see *Terrestrial Ecosystems Supplemental Report*) which is beneficial to four-toed salamanders.

Relevant Life History & Other Information:

This species seems to rely on a complex suite of microhabitat features that we do not fully understand yet. Nests are most often laid by females underneath clumps of moss on the edge of an appropriate wetland, but occasionally under sedges or other such plants. Larvae will hatch and move to the water. The Ohio EPA considers the presence of four-toed salamanders as one of the best indicators of high-quality wetlands (Pfingsten et al. 2013). This species is very secretive and can go undetected for decades in a given locale before being seen again.

Threats Relevant In or To the Plan Area:

Habitat - Degradation or destruction of breeding wetlands can negatively impact populations. This is especially true regarding destruction or degradation of mosses in the wetland. Four-toeds need thick mats of moss, and these can take many years, if not decades, to grow back if destroyed. Timber harvest within 159-290 meters (0.1-0.2 miles) of known breeding sites may be detrimental to the species, mainly by removing canopy cover and changing site-specific microclimatic conditions needed during the non-

breeding season. Climate change induced droughts might further harm this species if moss populations die out due to drought stress.

Predation - Four-toed salamander nests are also being predated at a higher rate than were historically due to the current higher abundance of meso-predators, like raccoons.

Population fragmentation - As this species exists in already highly fragmented populations, adequate gene flow to ensure resilience is of a concern. Destruction of one population, or further fragmentation (e.g., roads) between populations can lessen chances of gene flow and, ultimately, resilience.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

The Four-Toed Salamander is an uncommon species found in highly fragmented populations in southeast Ohio requiring relatively specific breeding microhabitat that is not abundant across the region. Historically, most of the natural wetlands throughout the state and southeast Ohio have been destroyed or degraded in the past 200 years, further limiting appropriate areas for this species with an already fragmented range. Destruction or degradation of breeding or surrounding non-breeding habitat or further fragmentation of any populations in the plan area would have an outsized impact on this species. Therefore, there is substantial concern for long-term persistence of this species in the planning area and it is recommended for consideration as a potential species of conservation concern at this time.

Mud Salamander (*Pseudotriton montanus*)

Group: Amphibians

Conservation Categories: Ohio Threatened; Ranked 5 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states), which includes Ohio. They are uncommon across their entire range, and Ohio is at the periphery of the range, where distribution is highly restricted (recorded from 9 counties). Numerous observations in the Ironton Unit of the Wayne between 2006 and 2018 in eleven widely distributed HUC-12s; most in Buffalo Creek. Uncommon across their range in Ohio, and very secretive and difficult to find due to subterranean habits. However, the Ironton Unit of the Wayne appears to harbor a

significant portion of the statewide population, therefore emphasizing the importance of the plan area habitat to this species.

Questions have been raised about the taxonomic status of this species. Currently, four subspecies are recognized (only one subspecies, *P. m. diastictus*, is known in Ohio). However, some researchers argue that the species should be split into two or more species. Further systematic research is needed to clarify the taxonomy of this species, and the global range could shrink if the species is shown to be two or more cryptic species. In that case, if Ohio's subspecies were determined to be its own species, every remaining occupied location would become that much more important.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown. This species has an already-fragmented metapopulation. Any loss of a local population would lessen or potentially end metapopulation gene flow, which could put this species at higher risk of threats by increasing isolation and lessening genetic diversity.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Groundwater-Dependent Systems; Rolling Bottomlands Mixed Hardwood Forest (class C, D).

Both adults and larvae are essentially tied to seeps, springs, and associated mud and pools of slow-moving water. These components must be embedded within forested areas. Unlike other seep and spring associated salamanders, mud salamanders appear to only be associated with seeps and springs in lowlands or valleys, and rarely ever seeps or springs mid slope on a hillside. Larvae appear to inhabit water directly-related to a given seep or spring. It is important to note that the pool of groundwater does not have to be deep; in fact, larvae can persist in muck and mud that is created by a tiny, but constant, seep or spring. Adults will be found near such seeps and springs, but will venture out further down slow-moving streams or in nearby riparian areas. Bottomland swamps and other flat, mucky areas associated with slow-moving streams that also have at least one seep or spring within that general area appear to be the best general habitat for this species. Rarely, however, populations will be found without any seep or spring readily apparent.

Habitat Trend in Plan Area:

Stable. Although seeps and springs are uncommon in the Wayne, they are generally not destroyed nor created, but integrity was not evaluated. Hanging Rock Region associated mining might have actually uncovered more seeps and springs than were there prior to iron ore-associated activity (Pfingsten et al. 2013). Associated slow-moving, mucky primary headwater streams are also stable. Rolling bottomlands is of low integrity habitat.

Relevant Life History & Other Information:

Secretive and difficult to detect. Adults will often reside underground in muddy burrows, while larvae hide among muddy leaf litter. Searching for larvae via dip-netting appears to be the easiest way to confirm presence, rather than searching for adults. Mud and red salamander larvae can be very difficult to tell apart. This species is not common anywhere within its range, and populations can seemingly avoid detection for years or decades before being found once again.

Threats Relevant In or To the Plan Area:

Habitat - Deforestation of riparian areas along streams and springs would negatively impact any populations. Climate change effects (warmer temperatures, more and longer droughts) could negatively impact some populations.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

The mud salamander is rare and scattered throughout its small Ohio range and considered a state Threatened species with a decreasing statewide population trend. The Ironton Unit of the Wayne appears to harbor a significant portion of the statewide population. Although habitat in the Wayne is believed to be stable, the mud salamander's relatively specific habitat requirements and uncommonality of that habitat across the Ironton Unit raise the level of concern for long-term persistence. Any negative direct or indirect modifications to that habitat could significantly impact the overall status of this species in Ohio. Any loss of a population within an already fragmented metapopulation would lessen or potentially end metapopulation gene flow, which could put this species at higher risk of threats by lessening genetic diversity. In light of all these reasons, there is a concern for this species' long-term persistence in the plan area and it is recommended as a potential species of conservation concern.

Northern Spring Salamander (*Gyrinophilus porphyriticus porphyriticus*)

Group: Amphibians

Conservation Categories: Ranked 1 as amphibian Species of Greatest Conservation Need; NatureServe rank G5T5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Ohio is on the western edge of its range, where it is found throughout eastern and southern Ohio (recorded from over 25

counties). Found in the Marietta Unit in two discrete locations: Fly Gorge Special Area and Rocky Fork Gorge Special Area. As a note, there are also known populations only a few miles from the southwest parcels of the Athens Unit, but none have been discovered in the Athens Unit as of present. Spring salamanders are secretive and can be difficult for humans to find. Pfingsten et al. (2013) says that spring salamanders "cannot be considered abundant anywhere in Ohio" and repeated trips to a known population might be required to find any individuals.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Groundwater-dependent systems and the directly adjacent Dry-mesic Mixed Oak Hardwood Forest (Class, C, D, E) and Rolling Bottomlands Mixed Hardwood Forest (Class C, D); Primary Headwater Streams and the directly adjacent Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest (Class C, D).

Associated closely with cool and coldwater habitat, specifically within primary headwater streams and groundwater dependent ecosystems such as seeps and springs. The aquatic larvae spend most of their time under cover objects within streams, especially in slow-moving pools. The adults are semi-aquatic. They will spend time within the cool and coldwater streams, seeps, and springs, and also on land on the edges of these aquatic habitats. Occasionally, adults have been found nearly 30 meters away from water sources (Pfingsten et al. 2013). Adults are also subterranean in nature, and found within areas such as caves or apparently traveling within underground portions of seeps and springs. Large portions of any given population may be underground at any given time.

Habitat Trend in Plan Area:

Stable. Groundwater dependent systems habitat integrity is not evaluated, with low-moderate to low habitat integrity in the directly adjacent dry-mesic mixed oak hardwood forest. Rolling bottomlands have low habitat integrity. Although seeps and springs are uncommon in the Wayne, they are generally not destroyed nor created. Primary headwater streams have moderate-high integrity in the Wayne, especially in the Marietta Unit (see *Aquatic Ecosystem & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

There is a lot still unknown about this species, especially given that much of its time is apparently spent underground. Breeding habits remain murky, but the larval period takes several years to complete. The adults feed heavily on other salamanders. Several researchers have raised questions about the taxonomy of this species; there is a thought

that many of the subspecies might be their own separate species, or that this species is actually a complex with cryptic species (Pfingsten et al. 2013).

Threats Relevant In or To the Plan Area:

Habitat - The main threat to this species involves destruction or degradation to its habitat. Because the spring salamander requires cool, clean spring water with high oxygen levels, anything which raises the temperature of the water or pollutes the water will negatively impact populations. Such actions include deforestation around the seep or spring, increased sedimentation in the water, and climate change induced warmer ambient air temperatures in the summer. As the climate changes and if summer air temperatures become warmer and fall droughts become more common, populations may begin to experience more stress during all parts of their lifecycle (aquatic larval stage and semi-aquatic adult stage). Increased road activity and energy production associated activity in the Marietta Unit is of particular concern, as the known populations of this species in the Wayne are concentrated in the northern section of this unit, which coincidentally has the highest minerals development.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

There is insufficient scientific information available locally to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Currently, the distribution of Northern Spring Salamanders is limited in the Wayne and is scattered throughout Ohio as a whole. They are difficult to discover and have relatively narrow habitat requirements. While the known habitats are currently stable (and the two in the Marietta Unit are relatively protected within the Fly Gorge and Rocky Fork Gorge Special Areas), there are a couple of threats over which we have little control. Climate change and local mineral development could both impact the species. However, not enough is known about the local population status or trend to gauge whether these threats could risk extirpation, or whether there are other populations of this cryptic salamander yet undiscovered in new locations.

Eastern Hellbender (*Cryptobranchus alleganiensis*)

Group: Amphibians

Conservation Categories: Ohio Endangered; Ranked 23 as amphibian Species of Greatest Conservation Need; U.S. Fish & Wildlife Species of Concern; NatureServe G3T2

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Rare and scattered in Ohio (recorded from 25 counties, but only 9 since 1989), and only in the Ohio River drainage. Eastern Hellbender distribution is extremely limited in the Wayne National Forest. It was thought Hellbenders were extirpated from streams crossing the Wayne until Wineland and Waldron (2018) sampled 19 sites (2 historical, 17 random) in the Ironton and Marietta Units of the Wayne using eDNA techniques. In these sites, they found evidence of hellbender presence at 1/7 random sites in the Ironton Unit and 1/12 sites in the Marietta Unit (Wineland and Waldron 2018). There is a chance these two populations may be functionally extinct (that is, no longer viable and able to reproduce), as this is a pattern commonly found across Ohio.

Population Trend Statewide and in the Plan Area:

Sharply decreasing statewide (ODNR 2015). Historical sites in the Marietta Unit were thought to be extirpated (Wineland and Waldron 2018). It is unsure whether the positive eDNA hits reflect a viable population in either the Marietta or Ironton Units, or whether they reflect one or a few old, non-reproducing (functionally-extinct) individuals.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Larger Streams & Rivers.

Hellbenders generally inhabit larger wadeable and larger boatable streams. The presence of large, flat rocks is necessary, as individuals spend much of their time in retreats under such "shelter" rocks. Such rocky sections of streams are patchy in Ohio, and, consequently, populations in Ohio are patchy (Pfingsten et al. 2013). Hellbenders typically prefer faster-flowing water, and will often be found in runs and riffles. It should be noted that although they prefer fast-flowing water, they can be found in slow or seasonally slow flow sections (Pfingsten et al. 2013). Oftentimes, sources will claim that hellbenders require cool water; however, this doesn't seem to always hold true, especially in Ohio. Individuals have been found in water temperatures over 30 degrees Celsius (over 86 degrees Fahrenheit). Stream water must be well-oxygenated and relatively clear of sediments.

Habitat Trend in Plan Area:

Not much appropriate habitat left, and what is left is probably decreasing in quality. Such areas have low habitat integrity. As a whole across southeast Ohio, larger wadeable and boatable streams have moderate-high integrity. However, Wineland and Waldron (2018) found that many of their survey sites throughout the Ironton and Marietta Units were "severely impacted by sedimentation and streambank erosion."

Relevant Life History & Other Information:

The largest salamander species in Ohio. Totally aquatic, and mostly sedentary throughout the year. Female lays up to 500 eggs in a nest the male excavates under a large flat rock.

Typically feeds on crayfish, snails, minnows, insects, and worms. There are reintroduction efforts going on in some portions of the state, as well as neighboring states (West Virginia).

Threats Relevant In or To the Plan Area:

Habitat - Primary threats include degradation of larger stream habitats. Sedimentation was, and continues to be, the major issue in Ohio (Pfingsten et al. 2013). Sedimentation impacts the breathing ability of hellbenders, but can also bury shelter rocks or embed them. Declining water quality as a result of pollutants is a threat. Water withdrawal (especially in the Marietta Unit) is of concern. Climate change impacts (drought and water temperature increase) will negatively impact this species.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Information gaps - There is a general problem with recruitment, but the cause of this problem is unknown (Pfingsten et al. 2013). Regardless, successful reproduction does not seem to be occurring on a regular basis throughout the remaining Ohio populations.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. This species is rare across the state, being extirpated from most historical locations and decreasing sharply where it remains. In fact, it was presumed the Marietta Unit population was extirpated, as no individuals had been observed since the 1980s. The eDNA hit from the Ironton Unit was recorded from a stream with no historic records, and is quite a surprise (Wineland and Waldron 2018). It is uncertain whether the positive eDNA hits reflect a viable population in either the Marietta or Ironton Units. With the unknown status of previously-considered extirpated or undocumented populations in the plan area and highly degraded status of habitats, it is unclear at this time whether any viable populations remain. More study is needed.

Common Mudpuppy (*Necturus maculosus*)

Group: Amphibians

Conservation Categories: Ranked 14 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Historically distributed throughout Ohio, but nowadays missing from much of the northwest quadrant. Currently found primarily throughout eastern and southern Ohio (>30 counties) (ODNR 2015). Known historically (pre-1990s) from the Athens and Ironton Units, but recent observations (past 20 years) have only been from the Marietta Unit in the Eightmile Creek-Little Muskingum River HUC-12. Historically, mudpuppies were probably present and common throughout the entire state in any larger perennial stream with patches of rocks available. Adverse human modification of habitats has reduced statewide abundance, but it is unknown to what extent, as they are secretive and exceedingly difficult to survey for. Consequently, we have little knowledge of current distribution or abundance. They are most likely still present in the Athens and Ironton Units, but there have not been any specific recent surveys for this species in these areas for confirmation.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in Wayne unknown, although Dr. Michael Hoggarth, a mussel expert at Otterbein University, believes the mudpuppy is more-or-less stable. The mudpuppy is the host species for the salamander mussel. During mussel surveys, he said he typically saw quite a few mudpuppies present in the lower sections of the Little Muskingum River, although he has not visited recently (personal communication, Michael Hoggarth, 2020).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. A fully aquatic species that inhabits a variety of aquatic ecosystems, namely large rivers, wadeable streams, reservoirs, and canals. A key component to these habitats are the availability of cover objects, such as flat rocks, logs, and other such objects under which individuals can retreat. Muddy bottoms are also used, as are tree root hides. Populations can be patchy within a given stream depending on the availability of structural components.

Habitat Trend in Plan Area:

Stable. Larger, wadeable streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Adults seem to prefer spending time in well-aerated portions of streams, such as to the side of riffles or just downstream from them. Mating takes place in the fall and the 18-180 eggs are laid the following spring. Females make nest cavities under logs or stones. Eggs attached to the underside of debris.

Threats Relevant In or To the Plan Area:

Habitat - Increased sedimentation and chemical pollutants in streams seem to be the primary threats to this species. Climate change will impact this species as well. Mudpuppies need water temperatures below 30 degrees Celsius. As air temperatures, and subsequently water temperatures, rise, some streams could become too warm for this species. Also, reduced streamflow as a result of climate change induced fall droughts could negatively impact populations.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long term. We do not have a full-enough picture to understand the broader distribution within the Wayne and how abundant or rare this species is. Because of these points, this species does not quality as a potential species of conservation concern.

Jefferson Salamander (*Ambystoma jeffersonianum*)

Group: Amphibians

Conservation Categories: Ranked 14 as amphibian Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Broadly distributed in the eastern and southern portions of the state (>30 counties), but populations can be patchy (Pfingsten et al. 2013; ODNR 2015). Widely distributed in the Wayne from the Athens and Ironton Units. Apparently absent from the Marietta Unit. "Pure" Jefferson salamanders may be less abundant than once thought, as many populations have been found to consist of hybrids.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Rolling Bottomlands Mixed Hardwood Forest - Class D, E); Wetlands.

As with all migratory, bi-phasic mole salamanders, there is an aquatic larval habitat and a terrestrial adult habitat. Adults live in a variety of mature, deciduous forests with relatively closed or closed canopies. They spend their time underground or just near the surface under cover objects like rocks and logs. The larvae inhabit a variety of wetlands, especially those lacking fish. Such wetlands include vernal pools, buttonbush swamps, flooded marshes and fields, and ephemeral or permanent ponds without fish.

Habitat Trend in Plan Area:

Stable. Current terrestrial ecosystems have low integrity as well as an overrepresentation of closed canopy classes compared to historic conditions, which benefits this species (see *Terrestrial Ecosystems Supplemental Report*). Aquatic habitats are currently stable, with vernal pools being abundant and wetland ecosystems as a whole having moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Migrates in the late winter or early spring from terrestrial habitats to aquatic habitats for breeding. Individuals might travel up to a mile from their summer or fall territories to their breeding pools. Jefferson salamanders can be active in cooler temperatures than other mole salamanders in the state, with surface activity happening in January if the temperatures are abnormally warm for that time and there has been a rain event. Quite uncommon to encounter an adult Jefferson salamander outside of the immediate breeding portions of the year, as they spend much of the rest of the year underground. Some populations will contain hybrid individuals or be adjacent to unisexual Ambystomatid hybrid populations. In fact, some have called into question how abundant pure Jefferson salamander populations are, and have argued that pure Jefferson Salamanders might be less abundant than has been previously thought (Pfingsten et al. 2013).

Threats Relevant In or To the Plan Area:

Habitat - Destruction or degradation of ephemeral wetlands used for breeding will negatively impact populations. Fragmentation and deforestation of mature forests can reduce adult populations and reduce gene flow.

Direct mortality - Road mortality is of particular concern to this species during migration from forested habitats to breeding habitat when they are separated by a road; they will cross in large numbers on specific nights and mortality can be high.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Relatively abundant across southern Ohio and the Wayne. This species can be found across a wide variety of ecosystem types as long as appropriate larval habitat is available. Habitat trends are stable, and there are no specific threats disproportionately impacting this species in the plan area or greater surrounding area. Because of this, there is no

concern for long-term persistence in the plan area and this species does not quality as a potential species of conservation concern.

Marbled Salamander (*Ambystoma opacum*)

Group: Amphibians

Conservation Categories: Ranked 10 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Ohio sits at the northern edge of its range. In Ohio, it is distributed throughout southern Ohio with isolated disjunct populations across northern Ohio. Recorded in over 30 counties (ODNR 2015). Much more common in southern Ohio than the northern Ohio populations. Numerous observations in the Wayne. Found in all three units.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Dry-Mesic Mixed Oak Hardwood Forests (class D, E); Dry Oak Forest (class D); Rolling Bottomland Hardwoods (class D); Wetlands; Primary Headwater Streams.

As with all migratory, bi-phasic mole salamanders, there is an aquatic larval habitat and a terrestrial adult habitat. Adults live in a variety of mature deciduous forests (mostly dry-mesic mixed oak hardwood forests), with a preference for closed or mostly closed canopy. Adults can withstand drier conditions than other mole salamanders (Pfingsten et al. 2013), and can even be found on dry ridgetops (personal communication, Kyle Brooks, 2020). Adults spend their days underground or just near the surface, in burrows, under cover objects (e.g., rocks), or in leaf litter. The aquatic larvae inhabit ephemeral wetlands, such as vernal pools and seasonally-inundated lowland areas near valley streams, also primary headwater streams.

Habitat Trend in Plan Area:

Stable. Current terrestrial ecosystems are low-moderate to low integrity, with an overrepresentation of closed canopy classes compared to historic conditions, which

benefits this species (see *Terrestrial Ecosystems Supplemental Report*). Aquatic habitats are currently stable, with vernal pools being abundant and wetland ecosystems as a whole having moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

The only Ohio mole salamander to undergo fall migration and breeding. Also unlike most other mole salamanders, it breeds on land and waits for the ephemeral wetland to become inundated. Larvae overwinter and then undergo metamorphosis in the spring, before dispersing to nearby terrestrial habitat.

Threats Relevant In or To the Plan Area:

Habitat - Destruction or degradation of ephemeral wetlands used for breeding will negatively impact populations. Larvae have a lower high temperature limit than other Ohio mole salamanders, and climate change induced temperature change could increase heat stress to larvae. Climate change induced fall droughts will hinder reproduction. Fragmentation and deforestation of mature forests can reduce adult populations and reduce gene flow.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Relatively abundant across southern Ohio and the Wayne. This species can be found across a wide variety of ecosystem types as long as appropriate larval habitat is available. Habitat trends are stable, and there are no specific threats disproportionately impacting this species in the plan area or greater surrounding area. Because of this, there is no concern for long-term persistence in the plan area.

Northern Red Salamander (*Pseudotriton ruber ruber*)

Group: Amphibians

Conservation Categories: Ranked 10 as amphibian Species of Greatest Conservation Need; NatureServe rankG5T5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Eastern Ohio is on the western edge of this species range, and it can be found throughout many eastern Ohio counties

(>30 counties). Numerous observations in the Wayne, where it is found across all three units.

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Groundwater-dependent Systems; Primary Headwater Streams and directly adjacent Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest (Class C, D).

Larvae are aquatic and inhabit seeps and springs and any associated nearby slow-moving primary headwater streams embedded within deciduous forests. Upland seeps and springs near the upper end of hollows seem to be preferred to lowland, valley springs (such as those preferred by the mud salamander). Adults are semi-aquatic. Adults spend some parts of the year in or near the springs and primary headwater streams to breed (early spring), and then transition to nearby terrestrial habitat in the summer. In this terrestrial period, adults spend their time under various cover objects (e.g., rocks, logs) and in burrows.

Habitat Trend in Plan Area:

Stable. Groundwater-dependent systems are not evaluated; other habitat is of moderate-high (primary headwater streams) and low integrity (rolling bottomlands). Although seeps and springs are uncommon in the Wayne, they are generally not destroyed nor created. Associated slow-moving, mucky primary headwater streams are also stable. Deciduous forests in riparian zones are also stable.

Relevant Life History & Other Information:

Adults are semi-aquatic, spending some of their time in slow-moving streams, and other times in nearby upland deciduous forests under cover objects. These relatively large salamanders are often found in much lower densities than smaller Plethodontids. Individuals (both larvae and adults) will retreat to underground areas in the winter. Varied diet includes other Plethodontid salamanders.

Threats Relevant In or To the Plan Area:

Habitat - Deforestation of riparian areas along streams and springs would negatively impact any populations. Climate change effects (warmer temperatures, more and longer droughts) could negatively impact some populations.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Although Red Salamanders are never found in abundance in southeast Ohio, they are nevertheless regularly encountered if searched for. There are no direct threats to their habitat currently, and no evidence of any statewide population decline. Because of this, there is no concern for long-term persistence in the plan area and this species does not quality as a potential species of conservation concern.

Long-Tailed Salamander (*Eurycea longicauda longicauda*)

Group: Amphibians

Conservation Categories: Ranked 13 as amphibian Species of Greatest Conservation Need; NatureServe rank G5T5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Widespread across eastern and southern Ohio (>30 counties) (ODNR 2015). Numerous observations in the Wayne (more than fifteen widely distributed HUC-12s widely distributed). In all three units. Populations are often abundant, but individuals are secretive and appear more uncommon to people than the actual population reflects.

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Groundwater Dependent Systems and Primary Headwater Streams; directly adjacent Rolling Bottomlands Mixed Hardwood Forests (Class C, D) and Dry-Mesic Mixed Oak Hardwood Forests.

Adults are terrestrial and live under cover objects (especially stones and logs) near streams and seeps within forested areas. Adults rarely inhabit the water directly, however. There is a marked preference for limestone and shale, both with cover objects and with streams lined with said rock types. Larvae are aquatic and most often found near springs and seeps (groundwater-dependent systems). Long-tailed salamanders will inhabit underground areas, including the twilight zones of caves (although true caves are rare in southeast Ohio).

Habitat Trend in Plan Area:

Adult habitat is stable, and the adults are most likely benefitting from uncharacteristically closed canopies. Rolling bottomlands integrity is low. Larval habitat is stable with moderate-high integrity, although groundwater-dependent systems are not evaluated.

Relevant Life History & Other Information:

Species has a two-phase life cycle. Larvae are aquatic and often tied to springs and seeps. Adults are terrestrial and can be found in rather dry areas to moist areas adjacent to primary headwater streams. Microhabitat (e.g., presence of small rocks or talus slope like areas for cover objects) seems to be more important than macrohabitat (e.g., deciduous forest). A rather secretive and hard to readily detect species.

Threats Relevant In or To the Plan Area:

Pollution - Acid mine drainage can negatively impact aquatic larvae. Canopy reduction can negatively impact adults.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Widespread across the plan area and greater surrounding area, although it can be difficult to detect in large numbers due to secretive nature. Habitat trends are stable, and there is no apparent population decline in this species in Ohio or the plan area. Because of this, there is no concern for long-term persistence in the plan area.

Northern Dusky Salamander (*Desmognathus fuscus fuscus*)

Group: Amphibians

Conservation Categories: Ranked 17 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Broadly distributed (>45 Ohio counties) across most of the state, but absent from northwest Ohio (Pfingsten et al. 2013; ODNR 2015). Numerous observations in the Wayne from 2003 to 2018. Abundant in all three units.

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams and directly adjacent Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest (Class C, D).

Semi-aquatic salamander closely tied to primary headwater streams. Individuals will be found either on land immediately adjacent to a primary headwater stream (generally no more than one meter away), or within the stream. Appropriate streams include intermittent and perennial headwater streams with rocks and woody debris. Larvae often found in leaf litter lined pools within a stream. Seeps and springs can also act as habitat.

Habitat Trend in Plan Area:

Stable. Primary headwater streams have moderate-high integrity in the Wayne (see *Aquatic Ecosystems & Watersheds Supplemental Report*) while rolling bottomlands have low integrity. Groundwater-dependent systems are not evaluated.

Relevant Life History & Other Information:

A "streamside" lungless salamander species. They have a two-phase life cycle. The larvae are aquatic and gilled, while the adults are semi-aquatic and lungless. Eggs are laid under rocks during the summer months. Females stay with the egg mass until the eggs hatch. Individuals may remain active year round, but do so in more underground areas during the winter.

Threats Relevant In or To the Plan Area:

Habitat - Threats primarily revolve around modification to headwater streams. Acid mine drainage impacted streams generally lack any populations. Sedimentation has been shown to negatively impact populations. Northern dusky salamanders are generally less tolerant of water loss than other streamside salamander species, so climate change induced droughts and water withdrawals can negatively impact populations. Higher temperatures associated with climate change or riparian vegetation removal can also harm populations.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Widespread and abundant throughout the watersheds of the Wayne, especially so in watersheds not impacted by acid mine drainage or in watersheds with high riparian vegetation cover. Habitat trends are considered stable, and global population secure. Because of this, there is no concern for long-term persistence in the plan area.

Red-Spotted Newt (*Notophthalmus viridescens viridescens*)

Group: Amphibians

Conservation Categories: Ranked 20 as amphibian Species of Greatest Conservation Need; NatureServe rank G5T5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Broadly distributed (>30 Ohio counties) across most of the state, but absent from much of northwest Ohio (ODNR 2015). Numerous observations in the Wayne from 2003 to 2018. Present in all three units.

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class C, D) and associated Wetlands.

Adults and larvae live in still-moving water, primarily shallow ponds but occasionally slow-moving streams and larger bodies of water. These water bodies are typically exposed to the sun and in an open area, but often embedded within a forested area or near a forest edge. The efts ("teenage" stage between larvae and adult) are terrestrial, and generally live in forested areas. Efts spend time under cover objects (e.g., rocks, logs) and leaf litter.

Habitat Trend in Plan Area:

Either stable, or increasing slightly as areas reforest and beavers create more ponds. Habitat integrity is low (large stream floodplain and riparian forest) to moderate-high Integrity of associated wetlands.

Relevant Life History & Other Information:

Most populations have a distinct three-phase life history. Adults live in the water. Eggs are laid in water, and the larval stage also takes place in water. Juvenile stage (eft) is terrestrial and individuals will wander. Adults, although primarily aquatic, can withstand

their home pond drying for short periods of time. If the pond stays dry for long, adults will move over land to another suitable location.

Threats Relevant In or To the Plan Area:

Climate-change-induced droughts could stress the reproductive cycle, specifically the larvae. As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Widespread and numerous across southeast Ohio, and broadly distributed in the Wayne. Beaver populations are increasing, which is resulting in more adult and larval habitat creation for newts. Habitat trends are considered stable or increasing. Because of this, there is no concern for long-term persistence in the plan area.

Mountain Chorus Frog (*Pseudacris brachyphona*)

Group: Amphibians

Conservation Categories: Ranked 18 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. Restricted to southeast Ohio (20 counties), but widespread within this area. In all three units of the Wayne (personal communication, Katrina Schultes, 2020; Pfingsten et al 2013).

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class D); Dry-mesic Mixed Oak Hardwood Forest (Class D, E). Wetlands and Groundwater-Dependent Systems and directly adjacent Rolling Bottomlands Hardwood Forests (Class C, D).

Adults are terrestrial during the summer months, where they live in deciduous forests on hillsides. Breeds aquatically in lowland valleys in small, ephemeral pools. Such areas include vernal pools, roadside ditches adjacent to forests, and pools associated with seeps

and springs; wetlands and directly adjacent Rolling Bottomland Hardwood Forest (Class C, D). Pools can be very small and ephemeral.

Habitat Trend in Plan Area:

Apparently stable. Current terrestrial ecosystems are of low-moderate integrity and have an overrepresentation of closed-canopied forests in the Wayne, which benefits the frog (see *Terrestrial Ecosystems Supplemental Report*). Wetlands in the Wayne have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Rolling bottomlands have low integrity.

Relevant Life History & Other Information:

Eggs and larvae develop in small pools in or adjacent to woods. Eggs are attached to leaves, sticks, or other vegetation in water. Overwinters underground or within rotting logs.

Threats Relevant In or To the Plan Area:

Few threats to this species in the Wayne. Climate change brings threats in the form of changes to the thermal landscape (higher summer temperatures) and increased droughts. Loss of canopy cover or breeding pools can result in localized declines.

Rationale for SCC Determination:

Found in appropriate habitats throughout the Wayne's three units. Abundant habitat, and no evidence of decline in the Wayne for either the species or its habitat. Because of this, there is no concern for long-term persistence in the plan area.

Western Chorus Frog (*Pseudacris triseriata triseriata*)

Group: Amphibians

Conservation Categories: Ranked 20 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Common statewide (>30 counties), mostly in glaciated portion of the state. Southeast Ohio is on the southern edge of global range. Uncommon and restricted distribution in the Wayne. In the Ironton Unit of the Wayne (four observations 2008 to 2010 in one HUC-12: Black Fork).

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Wetlands and directly adjacent Rolling Bottomlands Mixed Hardwood Forest (Class C, D); also Dry-Mesic Mixed Oak Hardwood Forest (Class D, E).

Generally prefers open pools with emergent vegetation. Such habitats include flooded fields, marshes, bottomland swamps, and wet woodlands. It emerges from hibernation with the thawing of the ice and congregates by the hundreds in small ponds. After the breeding season, they move to upland areas (such as Dry-mesic Mixed Oak Hardwood Forest) to hide under cover objects, in crawfish burrows, and other such areas. They overwinter in burrows and leaf litter. Grassy areas and ponds associated with reclaimed stripmines have also been shown to provide habitat for this species (Myers and Klimstra 1963), which is locally abundant in some areas of the Athens and Ironton Units.

Habitat Trend in Plan Area:

Apparently stable. Wetlands in the Wayne have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Grassy areas and ponds associated with reclaimed stripmines are stable resources as well. Rolling bottomlands have low integrity, with dry-mesic mixed oak hardwood forest having low-moderate integrity.

Relevant Life History & Other Information:

Breeding takes place early in the year during the late winter or early spring. The female lays clusters of 500-1000 eggs in the water that attach to vegetation, and the gestation period is 14 days. After hatching, the tadpoles turn into frogs after 40 to 90 days.

Threats Relevant In or To the Plan Area:

Habitat - Climate change brings threats in the form of changes to the thermal landscape (higher summer temperatures) and increased droughts. However, western chorus frogs seem rather resilient to disturbances (Pfingsten et al. 2013).

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

This species is uncommon across southeast Ohio and the Wayne National Forest due to this area being on the edge of the species' range. Habitats are generally considered stable across the plan area and this species is resilient to disturbances. Therefore, long-term persistence is not a concern given the presence of habitat and resilience of the species. Because of this, this species is not recommended as a potential species of conservation concern.

Wood Frog (*Lithobates sylvaticus*)

Group: Amphibians

Conservation Categories: Ranked 22 as amphibian Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Broadly distributed in the state (>30 Ohio counties) (ODNR 2015). Most abundant in the unglaciated portions of southeast Ohio. Widespread in the Wayne, with numerous observations across all units.

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Trend in Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Wetlands and Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest and Large Stream Floodplain and Riparian Forest (Class C, D).

In Ohio, generally prefers cool and moist forests, but can also be found in bottomland swamps, riparian areas, and open herbaceous areas adjacent to forests (Pfingsten et al. 2013). Breeds primarily in vernal pools, but also marshes, bottomland swamps, temporary ponds, damp meadows, slow moving streams, seeps, and other bodies of standing water (Pfingsten et al. 2013). Winter is spent underground or under surface cover in upland forests (Pfingsten et al. 2013).

Habitat Trend in Plan Area:

Apparently stable. Current terrestrial ecosystems are of low integrity and have an overrepresentation of closed-canopied forests in the Wayne, which benefits the frog (see *Terrestrial Ecosystems Supplemental Report*). Wetlands in the Wayne have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Wood frogs emerge from dormancy on land and migrate up to several hundred meters to breeding pools, where they breed explosively in late winter or early spring. Eggs are laid and larvae develop usually in vernal pools and other small fish-free ponds, temporary or permanent, in wooded (usually) or open areas. Larvae eat algae, plant tissue, organic

debris, and minute organisms in water; capable of eating amphibian eggs and hatchlings. Metamorphosed frogs eat various small invertebrates, mostly terrestrial forms.

Threats Relevant In or To the Plan Area:

Habitat - Population-level threats include lack of or destruction of breeding habitat (e.g., vernal pools), and fragmentation between breeding habitat and terrestrial habitat.

Disease - As with all amphibians, Chytrid fungus is a concern (AmphibiaWeb 2020). However, extent of Chytrid in Ohio is unknown.

Rationale for SCC Determination:

Species is a generalist found in a broad variety of habitats. Global population secure. Statewide populations are decreasing, but southeast Ohio remains a stronghold. In the Wayne, forests are increasing, and multiple observations in numerous HUCs distributed across the Wayne suggest widespread and common occupation. Because of this, there is no concern for long-term persistence in the plan area.

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Fish

Records for fish observations were considered recent if from 2000 or later. Records prior to 2000 were considered historic, and records prior to 1970 may not be mentioned.

When considering fish distribution and abundance, there are a few notes pertaining to the ways fish are sampled and inventoried to keep in mind:

i. Recent, available data is limited for some species and sites within the 20 year reference period. Limited and older data is still useful, but introduces a level of uncertainty to the situation (e.g., how do we know a species still populates a stream in the present if the record is from 1985?).

ii. Fish sampling is not exhaustive. Not all species present in a stream are found during each sampling event. Therefore, if a fish species was found in a stream 25 years ago, but not 15 years ago, it does not necessarily mean that species is not still there; it could simply have been missed during that particular sampling event. If there were no significant changes to the stream since that period, and the most recent sampling event achieved the aquatic life use designations, it should be assumed that the species in question is, or could still, be present there.

iii. More exhaustive sampling is necessary to confirm presence or absence of a fish species, and one cannot rely on just one sampling event, or one season's worth of data, or one sampling method (e.g., seine net).

Streamline Chub (*Erimystax dissimilis*)

Group: Fish

Conservation Categories: Ranked #41 as fish Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio. Center of range is in or near Ohio. GIS data shows limited distribution near the plan area. There are 3 locations in one HUC in the Marietta Unit from 2014-2015 (Eightmile Creek-Little Muskingum River). There is only one historic Athens Unit location within 10 km of National Forest System lands from 1977, and no locations near the Ironton Unit. Ranked 30th most common of 44 native cyprinids. Has been found in 17 of 88 Ohio Counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable (ODNR 2015) or increasing (Rice and Zimmerman 2019) statewide. Unknown trend in the Wayne.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Larger Streams & Rivers (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Streamline chub are found in medium to large streams and rivers in the Ohio River basin of Ohio. They are highly intolerant of clayey silt and other pollutants making them a good indicator of high quality streams. They are found in areas of swift current, often above or below a riffle in 1-4 feet of water over a clean gravel bottom. They are often found in slightly smaller streams than the closely related gravel chub. Their diet consists of a variety of aquatic invertebrates, such as stonefly or mayfly larvae.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and many of the Little Muskingum River associated streams are of exceptional quality. See the *Aquatic Ecosystems & Watersheds Supplemental Report* for more specific location data.

Relevant Life History & Other Information:

Streamline chub likely spawn in spring or early summer, but little is known about their reproductive biology.

Threats Relevant In or To the Plan Area:

Sediment, hydromodification, nutrients, and sewage are all listed as potential threats to this watershed (Ohio University 2020). At least 19 horizontal oil and gas wells exist in the watershed. Eighteen accidental or deliberate spills have been recorded between 2002 and 2016 (OEPA Biological and Water Quality Study of the Little Muskingum River 2015-16)

Non-Native Invasive Species - Reduces native species diversity, displaces rare plant and wildlife species, replaces riparian communities with monoculture, and alters hydrological conditions (see *Wayne National Forest Assessment*). Non-native invasive species that threaten aquatic resources in the study area include: Ranavirus (Iridoviridae spp.), chytrid fungus (*Batrachochytrium dendrobatidis*), snake fungal disease (*Ophidiomyces ophiodiicola*), Asian carp (*Cyprinus carpio*), watermilfoil (*Myriophyllum* spp.), Japanese knotweed (*Polygonum cuspidatum*), reed canarygrass (*Phalaris arundinacea*), and common reed (*Phragmites australis*) (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species has an extensive overall range and stable to increasing populations statewide. However, it is somewhat rare and has a very limited distribution (one watershed) in the plan area, making it more vulnerable to local extirpation. Hydromodification, nutrients, and sewage are all listed as potential threats to the occupied watershed (Ohio University 2020). At least 19 horizontal oil and gas wells exist in the watershed, and 18 spills have been recorded between 2002 and 2016. Therefore, there is substantial concern for long-term persistence of this species in the planning area and it is recommended for consideration as a potential species of conservation concern.

[Western] Creek Chubsucker (*Erimyzon claviformis*[8])

Group: Fish

Conservation Categories: Ohio Species of Concern; Ranked #58 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

[8] NatureServe lists *Erimyzon claviformis* as the western creek chubsucker, with range in Ohio. The Ohio State Wildlife Action Plan (ODNR 2015) uses same scientific name, but calls it the creek chubsucker. The Ohio Department of Natural Resource's species website lists the creek chubsucker as *Erimyzon oblongus*, which NatureServe does not list at all, and the Ohio Department of Natural Resource's habitat description does not appear to fit the Wayne National Forest. Therefore, the word western was added the common name, and NatureServe habitat and species information was used, as was GIS location data for *Erimyzon claviformis*.

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). In the Wayne, it is found only in the Ironton Unit in the Headwaters Pine Creek HUC. Other sources list Pine Creek (2010) and Youngs Branch (2005) locations (Ohio State University Fish Division Online Geospatial Database obtained 2019). Historic locations were listed in Negro Creek, Paint Creek, and Kimble Creek in late 1990s (from Ohio EPA GIS database obtained in 2019 and Ohio State University data). According to Rice and Zimmerman (2019), Pine Creek is currently the only known population east of the Scioto River, and one of the very few found in unglaciated Ohio. Ranked 16th most common of 21 (relatively rare) native catostomids. Has been found in 38 of 88 counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Declining Statewide (Rice and Zimmerman 2019). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams.

Silt, sand, and gravel-bottomed pools of clear headwaters, creeks, and small rivers; often near vegetation. Occasionally in lakes. Spawning occurs in river mouths or pools, riffles, lake outlets, or upstream. Diet includes small invertebrates and algae (NatureServe 2020).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Ironton Unit has the second highest concentration of high-quality streams. All but one of the watersheds in the Ironton Unit with at least 6% National Forest System lands are functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Adults migrate upstream to spawn in spring. Often chooses areas that have been dug out by other species located at the heads of riffles in moderately swift waters for spawning. They do not construct nests, but may modify the nests of others species.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

According to the most recent data, the Ironton Unit's Pine Creek watershed hosts the only known population in the southeastern corner of Ohio. While habitat appears stable overall with a moderate-high integrity rating, the statewide population is declining, and its limited distribution make it more vulnerable to local extirpation. Therefore, there is substantial concern for long-term persistence of this species in the planning area and it is recommended for consideration as a potential species of conservation concern.

Black Redhorse (*Moxostoma duquesnei*)

Group: Fish

Conservation Categories: Ranked #48 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS data show it occurs in all three units of the Wayne. It is well-distributed in numerous HUCs in the Marietta Unit from 2000-2016. There are fewer observations in Athens and Ironton Units; Athens has 6 locations in 6 HUCs (two from 1990s, and four since 2000), and Ironton has 4 locations in 3 HUCs (two from 1980-1990s and two since 2000). There are additional locations just west of both the Athens and Ironton Units, but more than 10 km from National Forest System lands. Seventh most common of 21 native catostomids. Has been found in 76 of 88 Ohio counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing statewide (ODNR 2015). Populations increasing statewide (Rice and Zimmerman 2019). Unknown trend in the Wayne.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Larger Streams & Rivers.

This species inhabits swift-flowing portions of moderate- or large-sized streams with clear water. Preferred substrates include gravel, bedrock, or sand. The black redhorse is less tolerant of low gradients, turbidity, and siltation compared to the golden redhorse, and they are an indicator of good water quality. Young redhorses feed in schools near

emergent aquatic vegetation close to the edge of pools. Adult black redhorses usually feed in schools just above or below a riffle. Adults and young feed by filtering through the substrate for aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see the *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

The eggs are buried in a substrate of fine rubble, sand, and gravel in water between 6 and 24 inches deep. This usually occurs at the top or bottom end of a riffle.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that

increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species occurs in all three units and is widely distributed statewide and in the Marietta Unit. Populations are increasing statewide, and habitat trends appear stable with Moderate-High Integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Redside Dace (*Clinostomus elongatus*)

Group: Fish

Conservation Categories: Ranked #31 as fish Species of Greatest Conservation Need; Forest Service Regional Forest Sensitive Species for the Wayne National Forest; NatureServe rank G3G4.

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS observations show it is mainly associated with the

Marietta Unit, but also with the Athens Unit. It is well-distributed and somewhat common with many locations in nine HUCs in the Marietta Unit from 2000-2016, with even more observations from the 1990s. There was just one observation in Athens Unit in Brushy Fork HUC (2017). There were also an additional four watersheds west of the Athens Unit, but more than 10 km from National Forest System lands. No observations associated with the Ironton Unit. Ranked 28th most common of 44 native cyprinids. Has been found in 44 of 88 counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing (ODNR 2015) or stable (Rice and Zimmerman 2019) statewide. Stable statewide. Unknown trend in the Wayne.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Primary Headwater Streams.

This species uses deep pools in small streams with an abundance of woody debris. These streams typically have rather high gradients, very clear cool water, and are in primarily forested watersheds. This species is intolerant of turbidity and silt. They feed on flying insects and various aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams and the Athens Unit the lowest (See *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the tributaries to the Little Muskingum River (such as the Straight Fork) are of exceptional water quality.

Relevant Life History & Other Information:

Like many smaller minnows species, they usually spawn in the nest of larger minnows or suckers such as creek chub, striped shiners, common shiners, and common white suckers. These nests are found just above or just below fast riffles in coarse sand or fine gravel. They leave the eggs to be guarded by the larger species and provide no parental care. Often associated with clear cool waters (Rice and Zimmerman 2019). As a non-migratory species with populations isolated in small tributary streams, the ability to recolonize streams following extirpation due to extreme drought or other events is often limited (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species is well-distributed and somewhat common in the Marietta Unit and also present, although not common, in the Athens Unit. State population trends appear to be stable to increasing. The specific habitat requirements of this species (small, cool, clear streams) limits where it can be found and decreases its ability to reestablish itself if a problem occurs. However, their habitat integrity is considered moderate-high overall. Currently, there is not a substantial concern for long-term persistence of this species in the planning area and, thus, it is not recommended for consideration as a potential species of conservation concern.

Bigeye Chub (*Hybopsis amblops*)

Group: Fish

Conservation Categories: Ranked #42 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). GIS observations show it is mainly associated with the Marietta Unit and a few locations in the Athens and Ironton Units. Good distribution of multiple locations within 2 HUCs in the Marietta Unit from 2014-2015: Eightmile Creek-Little Muskingum River and Wingett Run-Little Muskingum River. Found just west of the Athens Unit in early 2000s in the Hocking River and some of its tributaries. One recent observation (2016) just north of Ironton Unit within 10 km of National Forest System lands in Claylick Run-Raccoon Creek HUC. Twenty-seventh most common of 44 native cyprinids. Has been found in 59 of 88 counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable (ODNR 2015) to increasing (Rice and Zimmerman 2019; personal communication, Ohio EPA, 2020) statewide. Unknown trend in the Wayne.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

The bigeye chub is highly intolerant of murky waters and silt covered bottoms. They require small- to medium-sized streams and rivers. Primarily a pool species, often found in schools in deeper waters at the base of riffles in moderate current (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams and the Ironton Unit the second highest (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Overall, the Little Muskingum River and many tributaries are highly appropriate.

Relevant Life History & Other Information:

Their intolerance to turbid waters, silted substrate, and other forms of pollution makes them a good indicator species of high quality streams. Little is known about spawning, but thought to be a broadcast spawner, scattering eggs over sand and gravel substrate.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are

stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species has occurrences in or near all three units of the Wayne, and both the state population and suitable habitat appear to be stable to increasing statewide. The species has an extensive overall range (including 67% of Ohio counties). Although they have an intolerance to poor water quality, the habitat trends in the plan area appear stable with moderate-high integrity. Currently, there is not a substantial concern for long-term persistence of this species in the planning area and, therefore is not recommended for consideration as a potential species of conservation concern.

Lake Chubsucker (*Erimyzon sucetta*)

Group: Fish

Conservation Categories: Ohio Threatened; Ranked #46 as fish Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. Primarily found north and west of the Wayne, but it is associated with Black Fork of Symmes Creek, including Jackson Lake, which is part of a slow-moving stream system with interconnected wetland complexes in the north end of the Ironton Unit. Wayne GIS data show distribution in three HUCs in the Ironton Unit since 2000 (mainly Black Fork, and a few observations in Headwaters of Symmes Creek and Camp Creek-Symmes Creek), plus additional observations from 1990s. There are no records for Athens or Marietta Units. Ranked 18th most common of 21 (meaning it is rare) native catostomids. Has been found in 25 of 88 counties in Ohio (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Decreasing statewide (ODNR 2015). Unknown trend in the Wayne.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Lakes, Ponds, and Reservoirs.

In Ohio they are primarily found in glacially-formed natural lakes often referred to as pothole or kettle lakes. They are still present in those natural lakes that still have very clear water and an abundance of aquatic vegetation. They will also use quiet pools of creek and small rivers with little or no flow that are clear and have bottoms of sand or silt mixed with organic debris (NatureServe 2020). They feed on various aquatic invertebrates along with some algae and small amounts of vegetation.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. However, the integrity of many smaller water bodies in the Wayne are unknown (see *Aquatic Ecosystems & Watersheds Supplemental Report*). When comparing units, the Ironton Unit has the second highest concentration of high-quality streams. The watersheds in the northern part of the Ironton Unit are functioning, but at risk.

Relevant Life History & Other Information:

Spawn in April by scattering their eggs over vegetation. The eggs fall on aquatic vegetation where they remain until hatching. No further parental care is given. By mid to late June, young shift to acting like adults and feeding off the bottom instead of out of the water column like they did for the first month or two of their lives.

Threats Relevant In or To the Plan Area:

Habitat - Dewatering of aquatic resources, such as constructed wetlands, can occur without dam maintenance. Dam integrity can be at risk from unchecked mammal burrowing and tree growth, both of which can compromise the integrity of the dam.

Rationale for SCC Determination:

The species is Threatened in Ohio and the statewide trend is declining. It is limited to three HUCs in the Ironton Unit; however, the Jackson County and the Black Fork of Symmes Creek (within the Wayne) areas seem to be one of its strongholds in the state (personal communication, Hoggarth, 2020). Habitat trends in the plan area appear stable with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the planning area at this time, and it is not recommended for consideration as a potential species of conservation concern at this time. However, the Wayne National Forest may serve a distinctive role or contribution to this species' conservation within the broader landscape; therefore, plan components may be included in the revised forest plan to maintain or protect it.

Bluebreast Darter (*Etheostoma camurum*)

Group: Fish

Conservation Categories: Ranked #25 as fish Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. GIS data show it is limited to the Marietta Unit of the Wayne, where it is found at five locations in the Little Muskingum River in the Eightmile Creek-Little Muskingum River HUC (2011-2015). There are also multiple locations in the Ohio River along the boundary of the Marietta Unit from 2012 and 2014. Ranked 14th most common of 26 native percids and has been found in 25 of 88 counties in Ohio (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing statewide (ODNR 2015). At one time they had become quite rare in Ohio. However, as a result of improved water quality, they have made an impressive comeback in much of their historical range in the state. Bluebreast darters are found in medium to large streams and rivers, only in the Ohio River drainage within Ohio. They can now be

found in every major tributary to the Scioto River from Columbus to the Ohio River. They have also made a similar expansion in the Muskingum River drainage.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams; Larger Streams & Rivers.

Typically occurs in warm, typically clear or slightly turbid, creeks and small to medium rivers with moderate gradient; adults generally are in moderately swift runs and riffles with substrate of coarse gravel, rubble, or boulders. This species is much less commonly found in areas of large slab rock and in shallow runs over gravel; it has low tolerance of silt. Eggs are laid in sand or fine gravel beside large rocks at heads of riffles, and in riffles. Eats mainly benthic insects, chiefly dipteran larvae.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and the watersheds in the Marietta Unit with more than 6% National Forest System land are functioning, but at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Spawns in June and July. They bury their eggs in gravel in fast flowing riffles. Males guard a small territory around the spawning site until the eggs hatch. After the eggs hatch, no further parental care is given.

Threats Relevant In or To the Plan Area:

Bluebreast darters are intolerant of pollution (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Sediment, hydromodification, nutrients, and sewage are all listed as potential threats to this watershed (Ohio University 2020). At least 19 horizontal oil and gas wells exist in the watershed. Eighteen accidental or deliberate spills have been recorded between 2002 and 2016 (OEPA 2016).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

While the species is limited to one HUC, which is subject to various threats, and the Ohio River in the Marietta Unit, it was documented in quite a few locations. There is an overall upward trend in population and habitat statewide, and the species has made an impressive comeback in much of their historical range in the state with improved water quality.

Therefore, there is not substantial concern for long-term persistence of this species in the planning area at this time.

Eastern Sand Darter (*Ammocrypta pellucida*)

Group: Fish

Conservation Categories: Ohio Species of Concern; Ranked #29 as fish Species of Greatest Conservation Need; U.S. Fish & Wildlife Species of Concern; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. The eastern sand darter is found in both the Lake Erie and Ohio River drainage in Ohio. GIS data show locations in and around all three units of the Wayne, but mainly in the Marietta and Ironton Units where it appears fairly common. There are three HUCs within the Marietta Unit: Eightmile Creek-Little Muskingum River and Wingett Run-Little Muskingum River both have multiple locations, and Straight Fork-Little Muskingum River has one location. There are also more locations in two more HUCs within 10 km of National Forest System lands just to the east, as well as one Ohio River location, all since 2000. There are also a few more historic records within the same HUCs. The Ironton Unit has five locations in four HUCs since 2000 (Black Fork, Camp Creek-Symmes Creek, Aarons Creek, and Johns Creek), and at least seven more locations in three other HUCs within 10 km of National Forest System lands to the east and Storms Creek to the south.

Ranked 16th most common of 26 native percids. Has been found in 38 of 88 counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable (ODNR 2015) to increasing (Rice and Zimmerman 2019; personal communication, Ohio EPA, 2020) statewide. Unknown trend in the Wayne.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Primary Headwater Streams; Larger Streams & Rivers.

Slow moving portions of streams and rivers where the bottom is composed of clean sand. They are very intolerant of silt or mud covering up the clean sand and often disappear

from an area or entire stream if this happens. They spend much of their time buried in the sand where they watch for passing food items and quickly dart out, grab the food, and then quickly burrow back into the sand. They eat midge fly larvae and other aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams and the Ironton Unit the second highest (see the *Aquatic Ecosystems & Watersheds Supplemental Report*). The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning, but at risk. All but one watershed in the Ironton Unit is functioning at risk as well.

Relevant Life History & Other Information:

Eastern sand darters spawn later than many darter species. Females full of eggs can sometime be found as late in the year as August. They typically spawn in June or early July, burying their eggs in sand. No further parental care is given.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in

the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species is located in various watersheds in the Ironton and Marietta units where it appears relatively common. Furthermore, populations are increasing statewide, and habitat trends appear stable with Moderate-High Integrity. Therefore, there is not substantial concern for long-term persistence of this species in the planning area at this time.

Ohio Lamprey (*Ichthyomyzon bdellium*)

Group: Fish

Conservation Categories: Ohio Endangered; Ranked #13 as fish Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G3G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio. The center of its range is in or near Ohio. It is found in the Ohio River and the lower portions of its tributary streams. This species is restricted in the Wayne to the Marietta Unit. GIS data shows multiple, well-distributed, recent observations in the Marietta Unit in four HUCS (mainly Eightmile Creek-Little Muskingum River and Wingett Run-Little Muskingum River) associated with the Little Muskingum River, and also a couple of Ohio River locations just beyond 10 km of National Forest System lands near the Marietta Unit. The discovery of a spawning population in the Little Muskingum River in Washington County in 1983 was the first verified spawning location for this species in Ohio waters. Ranked 6th of 6 (least common) of native lampreys, and found in 11 of 88 counties in Ohio (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). NatureServe (2020) suggested that while it is generally uncommon, additional sampling is likely to yield new occurrences. It is also noted that populations can fluctuate greatly. Overall total adult populations size is unknown and trends are relatively stable overall or slowly declining.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams; Larger Streams & Rivers.

All parasitic lampreys required three distinctly different habitats that are connected by free flowing (free of dams) stretches of streams. Spawning adults are found in clear brooks with fast flowing water and either sand or gravel bottoms. Juveniles, or ammocoetes, are found buried in soft substrate in slow moving water of medium to large streams. During this phase, they eat organic particles strained from bottom sediments and the water, as well as microscopic organisms. After several years, the ammocoetes transform into parasitic adults in spring. Adults migrate into the Ohio River and parasitize other fish. The following spring, they migrate into tributary streams, spawn, and then die shortly after. They continue to be a common find only in the Little Muskingum River system in Ohio (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Varies based on life stage. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and all the watersheds in the Marietta Unit with more than 6% National Forest System land are functioning, but at risk (see *Aquatic Ecosystems & Watersheds*

Supplemental Report). Many Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Ohio lampreys spawn in late May or early June in shallow pits that are excavated near the upper ends of gravel riffles. These pits are created communally by several individuals constructing one pit. After hatching, the ammocoetes (larval stage of lampreys) drift downstream to larger, slower moving streams, and burrow into the sediment. Adults die post spawn.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The overall range for the species covers the eastern United States. This species is listed Endangered in Ohio due to its restricted range in the state, but the statewide trend is apparently stable. In Ohio, it is only considered common in the Little Muskingum River system, but it appears fairly well-distributed with recent occurrences through the heart of the Marietta Unit of the Wayne. This limited distribution in Ohio may make it more vulnerable to local extirpation if there were a catastrophic event, such as a sudden pollution or siltation input, but overall habitat is considered to have moderate to high integrity. At this time, there is no specific threat identified or other concern beyond its limited distribution in Ohio that presents a substantial concern about the species' capability to persist in the plan area. Therefore, this species cannot be recommended for consideration as a potential species of conservation concern at this time. However, there may be a distinctive role or contribution of the plan area with regard to the species, since the only known spawning locations in Ohio occur in the Wayne.

Silver Lamprey (*Ichthyomyzon unicuspis*)

Group: Fish

Conservation Categories: Ranked #26 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. They can still be found in both Lake Erie and the Ohio River, and spawning runs are made up tributaries; however, they are much less numerous than in the past. There were scant and scattered GIS observations from the 1980s-1990s within 10 km of National Forest System lands, mainly in the Ironton Unit, including: one in Wards Run-Little Scioto River to west (1983), two in Ohio River just west (1989 & 1994), and one in Ohio River to the southeast (two observations, 1992 & 1994). There was also one in Middle Fork Salt Creek near Creola in the Athens Unit (1988). For Marietta, there was only 1 location from 2006, which was 10.5 km from the Marietta Unit in the Muskingum River downstream of the Devola Dam. However, it is important to note that according to Rice and Zimmerman (2019), silver lamprey have been observed spawning in the Little Muskingum River and other smaller Ohio River tributaries in May, which is before the Ohio EPA sampling index period begins. Thus, it can be assumed that the direct Ohio River tributaries could possibly be critical spawning habitat for this species, but this has not been confirmed (personal communication, Kelly Capuzzi, 2020). Rice and Zimmerman (2019) reported that the Little Muskingum may be one of the few known, current spawning locations in southern Ohio. This species is ranked 3rd most common of 6 native lampreys, and has been found in 27 of 88 counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams; Larger Streams & Rivers.

All parasitic lampreys required three distinctly different habitats that are connected by free flowing (free of dams) stretches of streams. Spawning adults are found in clear brooks with fast flowing water and either sand or gravel bottoms. Juveniles, or ammocoetes, are found buried in soft substrate in slow moving water of medium to large streams. During this phase, they eat organic particles strained from bottom sediments and the water, as well as microscopic organisms. After several years, the ammocoetes transform into parasitic adults in spring. Adults migrate into the Ohio River and parasitize other fish. The following spring, they migrate into tributary streams, spawn, and then die shortly after (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Varies based on life stage. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and all the watersheds in the Marietta Unit with more than 6% National Forest System land are functioning, but at risk (see *Aquatic Ecosystems & Watersheds*

Supplemental Report). Many Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Silver Lamprey are typically found in large rivers during the Ohio EPA's summer sampling period of June 15 to October; thus, they would be less easily surveyed and recorded than other fish species.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the

groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. The silver lamprey is still found in both Lake Erie and the Ohio River with a stable statewide population trend. The direct Ohio River tributaries are probably spawning habitat for this species in Ohio, including the Little Muskingum River, which runs through the heart of the Marietta Unit. Experts noted this species is difficult to document using normal Ohio EPA protocols, and suggest it is likely more common than GIS databases show. It appears that silver lampreys may have a higher abundance, wider distribution, and stable population trends, but some assumptions are being made about where they do and do not occur and spawn. There does not appear to be a substantial concern for long-term persistence of this species in the planning area at this time, but more information may be warranted.

Least Brook Lamprey (*Lampetra aepyptera*)

Group: Fish

Conservation Categories: Ranked #35 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). The least brook lamprey is native to the Ohio River drainage. Recent GIS observations in all three units of the Wayne, but especially the Ironton and

Athens Units. Found commonly in the Ironton Unit in the Symmes Creek watersheds with at least 18 locations in seven HUCs. There are even more locations in three Pine Creek HUCs from the 1980s and 1990s. Found commonly in the Athens Unit in the Sunday Creek watersheds, with at least 12 locations in four HUCs. There are also quite a few more locations within 10 km of the periphery of the unit, both recent and from the 1980s and 1990s. Fewer records exist on the Marietta Unit, with only two locations in two Little Muskingum River HUCs. Noted separately from the GIS query, Nate Schlater of Rural Action reported that it is also found commonly throughout the Athens Unit, including within the Monday and Sunday Creek Watersheds, and also throughout the Ironton Unit. Fewer records exist in the Marietta Unit, but this species has been recorded in the Little Muskingum River watershed as well (personal communication, Nate Schlater, 2020; personal communication, Jeff Calhoun, 2020). Ranked 1st (most common) of 6 native lampreys, and has been found in 41 of 88 counties in Ohio (Rice and Zimmerman 2019). Experts note that this species, while common, is sometimes difficult to document through traditional electroshocking techniques and, therefore, may not show up in surveys even though it is present.

Population Trend Statewide and in the Plan Area:

Stable to increasing statewide (ODNR 2015; Rice and Zimmerman 2019). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams; Larger Streams & Rivers.

This species is non-parasitic, so they do not attach themselves to larger species of fish. All non-parasitic lampreys require two distinctly different habitats that are connected by free flowing (free of dams) stretches of streams. Adults are found in clear brooks with fast flowing water and either sand or gravel bottoms. Juveniles or ammocoetes are found buried in soft substrate in slow moving water of medium to large streams. They feed on organic matter and microscopic organisms.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the streams in the Athens Unit suffer from acid mine drainage, but numerous records have shown that this species lives in streams that are recovering from acid mine drainage impairment (personal communication, Jeff Calhoun, 2020). As of 2018, there were 752 acid mine seepage sites throughout the Wayne National Forest. Monitoring has shown that recent projects across Raccoon Creek, Monday Creek, and Sunday Creek have reduced daily acid loading, allowing 92% of monitored stream miles to meet its 6.5 pH target between 2005 and 2016. Monitoring has

shown that aquatic organism populations have improved in all of these streams (Bowman et. al. 2019; see also *Wayne National Forest Assessment*).

Relevant Life History & Other Information:

The least brook lampreys spawn in March and April in shallow pits that are excavated near the upper ends of gravel riffles. These pits are created communally. A single female can deposit as many as 1,100 eggs. After hatching, the ammocoetes burrow into the sediment. After at least three years, the ammocoetes transform into non-parasitic adults in the late summer or fall. Adults remain in the smaller streams and do not feed. The following spring, they spawn and then die shortly after. Many of the spawning sites are located in intermittent streams with riffles that go dry before late summer (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments.

Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This common lamprey has an increasing statewide trend, wide and common distribution across the plan area, and stable habitats with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Silver Redhorse (*Moxostoma anisurum*)

Group: Fish

Conservation Categories: Ranked #52 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Very well distributed in Ohio. GIS data show fairly good distribution in the Wayne with recent and older locations in all three units, with most in Marietta Unit. Since 2000, it is well-distributed in the Little Muskingum River in four HUCs, with additional locations in two HUCs from the 1980s and 1990s. It has more

limited observations in the Athens Unit with four locations in four HUCs in the Hocking River and Sunday Creek watersheds, and additional 1980s and 1990s records in the Dorr Run-Hocking River HUC. Also within 10 km of National Forest System lands, there are additional locations in a Hocking River HUC to the west and two more to the southeast. In the Ironton Unit, there are two locations in two HUCs each in Symmes Creek and Pine Creek watersheds, as well as multiple locations from the 1980s, 1990s, and 2000s around the periphery of the unit, some within 10 km of National Forest System lands. Ranked 5th most common of 21 native catostomids, and has been found in 78 of 88 counties in Ohio (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing statewide (ODNR 2015). Trend in the Wayne unknown. It was noted by experts that monitoring by the Ohio EPA is cyclic, so locations may only be sampled once in a while, and the number of times a species has been recorded across years may have nothing to do with trend and everything to do with frequency of monitoring.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers.

Silver redhorse are found in medium to large rivers throughout the state. They are intolerant of pollution or very turbid (murky) waters, and are an indicator of good water quality. This species is typically found in deep, slow pools, and is often found over a sand substrate. It feeds on larval insects, snails, small mollusks, and other aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Aquatic monitoring in Storms Creek showed higher than average silt and sediment—most likely from impervious surfaces—and channel alteration from impoundments.

Relevant Life History & Other Information:

Silver redhorse spawn in April and May. They spawn at night at the top and bottom ends of shallow riffles. They bury their eggs in fine gravel with their tails. No further parental care is given.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species is common, found in all units of the Wayne, has a stable statewide population, and has stable habitats with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Smallmouth Redhorse (*Moxostoma breviceps*)

Group: Fish

Conservation Categories: Ranked #63 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS data shows occurrences across the Wayne in all three units, but mainly in the Marietta Unit. Since 2000, it is well-distributed in eight locations in two HUCs in the lower half of the Little Muskingum River, plus one location in another HUC to the north. GIS data does not show any locations within the Athens Unit, but there were two recent ones within 10 km to the southeast of National Forest System lands in Hocking River watersheds, and also at least one other 1990s location. There were also not any locations within the Ironton Unit in GIS data from the 2000s (only one observation in 1990 at the southern end of Howard Run), but there were eight recent locations around the periphery of the unit within 10 km, as well as multiple older locations along the Ohio River south of the unit. Nate Schlater reported that it was also found in the Ironton Unit in Symmes Creek (2016) and the mouth of Pine Creek (1990) (Ohio EPA monitoring data). Ranked 6th most common of 21 native catostomids. Only found in Ohio River drainage. Has been found in 44 of 88 Ohio Counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing statewide (ODNR 2015). This species is only found in the Ohio River drainage; therefore, the statewide trend is representative of the trend in the plan area (Rice and Zimmerman 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers.

They prefer relatively shallow water and swift currents. They are found in areas with a clean sand or gravel substrate free of clay or silt. Smallmouth redhorse are intolerant of pollution and turbid (murky) water and are an indicator of good water quality. They feed on larval insects, snails, small mollusks, and other aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and the Ironton Unit the second highest. The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning, but at risk, while all but one of the Ironton Unit watersheds are functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

They spawn at night at the top and bottom ends of shallow riffles. They bury their eggs in fine gravel with their tails. No further parental care is given.

Threats Relevant In or To the Plan Area:

Intolerant of highly turbid waters, silted substrates, and other pollutants. Dams can impair movement of this species (Rice and Zimmerman 2019).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species is relatively common and has been shown to be widely distributed in the larger streams in the Muskingum River system and found in the lower sections of many of the smaller Ohio River tributary streams all along the Ohio border. Populations statewide are increasing and habitats appear stable with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the planning area at this time.

Variegate Darter (*Etheostoma variatum*)

Group: Fish

Conservation Categories: Ranked #53 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). In Ohio the variegate darter is only found in the Ohio River basin and is well-distributed in most of the major river systems in that drainage. For the Wayne, it is fairly well-distributed in the lower Little Muskingum River watershed in the Marietta Unit, where GIS data shows eight locations in three HUCs (Eightmile Creek-Little Muskingum River, Wingett Run-Little Muskingum River, and Archers Fork), and one Ohio River location near National Forest System lands. For the Athens Unit, there was one recent and one older location within 10 km of National Forest Systems lands west of Creola in East Fork Queer Creek. There are 3 recent locations within 10 km of the Ironton Unit in two western HUCs, and Nate Schlater noted that Ohio EPA monitoring data shows it was also found in 2010 in a Pine Creek location near Franklin Furnace (within 10 km). Ranked 12th most common of 26 native percids and has been found in 37 of 99 counties in Ohio (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable (ODNR 2015) to increasing statewide (Rice and Zimmerman 2019). Unknown trend in the Wayne.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers.

Found in medium to large streams and rivers in areas with swift flowing riffles with gravel, cobble, or boulders on the stream bottom. Here they feed on insect larvae, crustaceans, and other aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and the Ironton Unit the second highest. The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning at risk, while all but one of the Ironton Unit watersheds are functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Spawn in spring from mid-April to mid-May. They lay their eggs in riffles, burying them in sand or gravel. They provide no further parental care for the eggs or young.

Threats Relevant In or To the Plan Area:

Inhabits swift riffles with silt-free gravel and cobbles. Generally absent from streams where the substrates have become embedded by silt and other pollutants (Rice and Zimmerman 2019).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-

scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

In Ohio, this species is only found within the Ohio River basin, where it is well-distributed with multiple locations documented within and near the plan area in all units. This species will be absent from streams where the substrates have become embedded by silt and other pollutants, but there is a stable to increasing statewide population trend and stable habitats with moderate-high integrity in the plan area. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Southern Redbelly Dace (*Phoxinus* [*Chrosomus*] *erythrogaster*)

Group: Fish

Conservation Categories: Ranked #53 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Extremely well-distributed in 2/3 of Ohio (2011-2015) (Ohio State University 2020). This species is well distributed in all three units of the Wayne, including very abundant populations in the Little Muskingum River watershed in the Marietta Unit (Rice and Zimmerman 2019; data from Ohio EPA Total Maximum Daily Load Program). GIS data also shows two locations in Sunday Creek HUCs in Athens Unit since 2000 (Dotson Creek and East Branch) plus one within 10 km in Middle Fork-Salt Creek and one location from the 1990s to the west in East Branch Queer Creek. In the Ironton Unit, it was also found within the Symmes Creek watershed and in Elkins Creek, Caulley Creek, Brushy Creek, Miller Creek, and others in the Ironton Unit. GIS data also shows four additional locations from the 1990s for the Ironton Unit in Kimble Creek, Negro Creek, Pigeon Creek-Symmes Creek, and Sand Fork.

Population Trend Statewide and in the Plan Area:

Stable (Rice and Zimmerman 2019) to increasing (ODNR 2015) statewide. Trend in the Wayne unknown.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Primary Headwater Streams.

Prefers permanent small headwater streams of clear unpolluted water in well-shaded forest areas. Many of these streams are less than 5 ft. wide and have moderate to high gradients with well-developed pools and riffles. They are found in pools with some flow and an abundance of hiding places, such as undercut banks, down trees, and logs in the stream. This species relies heavily on the presence of these habitat features to sustain a large population in a given stream. They feed in groups along the bottom on detritus (decaying organic matter) and some aquatic invertebrates.

This species is a coldwater/groundwater indicator species, and Ohio EPA found numerous populations in the Little Muskingum River and Symmes Creek watersheds, typically in streams with a drainage area less than 10 square miles (OEPA monitoring data and personal communication with OEPA staff).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*). The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning at risk, while all but one of the Ironton Unit watersheds are functioning at risk. Of the twelve watersheds with more than 6% National Forest System land in the Athens Unit, only two are functioning at risk; the rest have impaired function.

Relevant Life History & Other Information:

Spawns in large groups in late April or early May. Like many smaller minnows species, they usually spawn in the nest of larger minnows or suckers such as creek chub, striped shiners, common shiners, and common white suckers. These nests are found just above or just below fast riffles in coarse sand or fine gravel. They leave the eggs to be guarded by the larger species and provide no parental care.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species is common and found in all three units of the Wayne. It has a stable statewide population, and stable habitats with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Dusky Darter (*Percina sciera*)

Group: Fish

Conservation Categories: Ranked #58 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. They are found throughout much of the Ohio River drainage, including the Muskingum, Scioto, Walhonding, Hocking, and Raccoon Creek systems. GIS data shows observations for all three units of the Wayne from 2004 to 2016, with good distribution in Athens and Ironton Units in multiple HUCs (Ohio State University 2020). It is also known in the Little Muskingum River (2016) in Marietta and in Symmes Creek (2005) in Ironton (Ohio State University 2020). It was also found in Monday Creek (2001) in the Athens Unit (Ohio EPA GIS database obtained in 2019). In the Ironton Unit, Ohio EPA monitoring data shows that this species was found in Pine Creek in 2010 and data from the 1990s showed locations in the Howard Run-Pine Creek HUC. According to Rice and Zimmerman (2019), two of the best sites to find this species in the state include the Hocking River in Athens County (Athens Unit) and Raccoon Creek in Gallia, Jackson, and Vinton Counties (Ironton Unit). Ranked 15th most common of 26 native percids and has been found in 24 of 88 Ohio counties.

Population Trend Statewide and in the Plan Area:

Increasing statewide. One of several darter species that have greatly expanded their range in Ohio since the mid-1980s. This coincides with better treatment of wastewater resulting in improved water quality. Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers.

Found in medium to large streams and rivers in areas with moderate to swift current near submerged brush, roots, or other woody debris typically in 2-4 feet of water. They feed on insect larvae, crustaceans, and other aquatic invertebrates.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*). The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning at risk, while all but one of the Ironton Unit watersheds are functioning at risk. Of the twelve watersheds with more than 6% National Forest System land in the Athens Unit, only two are functioning at risk; the rest have impaired function.

Relevant Life History & Other Information:

Spawns in spring. They bury their eggs in coarse sand or gravel in riffles and no further parental care is given.

Threats Relevant In or To the Plan Area:

Acid mine drainage is a threat in the plan area, but it does not appear to be significantly impacting this species' habitat, and Pine Creek achieves Ohio EPA warmwater habitat aquatic life use through RM 41. More monitoring is necessary to determine the impacts of addressing the acid mine drainage pollution.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen

content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species is common and found in all three units of the Wayne. It has an increasing statewide population, and stable habitats with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area at this time.

Rosyside Dace (*Clinostomus funduloides*)

Group: Fish

Conservation Categories: Ranked # 39 as fish Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Broad range (multiple states), but is limited in Ohio to four counties in the southern portion, which represents the northern edge of the global range. The Ohio population represents the only known occurrences on the north side of the Ohio River. This species is restricted to small headwater streams that were once part of the ancient Teays River System in southern Ohio. Found in the headwaters of the Little Scioto River within 10 km of the Wayne National Forest, Ironton Unit (only a small portion of the Wayne is within the Little Scioto River watershed.) This species has been found in the McDowell Creek-Little Scioto HUC-12, directly north of the Fredrick Creek HUC-12 sub-watershed to the Little Scioto, a watershed with some Wayne National Forest ownership. Ohio EPA monitoring near the mouth of Frederick Creek (RM 1.4) would likely not have identified rosyside dace since they are usually found in much smaller headwater streams and often occur in drainage areas less than one square mile, which is typically not sampled by Ohio EPA for surveys (personal communication, Ohio EPA and Kelly Capuzzi, 2020). Therefore, it may be under-represented in survey data. Ranked 35th most common of 44 native cyprinids (not particularly common), and has been found in 4 of 88 Ohio counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide (Rice and Zimmerman 2019). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams.

Headwater streams with forested riparian buffers that have clear water and pools with clean rocky substrate consisting of gravels, cobbles, boulders, and bedrock. This species will occupy the deepest pools available. They may be found in smaller numbers in deeper waters of riffles and runs where pools are not available. Streams with permanent flow and well developed pools have the largest populations. (Rice and Zimmerman 2019)

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Ironton Unit has the second highest concentration of high-quality streams. All but one of the watersheds in the Ironton Unit with more than 6% National Forest System land are functioning at-risk. Scattered sections of streams throughout the Ironton Unit lack

adequate riparian vegetation, but many sections of streams have adequate vegetation (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Spawns in groups often using the nests of other species (typically creek chubs and white suckers) which are found above or below riffles in gravel and coarse sand. Eggs are left to be guarded unknowingly by the other species (Rice and Zimmerman 2019)

Threats Relevant In or To the Plan Area:

Their survival depends on pool habitats deep enough to survive periods of low flow and periodic droughts. Activities that eliminate these pools will generally result in extirpation of this species (Rice and Zimmerman 2019).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic

ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species is found in the headwaters of the Little Scioto River within 10 km of the Wayne National Forest's Ironton Unit. However, since Ohio EPA monitoring would likely not have identified rosyside dace—as they are usually found in much smaller headwater streams than what they routinely survey—there is a data gap. It is possible that headwater streams in or coming from the Wayne could have undocumented populations of this species, but more information is needed to understand the distribution and population trends of this species in the plan area. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area at this time.

Paddlefish (*Polyodon spathula*)

Group: Fish

Conservation Categories: Ohio Threatened; Ranked #9 as fish Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. In the Ohio River, this species is most frequently found between Portsmouth and the Indiana state line, but small numbers are also found between Portsmouth and the Pennsylvania line. They have been found with increasing frequency in the Scioto River as far upstream as the dam in Columbus (Rice and Zimmerman 2019). Found in Raccoon Creek, and likely accesses other mid to large size Ohio River tributaries. Has been found in 14 of 88 Ohio Counties (Rice and Zimmerman 2019). There is also at least one record in lower end of Little Muskingum River (personal communication, Brian Zimmerman, 2020).

Population Trend Statewide and in the Plan Area:

Stable statewide (Rice and Zimmerman 2019). Unknown trend in the Wayne.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Larger Streams & Rivers.

Two habitat types are important to this species. (1) spawning - silt-free gravel bars and riffles inundated during periods of high water in spring and early summer, but dry during low flow periods and (2) not spawning - sluggish pools, side channels, oxbows, bayous and other lentic habitats with profuse growths of plankton. A filter feeder (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Apparently stable. Moderate-High Integrity. There may be available habitat within the mouth of Symmes Creek, Little Muskingum River, and the few areas of Wayne National Forest adjacent to the Ohio River within the Marietta Unit.

Relevant Life History & Other Information:

Fish congregate on submerged gravel bares to spawn. Fertilized eggs are adhesive and stick to rocky substrate. They only spawn when all conditions are right. Temperature (55 to 60 degrees F), water flow rising, and photoperiod all must align. This does not happen every year, and populations can sometimes go 4-5 years between spawning events. Females do not spawn until they are 7-10 years old, and then only once every 2-3 years thereafter (Rice and Zimmerman 2019). Recently this species was found near the mouth of Raccoon Creek, and it is possible that it is using other tributaries that flow through National Forest System lands to spawn when conditions are right. More data may be necessary to determine if this species uses streams in National Forest System lands.

Threats Relevant In or To the Plan Area:

Blocking this species from its spawning grounds is a threat to its ability to survive. Pollution, overharvesting, and destruction of backwater habitat all played a role in the initial decline of this species in Ohio and potentially pose threats today (Rice and Zimmerman 2019).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients.

There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

It is possible that this species utilizes streams within or that flow through the Wayne, but sufficient monitoring of these sites has likely not been conducted and represents a data gap. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area at this time.

Bowfin (*Amia calva*)

Group: Fish

Conservation Categories: NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Has been found in 39 of 88 counties in Ohio. This species is relatively common in Lake Erie's vegetated shallows, and in tributaries and glacial lakes of the upper Muskingum River system outside of the plan area. In the Symmes and Pine Creek watersheds of the Ironton Unit, lakes, wetlands, and beaver impoundments support good numbers of this species. They do not apparently exist within the other units of the Wayne where fish monitoring has occurred (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide (Rice and Zimmerman 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Wetlands: Palustrine; Lakes, Ponds, and Reservoirs.

Lentic habitats associated with rivers and backwaters. Clear waters with dense beds of aquatic vegetation. If vegetation is lacking there are often other forms of cover such as woody debris (Rice and Zimmerman 2019)

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some water bodies. All but one of the watersheds in the Ironton Unit with more than 6% National Forest System land are functioning at-risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Overall in the Wayne, wetlands have moderate-high integrity. However, many smaller water bodies are of unknown integrity.

Relevant Life History & Other Information:

Spawns in circular depressions in dense weeds or under stumps, logs, or other forms of cover. Male guards the eggs and young for about a month. Males will defend young against all threats (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Loss of wetlands and sedimentation. Monitoring efforts have only found this species in the Ironton Unit of Wayne National Forest (Rice and Zimmerman 2019).

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects,

while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

Although distribution in the Wayne is limited to the Ironton Unit, and the species has a somewhat limited state-wide distribution, it appears to be common and stable where it is found, and habitats are considered stable with moderate to high integrity. Therefore, there is no substantial concern for long-term persistence of this species in the plan area at this time.

Longnose Dace (*Rhinichthys cataractae*)

Group: Fish

Conservation Categories: Ohio Species of Concern; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states) which includes Ohio. A single individual was collected in the Little Muskingum River for the first time in 2014 (mouth of Eightmile Creek). This may suggest that there is expansion taking place in eastern Ohio River tributaries. Ranked

36th of 44 (relatively uncommon) native cyprinids. Has been found in 12 out of 88 Ohio Counties (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Increasing in Ohio River Drainage. A single individual was collected in the Little Muskingum River for the first time in 2014. This may suggest that there is expansion taking place in eastern Ohio River tributaries (Rice and Zimmerman 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams and Rivers.

High gradient streams with boulder, gravel, and bedrock substrate. Often found in the swiftest parts of the riffles and runs with lots of boulders (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable or potentially increasing. Moderate-High Integrity. The Little Muskingum River and associated tributaries are of high quality.

Relevant Life History & Other Information:

Spawning occurs in spring over gravel substrate in fast currents. Fertilized eggs are adhesive and settle between, or stick to, stones on the stream bottom. Unlike many species of dace, longnose dace sometimes create and defend a shallow depression where spawning occurs. They do not spawn in nests built by other species (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This species has been identified within the plan area, and its distribution is believed to be expanding (Rice and Zimmerman 2019). Based on this expansion, it is likely that this species will inhabit other waters in the Wayne National Forest in the future. However, more information is needed to understand the distribution and population trends of this species in the plan area. Therefore, there is insufficient information to determine whether or not there is substantial concern for long-term persistence of this species in the plan area at this time.

River Chub (*Nocomis micropogon*)

Group: Fish

Conservation Categories: NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Broad range (multiple states and Canada) which includes Ohio. Twenty-first most common of 44 native cyprinids. Has been found in 62 of 88 Ohio counties. Found in the Pine Creek watershed in the Ironton Unit, and in the Little Muskingum and direct Ohio River tributaries in the Marietta Unit (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide (Rice and Zimmerman 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams and Rivers.

Medium to large streams with moderate to high gradient and rocky substrates. Intolerant to high turbidity and silted stream beds. Generally associated with swift current and flowing pools (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, and the Ironton Unit the second highest. The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning at risk, while all but one of the Ironton Unit watersheds are functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Males carry small stones in their mouths to build gravel mounds near boulders just above or below a riffle. Eggs are buried in these mounds as the males add more stones. Many other species of fish use these nest piles for spawning where the male River Chub protects all of the eggs. Insectivore (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients.

There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

The species is well-distributed in 70% of counties in Ohio, and located in various watersheds in the Ironton and Marietta Units. Populations are stable statewide, and habitat trends appear stable with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Steelcolor Shiner (*Cyprinella whipplei*)

Group: Fish

Conservation Categories: NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Broad range (multiple states and Canada) which includes Ohio. Twenty-fourth most common of 44 native cyprinids. Has been found in 21 of 88 Ohio counties. Found in the Little Muskingum River (most upstream population documented in Ohio River drainage) (personal communication, Brian Zimmerman, 2020) in the Marietta Unit, and in the Pine Creek and Symmes Creek watersheds in the Ironton Unit (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable (Rice and Zimmerman 2019).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams and Rivers.

Found in moderately-sized streams in a variety of habitats including pools, runs, and backwaters with moderate to low gradient. Often found in areas with moderate current (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Marietta Unit

has the highest concentration of high-quality streams, and the Ironton Unit the second highest. The watersheds in the Marietta Unit with more than 6% National Forest System land are functioning at risk, while all but one of the Ironton Unit watersheds are functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many of the Little Muskingum River associated streams are of exceptional quality.

Relevant Life History & Other Information:

Males establish spawning territories. These territories typically include a crevice under a rock, or under bark on a submerged log. Small groups of fish typically gather at the spawning sites. Males protect their territories from rival males. The eggs are adhesive and stick to the interior surfaces of the crevices where mating and egg laying takes place. Spawning starts in May and continues throughout much of the summer (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects,

while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

While this species has a somewhat limited distribution in Ohio and in the plan area (3 watersheds), populations are stable statewide, and habitat trends appear stable with moderate-high integrity. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Brown Bullhead (*Ameiurus nebulosus*)

Group: Fish

Conservation Categories: NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Broad range (multiple states and Canada) which includes Ohio. Has been found in 87 of 88 counties in Ohio. Ranked 5th most common of 12 native ictalurids. In the Wayne, they have been found in the Hocking River watershed in the Athens Unit and Pine and Symmes Creeks in the Ironton Unit (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Declining statewide. Brown bullheads have declined in recent years across Ohio. They have been recorded half as often in the latter half of the past 30 years as they were in the beginning half (Rice and Zimmerman 2019).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Wetlands: Palustrine; Ponds, lakes, deeper pools, and other lentic habitats associated larger streams.

Clear waters with aquatic vegetation and sand, gravel, and organic substrate (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Appropriate habitat appears stable overall, but with localized water quality issues in some places. When comparing units, the Ironton Unit has the highest concentration of high-quality streams, and the Athens Unit the lowest. Many of the watersheds in the Athens Unit with at least 6% National Forest System lands have impaired function, while all but one of the Ironton Unit watersheds are functioning at risk (see Aquatic Ecosystems & Watersheds Supplemental Report).

Relevant Life History & Other Information:

Brown Bullheads make depressions in sand, gravel, or mud, or under logs, rocks, or roots. They also commonly use hollow logs, muskrat burrows, undercut banks, or other natural cavities. Parents guard and brood the eggs (fanning and stirring them until they hatch). Young form tight "feeding balls" and are guarded by the adults (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such

impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

This is a broadly distributed species in the state and considered relatively common. They have limited distribution in National Forest System lands, and are declining statewide (Rice and Zimmerman 2019), but they were not identified as a state species of conservation concern and have a NatureServe ranking of G5 (Secure). With these apparent contradictions, more information is needed to understand the status and distribution of this species in the plan area. Therefore, there is insufficient information to

determine whether or not there is substantial concern for long-term persistence of this species in the plan area at this time.

Muskellunge (*Esox masquinongy*)

Group: Fish

Conservation Categories: Ohio Species of Concern; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states and Canada) which includes Ohio. Has been found in 37 of 88 Ohio counties. In the Wayne, found in the Marietta Unit in the Little Muskingum River (Rice and Zimmerman 2019).

Population Trend Statewide and in the Plan Area:

Stable statewide. Most Ohio muskellunge populations are maintained by stocking, and many of the stream catches of this species are thought to be escaped stocked fish, but there are a few naturally reproducing populations in southern Ohio, including the population in the Little Muskingum River watershed in National Forest System lands (Rice and Zimmerman 2019).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers; Lakes, Ponds, and Reservoirs.

Lakes and rivers with clear waters and beds of aquatic vegetation, stumps, and other woody debris. Ohio streams with native populations have relatively clear water, low gradients, long and deep pools with spatterdock, and undercut banks and submerged logs or other woody structure. These streams can be quite small relative to the size of this species (Rice and Zimmerman 2019).

Habitat Trend in Plan Area:

Probably stable overall. Moderate-High Integrity; Moderate-High Integrity. The Little Muskingum River system has several tributaries of exceptional quality, and the watershed overall is functioning at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Eggs are broadcast over vegetation in shallow wetlands and flooded lowlands. The slightly adhesive eggs stick to plants or bottom substrates. Mortality of hatchlings is very high (Rice and Zimmerman 2019).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see *Wayne National Forest Assessment*).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

Land Cover Changes - Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-

scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Rationale for SCC Determination:

Although this is a game species, most populations in lakes and reservoirs are stocked and there are only a few naturally reproducing populations, one is in the Little Muskingum River within the plan area. However, there is nothing to indicate a downward trend or particular threats to the species; therefore, there is not a substantial concern for long-term persistence of this species in the planning area at this time.

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Aquatic Invertebrates

Little Spectaclecase (*Leaunio lienosus aquilonius*[9] [*Villosa lienosa*[10]])

Group: Bivalves/Mollusks

Conservation Categories: Ohio Endangered; Ranked #7 as aquatic invertebrate Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

[9] G.T. Watters 2018

[10] Conrad 1834

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is rare (<5 counties) (ODNR 2015). The little spectaclecase is uncommon and on the northern edge of its range in Ohio (ODNR 2015). GIS data for the Wayne show this species was detected in the 1980s in Black Fork, Pine Creek, Symmes Creek, and Buffalo Creek in the Ironton Unit. Since 2000, it has only been detected in Symmes Creek.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). This is a wide ranging species that is stable in most areas, except at the edges of its range. It is thought to be declining in the plan area. Hoggarth et al. (2007) said this species had been reported from the upper reaches of Symmes Creek previously and was collected alive during their study, but in much fewer numbers than had previously been reported. They noted that the mussel community in the lower mainstem of Symmes Creek has remained healthy, while the communities in the headwaters of Symmes Creek and its smaller tributaries have become severely reduced.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams.

In Ohio, inhabits headwater and small inland streams, usually along the banks in slower currents.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Primary headwater streams appear stable, but with some localized water quality issues in some places. When comparing units, the Ironton Unit has the second highest concentration of high-quality streams. The watersheds in the northern Ironton Unit are functioning, but at risk (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Long-term brooder, not migratory. Larvae generally are parasitic on fish and there may be a specificity of fish species. Keller and Ruessler (1997) list four species of fish as hosts: brown bullhead, channel catfish, bluegill, and largemouth bass. Presumably adults feed on fine particulate organic matter, primarily detritus, zooplankton, or phytoplankton.

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater

streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The "lakes" behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation

of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

This species is rare and at the edge of its range. It is state endangered and known to be declining in Ohio. Hoggarth (a mussel expert) noted that the mussel community in the lower mainstem of Symmes Creek has remained healthy while the communities in the headwaters of Symmes Creek and its smaller tributaries have become severely reduced, although the reasons why may not be entirely known (personal communication, Hoggarth, 2020). Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Creek Heelsplitter (*Lasmigona compressa*)

Group: Bivalves/Mollusks

Conservation Categories: Ohio Species of Concern; Ranked #23 as aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Found sporadically throughout the entire Ohio River drainage and Raccoon Creek (Hoggarth et al. 2007), although not abundant at any site (Hoggarth 1999). Usually distributed in the headwaters of streams in Ohio. However, in the Little Muskingum River, it was found in the mainstem only. GIS data show it was historically in all three units of the Wayne. Since the 2000s, it was only found in the Athens Unit in the Hocking River (one observation in Dorr Run-Hocking River HUC in

2000, and two within 10 km of National Forest System lands at one location in Coates Run in 2014 and 2016). Looking back further into the 1980s, it was found in seven locations in three Little Muskingum River HUCs in the Marietta Unit, and two locations in Symmes Creek in the Ironton Unit, with two more within 10 km of National Forest System lands.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). It is thought to be declining in the plan area due to an absence of records in historic locations since the 1980s. Hoggarth commented that the creek heelsplitter is a headwaters species, many of which are in decline. He believes it is probably because water quality has declined in a way that directly affects mussels (personal communication, Hoggarth, 2020).

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Primary Headwater Streams.

A high-water-quality species, the creek heelsplitter is found in clean creeks in sand and cobble, in a current or in slackwater (Watters et al. 2009).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Headwater streams appear stable, but with some localized water quality issues in some places. When comparing units, the Marietta Unit has the highest concentration of high-quality streams, the Ironton Unit the second highest, and the Athens Unit the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Microscopic larval stage of this freshwater mussel survives on a wide variety of hosts. Non-migratory.

Threats Relevant In or To the Plan Area:

Habitat - Declines in headwater water quality may be resulting in associated mussel species. Hoggarth commented that there is simply not enough water in a headwater stream to effectively dilute pollutants entering the stream; even if the overall pollution input is smaller, it is still larger in comparison to mid-sized and larger streams. There is also a sediment component, both in terms of delivery of pollutants to mussels attached to sediment, and the sediment itself covering mussels or clogging their gills. Ohio EPA has shown that large rivers in Ohio are meeting their designated uses (over 80% compliance with designated uses), but watersheds are lagging behind. It may be different events in each headwater stream or a combination of events, but these impacts eventually eliminate mussels (personal communication, Hoggarth, 2020).

Rationale for SCC Determination:

This state Species of Concern is declining in Ohio. Although uncommon overall, the species used to be found sporadically in all three units of the Wayne, but recent records are from fewer and more scattered locations. Hoggarth believes it may be one of several headwaters species in decline in the plan area, and cites various reasons tied to a decline in water quality in headwater habitats to which mussels are specifically vulnerable. Therefore, there is substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Salamander Mussel (*Simpsonaias ambigua*)

Group: Bivalves/Mollusks

Conservation Categories: Ohio Species of Concern; Ranked #25 as aquatic invertebrate Species of Greatest Conservation Need; U.S. Fish & Wildlife Species of Concern; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G3; The U.S. Fish & Wildlife Service is currently conducting Species Status Assessment on this species to help determine if listing under the Endangered Species Act is warranted.

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. It is considered rare but widespread in Ohio, and is known from the Grand, St. Joseph, Big Darby Creek, Little Miami, Ohio Brush Creek, lower Little Scioto Rivers, and from Salt Creek and Symmes Creek (Hoggarth et al. 2007). In the Wayne, it was only found in the lower reaches of the mainstem of the Little Muskingum River. This species was found from sites 26 through 32. It was not found in 1987; however, it was probably overlooked then rather than having expanded its distribution into the river (Hoggarth 1999). While Hoggarth noted that this species should remain listed as a species of concern in Ohio, it is very likely that it is much more abundant than indicated by mussel surveys. For example, it is found in unusual habitat given that its host is the mudpuppy, so it might not be found because biologists are not looking in the right place (under large boulders or stationary logs [stumps]). Also, it is relatively small and consequently might be overlooked or even identified as the juvenile of some other species. It was not well-represented in spatial databases, with only one location within 10 km of National Forest Systems lands in the Marietta Unit from 2015 (New Years Creek-Duck Creek), and one location in the Ironton Unit from 1987 in the Little Scioto River within 10 km of National Forest System land.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Unknown trend in the plan area, although Hoggarth believes its host species, the mudpuppy, is more-or-less stable. Hoggarth noted that he typically saw quite a few mudpuppies present in the lower sections of the Little Muskingum River, but has not visited recently (personal communication, Hoggarth, 2020).

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Primary Headwater Streams; Larger Streams, and Rivers.

In the Wayne, this species is found in locations where its host, the mudpuppy, is found. These habitats include under flat boulders and submerged logs. In the Little Muskingum River, the salamander mussel was found under flat boulders in mud and sand.

Habitat Trend in Plan Area:

Apparently stable habitat trend. Moderate-High Integrity; Moderate-High Integrity. The Marietta Unit has the highest concentration of high quality streams in the Wayne, with the Ironton Unit the second highest. Distribution of large, flat rocks within streams are extremely patchy throughout all of southeast Ohio (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Microscopic larval stage of this freshwater mussel presumably survives on mudpuppy. Non-migratory.

Threats Relevant In or To the Plan Area:

In some places where it is still abundant (like the Grand River and Conneaut Creek), lampricide treatment kills mudpuppies, and therefore probably impacts the mussel as well.

Habitat - Declines in headwater water quality may be resulting in associated mussel species. Hoggarth commented that there is simply not enough water in a headwater stream to effectively dilute pollutants entering the stream; even if the overall pollution input is smaller, it is still larger in comparison to mid-sized and larger streams. There is also a sediment component, both in terms of delivery of pollutants to mussels attached to sediment, and the sediment itself covering mussels or clogging their gills. Ohio EPA has shown that large rivers in Ohio are meeting their designated uses (over 80% compliance with designated uses), but watersheds are lagging behind. It may be different events in each headwater stream or a combination of events, but these impacts eventually eliminate mussels (personal communication, Hoggarth, 2020).

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen

content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The “lakes” behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

This mussel is rare and in decline in Ohio. In the plan area, it has limited distribution and is restricted to the lower reaches of the mainstem of the Little Muskingum River, although Hoggarth noted that it is likely more common in the plan area than survey data would suggest. It uses one specific host, the mudpuppy, to complete its life cycle. Mudpuppies are listed as a Species of Greatest Conservation Concern in Ohio, and their populations are also believed to be declining (ODNR 2015). However, Hoggarth suggested the mudpuppy may be secure in the Wayne. That being said, local abundance, distribution, and population trends in the plan area are unclear for both the salamander mussel and its host, the mudpuppy. Therefore, there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long term at this time.

Threeridge (*Amblema plicata*)

Group: Bivalves/Mollusks

Conservation Categories: Ranked #40 as aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). This species is considered common and widespread throughout much of the United States and Canada, and is considered stable, or in some cases expanding, throughout its range (NatureServe 2019). Wayne observations in Symmes Creek (Hoggarth et al. 2007; Ohio EPA Macroinvertebrate GIS Database 2016). It is considered rare in the Little Muskingum River, and is mostly distributed in the downstream reaches (Hoggarth 1999). Spatial data indicates recent locations in the Marietta and Ironton Units, and one older location near the Athens Unit. The Marietta Unit has three locations in the upper reaches of the Little Muskingum River in the Wolfpen Run HUC in 2000 and 2015, and one location in 2006 in the Muskingum River downstream of Devola Dam, which is 10.5 km west of National Forest System lands. The Ironton Unit has one location from 2016 in the northeast part of the unit, in Symmes Creek in the Camp Creek HUC. There was one older location from 1990 within 10 km of the Athens Unit to the southeast in the Hocking River in the Piper Run HUC.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). It is decreasing in some parts of the state, but it is increasing in others. Hoggarth said there is no evidence that it is decreasing in the Wayne (personal communication, Hoggarth, 2020). The species is rare in the Little Muskingum River, but appears to have a stable population. In fact, more individuals were collected in 1999 than in 1987, but his may be due to the extremely low flow levels in 1999 compared to 1987 (Hoggarth 1999).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams and Rivers.

It is a species of large to medium sized rivers, and prefers sand and gravel habitat with fairly swift currents. It has been found to survive impoundment conditions in big rivers, but is fairly sensitive to impoundment conditions in smaller streams. It is found in a variety of substrates, including clay, mud, sand, sand mixed with gravel, and gravel, but is most common on bottoms composed of sand and gravel in one to three feet of water.

Habitat Trend in Plan Area:

Apparently stable habitat trend. Moderate-High Integrity; Moderate-High Integrity. The Ironton Unit has the second highest concentration of high quality streams of the Wayne's three units (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Microscopic larval stage of this freshwater mussel survives on a wide variety of hosts. Non-migratory.

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The “lakes” behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

Species uses a wide variety of hosts. Habitat appears stable overall with moderate-high integrity. Hoggarth said that he has no evidence that this species is declining in the Wayne. This species is not identified as a potential species of conservation concern because it is believed to be secure in the plan area, but it may have a distinctive role or contribution within the broader landscape, so plan components may be included in the revised plan to maintain or protect it, as recommended by Hoggarth. Future monitoring may be necessary to ensure that the Wayne populations do not follow the state trend.

Round Hickorynut (*Obovaria subrotunda*)

Group: Bivalves/Mollusks

Conservation Categories: U.S. Fish & Wildlife Service Species of Concern; Ranked #42 as aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4; The U.S. Fish & Wildlife Service is currently conducting Species Status Assessments on this species to help determine if listing under the Endangered Species Act is warranted.

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. Wayne observations in Symmes Creek (Hoggarth et al. 2007), including from 2012 (from Ohio Division of Wildlife GIS Databases). Found in low numbers throughout most of the lower reaches of the Little Muskingum River. It was most abundant at site 21 in sand and gravel substrate in shallow run habitats (Hoggarth 1999). The master GIS file for candidate species of conservation concern does not have any records for this species.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown. This is another species that seems to do well in some reaches of streams, and not so well in others, but it is not clear why. It may be experiencing the same kind of habitat degradation and water quality issues as headwaters species (personal communication, Hoggarth, 2020).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

In Ohio, this species is associated with a variety of flow regimes, including riffles and runs in Big Darby Creek system and slow-moving water in sandy mud in Shade River and Salt Creek. Hoggarth would classify it as a mid-sized stream species (similar to *A. plicata*), but higher upstream than other mid-sized stream species (like *Q. quadrula* and *C. pustulosa*).

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity; Moderate-High Integrity. The Marietta Unit has the highest concentration of high quality streams of the Wayne's three units, and the Ironton Unit has the second highest (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

The host species for the microscopic larval stage of this freshwater mussel is unknown. Non-migratory.

Threats Relevant In or To the Plan Area:

This is another species that seems to do well in some reaches of stream and not so well in others, and it is not clear why. It may be experiencing the same kind of habitat degradation and water quality issues as headwaters species (personal communication, Hoggarth, 2020).

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The “lakes” behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

It is currently a state Species of Concern and found in low numbers, but habitat trends are stable with apparent moderate-high integrity. Hoggarth commented that this is another species that seems to do well in some reaches of streams and not so well in others, and it is not clear why. It may be experiencing the same kind of habitat degradation and water quality issues as headwaters species. However, it is unclear at this time what the population trend is for the Wayne. Therefore, there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long term at this time.

Black Sandshell (*Ligumia recta*)

Group: Bivalves/Mollusks

Conservation Categories: Ohio Threatened; Ranked #42 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Wayne observations in Symmes Creek (Hoggarth et al. 2007; Ohio Division of Wildlife GIS Databases), including from 2012. Wayne GIS data show locations on all 3 units. For the Marietta Unit, there were two Ohio River locations, the Mill Creek HUC (2016), and the Cow Creek HUC (2008). There was a historic location (1930) from Eightmile Creek-Little Muskingum River HUC; however, it is not now found in the Little Muskingum River (Hoggarth 1999). The Athens Units had one location in the Dorr Run-Hocking River HUC (2000) and one in the Upper Moxahala Creek (2016), which is just north of the unit.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Species was listed as threatened in the state and recovered. There are numerous populations of this species in the large rivers in the state and in the Ohio River (personal communication, Hoggarth, 2020).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers.

It is typically found in medium-sized to large rivers in locations with strong current and substrates of coarse sand and gravel with cobbles in water depths from several inches to six feet or more. It can be found in sand, gravel, or silt.

Habitat Trend in Plan Area:

Apparently stable. Moderate-High Integrity. The Marietta Unit has the highest concentration of high quality streams of the Wayne's three units, the Ironton Unit has the second highest, and the Athens Unit has the lowest (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

This species uses a wide variety of hosts. Non-migratory.

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the

base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The "lakes" behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments.

Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

Species uses a wide variety of hosts. It is found in all three units of the Wayne, and is considered stable in Ohio. Hoggarth stated that while it was listed as threatened in the state, it has recovered. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Threehorn Wartyback (*Obliquaria reflexa*)

Group: Bivalves/Mollusks

Conservation Categories: Ohio Threatened; Ranked #54 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). It is abundant in the lower reaches of the state's largest rivers (i.e., Muskingum River and Maumee River), but is not often a dominant member of the mussel community in medium to small rivers. Only two specimens of the threehorn wartyback were collected during Hoggarth's Little Muskingum River study. It was not collected in 1987 and was not collected as a living specimen in 1999. Hoggarth reports that this species does better in large rivers, and if it has a population in the Little Muskingum River, it is very small and has a very limited distribution. Spatial data shows locations on the periphery of all three units of the Wayne. For the Marietta Unit, there were nine Ohio River locations, eight of which were in the Cow Creek HUC from 2008-2015 and one in the Mill Creek HUC in 2016. There was also one location 10.5 km west of the plan area in the Muskingum River downstream of Devola Dam, as well as four older records from the Devol Run HUC (1960s-1990s) within 10 km. The Athens Unit had two locations within 10 km of National Forest System lands: one to the north in the

Upper Moxahala Creek HUC (2016) and one to the south in Willow Creek-Hocking River HUC (2012). The Ironton Unit also had one locations within 10 km to the southeast in the Ohio River in the Grays Branch HUC.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Species was listed as threatened in the state and recovered. There are numerous populations of this species in the large rivers in the state and in the Ohio River (personal communication, Hoggarth, 2020).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers.

Found in large rivers where there is moderately strong current and a stable substrate composed of gravel, sand, and mud. Although found at depths of up to 20 feet, it seems to do well at a depth of no more than four to six feet often in shallow, sand- and mud-bottom river embayments with little or no current. It also occurs in many reservoirs.

Habitat Trend in Plan Area:

Apparently stable as a whole. Moderate-High Integrity. Low occurrence in the Athens Unit, which has the lowest concentration of high quality streams when compared with the other two units. The northern section of the Athens Unit (near Moxahala Creek) has been historically degraded by past mining. The Marietta Unit has the highest concentration of high quality streams of the Wayne's three units (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Known hosts include goldeye, silverjaw minnow, common shiner, and longnose dace. Non-migratory.

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The "lakes" behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

This species uses a wide variety of hosts and is found in all three units of the Wayne. It is considered stable in Ohio. Hoggarth stated that while it was listed as threatened in the state, it has recovered. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Round Pigtoe (*Pleurobema sintoxia*)

Group: Bivalves/Mollusks

Conservation Categories: Ohio Species of Concern; Ranked #50 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). The Wayne has few locations in spatial databases, with recent ones in both the Marietta and Athens Units, and only one historic one in the Ironton Unit. The Marietta Unit has two locations from 2000, one each in Wingett Run-Little Muskingum River and Straight Fork-Little Muskingum River HUCs, as well as one from 2013 in the Ohio River (Cow Creek HUC). For the Athens Unit, there is one location from 2000 in Dorr Run-Hocking River HUC and historic observations from Hocking River (one in Dorr Run and one in Coates Run within 10 km to southeast) and one in East Branch Sunday Creek, all from the 1980s. There is only one location from within 10 km of the Ironton Unit to the northwest. Hoggarth (1999) reported it was intermittently collected in the mainstem of the Little Muskingum River, but it was not found in the tributary streams.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). It is decreasing in some parts of the state, but it is increasing in others. Hoggarth said there is no evidence that it is decreasing in the Wayne, similar to the threeridge (*A. plicata*) (personal communication, Hoggarth, 2020). This

species appears stable in the state and may have been overlooked in the 1987 survey (Hoggarth 1999).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers.

Found in medium to large rivers in mixed mud, sand, and gravel at depths of less than three feet to more than 20 feet.

Habitat Trend in Plan Area:

Apparently stable as a whole. Moderate-High Integrity. Larger wadeable to boatable streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Low availability in the Athens Unit, which has the lowest concentration of high quality streams when compared with the other two units. Higher availability in the Marietta Unit, which has the highest concentration of high quality streams of the Wayne's three units.

Relevant Life History & Other Information:

Uses variety of hosts. Primary food sources for adults are bacteria, algae, particles of organic detritus, and some protozoans. Non-migratory.

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The "lakes" behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

This species uses a wide variety of hosts, and habitat appears stable overall with moderate-high integrity. Hoggarth said that he has no evidence that this species is declining in the Wayne. This species is not identified as a potential species of conservation concern because it is believed to be secure in the plan area, but it may have a distinctive role or contribution within the broader landscape, so plan components may be included in the revised plan to maintain or protect it, as recommended by Hoggarth.

Cylindrical Papershell (*Anodontoides ferussacianus*)

Group: Bivalves/Mollusks

Conservation Categories: Ranked #56 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). The Wayne's GIS database only shows two locations for this species: the Marietta Unit from 1996 in Archer's Fork HUC and the Ironton Unit from 1999 in Caulley Creek in the Buffalo Creek HUC. There are, however, more recent locations in the literature. The species is known in Symmes Creek in the Ironton Unit (Hoggarth et al. 2007), and Ohio EPA Macroinvertebrate GIS Data shows it in Archers Fork near Little Muskingum River (2015) in the Marietta Unit. The cylindrical papershell was also found in the Cranenest Fork, the Clear Fork, and intermittently from sites 7 through 28 on the mainstem of the Little Muskingum River in the Marietta Unit (Hoggarth 1999). There are no documented locations for the Athens Unit in any of the sources.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams.

Found in shallow water near shore in silt. It is thought to inhabit small streams or side channels of larger streams, in slackwater mud or sand. It is tolerant of impoundment.

Habitat Trend in Plan Area:

Apparently stable as a whole. Moderate-High Integrity. Medium availability in the Ironton Unit, which has the second highest concentration of high quality streams when compared with the other two units. Higher availability in the Marietta Unit, which has the highest concentration of high quality streams of the Wayne's three units (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Uses variety of hosts. Non-migratory. Hoggarth said this is a headwaters species that does well where there is excessive sedimentation (especially silt and clay), but maybe not where there is also excessive nutrient loading or other pollutants. It is a species that should be monitored to separate sedimentation impacts from water chemistry impacts (personal communication, Hoggarth, 2020).

Threats Relevant In or To the Plan Area:

Watershed Degradation - Increased impervious surface and forest fragmentation can decrease the amount of water retained and transpired by vegetation cover, consequently facilitating surface runoff and resulting in impaired water quality (low dissolved oxygen content, sedimentation, and moderate concentration of nutrients), while also increasing turbidity and total suspended solids (see *Wayne National Forest Assessment*). Changing land surface and hydrology can alter infiltration and groundwater flow rates that drive the rate and transport of contaminants, which alters the groundwater input to headwater streams and coldwater habitat. Relatively small changes in forest cover and associated woody debris can alter food webs in small streams. Red maple (*Acer rubrum*) generates two- to three-times more water and precipitation-derived nutrients directed towards the base, driving up nutrient input into water bodies. Broad-scale shifts to more mesophytic species could adversely affect aquatic ecosystems far beyond the point of impact (see *Wayne National Forest Assessment*).

Roads & Trails - Runoff from roads and trails contributes to both sedimentation and chemical pollution of waterways via transport of contaminants, fertilizers, and nutrients. There is a combined total of 6,784.42 miles of roads and utility corridors (326 miles of National Forest System roads), and 1,185.63 total miles of trails (336 miles of National Forest System trails) across the 17-county study area (see *Wayne National Forest Assessment*).

Impoundments - Dams concentrate mussels immediately downstream of the dam and serve as a barrier for the movement of fish, and therefore mussels. The “lakes” behind dams are not that problematic for mussels, with a fairly good diversity and large number of mussels being able to survive and thrive in these impoundments. The species of host identified in the *Relevant Life History* section are also quite adaptable to the impoundments behind dams, and so should be able to help sustain a population of the species, if there. Hoggarth believes factors other than damming of primary headwater streams are causing the loss of headwaters species in Ohio (personal communication, Hoggarth, 2020).

Mining & Energy Development - The increase in oil and gas development (especially high-volume hydraulic fracturing) is expected to continue to be a potential source of impacts to water resources, either through increased risk of surface or groundwater contamination, or through increased water withdrawals. Water withdrawal operations with poor controls on timing could deplete minimum flows or shorten duration of inundation periods for aquatic ecosystem functions reliant on water (see Wayne National Forest Assessment).

Legacy effects from historic mining land use, such as acid mine drainage, can negatively impact populations in impaired streams. However, management actions that mitigate such impairments (e.g., limestone dosers) have proven effective in the plan area. These management actions require ongoing maintenance and upkeep.

Non-Native Invasive Species - Reduce native species diversity, displace rare plant and wildlife species, replace riparian communities with monoculture, cause disease, and alter hydrological conditions (see *Wayne National Forest Assessment*).

Climate-Related Stressors - Monitoring indicates an increase in the length of the growing season within the study area. The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy rain events. Heavier spring precipitation and longer autumn drought patterns linked to a changing climate are stressors for fish by compounding other stressors, such as increased runoff, proliferation of non-native invasive species, and effects of acid mine drainage. There is potential that increases in heavy rain events could exacerbate acid mine drainage and legacy effects, while hindering the effectiveness of existing treatments and human-made impoundments. Warmer water temperatures can lead to increased primary productivity in aquatic ecosystems, which lowers dissolved oxygen availability for sensitive organisms (see *Wayne National Forest Assessment*).

A recent doctoral dissertation at Ohio University (Thrush 2018) suggests that drought years do not further impair macroinvertebrate communities; however, macroinvertebrate diversity and abundance are enhanced in wet years (as identified by the Palmer drought index). Overall, macroinvertebrates exhibited substantial resilience during hydrological extremes; however, the extent to which these findings can be generalized is not yet clear (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Rationale for SCC Determination:

This species uses a wide variety of hosts, and its habitat appears stable overall with moderate-high integrity. Stable population trend in Ohio, although the specific trend in the plan area is unknown. It appears to have relatively good distribution, especially in the Marietta Unit. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Devil Crayfish (*Cambarus diogenes*)

Group: Crustaceans

Conservation Categories: Ranked #3 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is rare (<5 counties) (ODNR 2015). This species is part of a complex of species that used to be considered one species. Primarily only found in Wabash River drainage. Not known from the plan area or within 10 km.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

Lives as primary burrower in burrows constructed in timbered and formerly timbered areas along streams and ditches.

Habitat Trend in Plan Area:

Apparently stable as a whole. Moderate-High Integrity; Moderate-High Integrity. Medium availability of good quality streams in the Ironton Unit, which has the second highest concentration of high quality streams when compared with the other two units (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Herbivore.

Threats Relevant In or To the Plan Area:

Not applicable.

Rationale for SCC Determination:

Thoma stated that *Cambarus diogenes*, devil crayfish, does not exist in the Wayne National Forest. All previously records have been determined to actually be *Lacunicambarus* [*Cambarus*] *thomai*, the little brown mudbug, which is already in consideration for species of conservation concern (personal communication, Thoma, 2020). Therefore, this species cannot be considered as a potential species of conservation concern.

Sanborn's Crayfish (*Faxonius* [*Orconectes*] *sanbornii*)

Group: Crustaceans

Conservation Categories: Ranked #6 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Center of range is in or near Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Extremely common in all three units of the Wayne from 2000-2017.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown. Observed to be declining in areas of heavy sedimentation (personal communication, Thoma, 2020).

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

Requires unembedded rock or rubble (personal communication, Thoma, 2020), underneath undercut banks in small, medium, and large sized streams and pools.

Habitat Trend in Plan Area:

Apparently stable as a whole. Moderate-High Integrity; Moderate-High Integrity.

Relevant Life History & Other Information:

Apparently not tolerant to heavy sedimentation and will suffer population reductions, but it is not typically extirpated in most cases (personal communication, Thoma, 2020).

Threats Relevant In or To the Plan Area:

In Ohio and West Virginia, *Orconectes rusticus* is causing rapid declines and displacement of Sandborn's Crayfish through competition, although this phenomenon does not lead to complete extirpation of the latter (personal communication, Thoma, 2020).

Rationale for SCC Determination:

This species is common in all three units of the Wayne, where there is no apparent indication of a downward trend for the species. It is, however, unclear how often heavy

sedimentation and competition with *O. rusticus* may be at issue in the plan area. Therefore, there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long term at this time.

Big Water Crayfish (*Cambarus robustus*[11])

Group: Crustaceans

Conservation Categories: Ranked #7 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

One population highly restricted (Lawrence and Gallia counties), the other widely distributed in the upper Ohio River basin in Ohio, West Virginia, and Pennsylvania (personal communication, Thoma, 2020). Using *Cambarus robustus* species name to search in GIS databases, it occurs in all three units of the Wayne. It appears to be quite common across the Marietta Unit in multiple locations, mainly associated with the Little Muskingum River, in nine HUCs from the 2000-2010s, as Thoma stated. But there are also four locations in four HUCs in the Athens Unit, plus five more locations in four more HUCs within 10 km of National Forest System lands nearby. For the Ironton Unit, whose populations may be a separate species, there are five locations in four HUCs: Wolf Run in Camp Creek-Symmes Creek HUC (2016), Miller Creek in Buffalo Creek HUC (2016), Brushy Buckeye Creek in Johns Creek HUC (2016), and two locations within Storms Creek in the Storms Creek HUC (both 2010).

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). The Lawrence-Gallia population is under stress and likely declining in number within its respective streams. The Little Muskingum River population is healthy, but mainstem communities are under stress from excess sediment loads (personal communication, Thoma, 2020).

Habitat:

[11] Note: This species name actually encompasses two undescribed species; one from Gallia and Lawrence Counties in Swan Creek and Dirty Fork, and the other from the Little Muskingum River (personal communication, Thoma, 2020).

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

Fairly general in habitat requirements, from small headwater streams only 1 m wide to rivers greater than 14 m in width under slab rock and cobble in pools, mid-stream in flowing water, and along stream margins. Both populations are confined to areas with larger flat rocks (1 foot by 1 foot) that are not embedded by sand and silt (personal communication, Thoma, 2020).

Habitat Trend in Plan Area:

Declining. Moderate-High Integrity; Moderate-High Integrity. Suitable habitat declining due to excess sedimentation (personal communication, Thoma, 2020).

Relevant Life History & Other Information:

This species might actually be a complex consisting of two yet-to-be-described species. If this is the case, then each species—once described—should be evaluated separately (personal communication, Thoma, 2020).

Threats Relevant In or To the Plan Area:

This species is intolerant of pollution, especially enrichment, sediment, and metals. The greatest threat in the Wayne is sedimentation. Brine from wells can be deadly, depending on its constituents (personal communication, Thoma, 2020).

Rationale for SCC Determination:

There is insufficient scientific information available at this time. The species expert in the state has explained that there is not actually a Big Water Crayfish (*Cambarus robustus*) species in Ohio, but rather a complex comprised of two undescribed species. Without clear separation of species with locations and distribution documented in the literature, it is not possible to consider this species or any undescribed species for potential species of conservation concern listing at this time.

Little Brown Mudbug (*Lacunicambarus* [*Cambarus*] *thomai*)

Group: Crustaceans

Conservation Categories: Ranked #9 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Observations in 11 HUCS in the Wayne; Athens (5) and Ironton (6) Units from 2001-2017, with one observation per HUC, plus three more HUCs from the 1990s in the Athens Unit.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Larger Streams & Rivers; Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest.

Little brown mudbugs are common throughout the Ohio River floodplain, reaching their highest densities in mature bottomland forests. This species burrows in wet areas near swamps with or poorly drained areas.

Habitat Trend in Plan Area:

Stable to increasing. Moderate-High Integrity; Low Integrity. Stable, and may be increasing as streams become choked with sediments (personal communication, Thoma, 2020). The rolling bottomland mixed hardwood forests in the Wayne have low integrity, but the embedded wetlands have moderate-high integrity (see *Terrestrial Ecosystems Supplemental Report* and *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Burrows are usually moderately complex.

Threats Relevant In or To the Plan Area:

There are no apparent serious threats to the widely distributed population of this species; species of similar habits seem very tolerant of humans.

Rationale for SCC Determination:

Common in all three units of the Wayne, where there is no indication of a downward trend for the species or its habitat. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Spiney Stream Crayfish (*Faxonius* [*Orconectes*] *cristavarius*)

Group: Crustaceans

Conservation Categories: Ranked #11 as Ohio aquatic invertebrate aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is rare (<5 counties) (ODNR 2015). Only known from the Ironton Unit (other labeled observations in Wayne's database were based on misidentifications; personal communication, Thoma, 2020). Relatively common in the Ironton Unit, with most GIS observations in the headwaters of Pine Creek HUC (2000-2017).

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams.

Inhabits creeks and small to medium-sized rivers with cobble and gravel substrates, and uses large pieces of gravel and cobble as shelter.

Habitat Trend in Plan Area:

Stable. Moderate-High Integrity. Primary headwater streams and wadeable streams both have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Feeds on detritus and animal matter.

Threats Relevant In or To the Plan Area:

This is an abundant species, but it is known to be impacted by sediment loads.

Rationale for SCC Determination:

While it was thought to commonly occur across the plan area in all three units, Thoma stated that this species is only found in the Ironton Unit where it is impacted by excess sediment loads. It is unclear from the information provided whether this is a common or abundant species, or what its population trend may be in the plan area. Given that it was misidentified over a number of years and confused with another species, the overall status of the species is unclear. Therefore, there is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long term at this time.

Coalfields Crayfish (*Cambarus theepiensis*[12])

Group: Crustaceans

Conservation Categories: None; Not ranked by NatureServe

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in southern Ohio, where it is rare (only 3 counties). It is abundant in the rest of an overall limited range in Kentucky and West Virginia, and also slightly into Virginia (NatureServe 2020). Southern Ohio is the natural northern periphery of this species' range. The species shows two geographically isolated population centers in Ohio; one in the vicinity of the Ironton Unit in Lawrence (with seven occurrences), Jackson (with one occurrence), and Scioto (with one occurrence) Counties (the "eastern population center"), and one to the west of the Wayne in the Shawnee State Forest area in Scioto County with multiple occurrences (the "western population center"). GIS data for the Wayne show the species occurs in the Ironton Unit in the Pigeon Creek-Symmes Creek and Storms Creek (part of Ice Creek) watersheds in Lawrence County, with other historic locations within the unit (personal communication, Thoma, 2020). The single eastern population center records in Jackson and Scioto Counties are outside of the plan area. The two areas of occupation in Ohio display differing habitat conditions with the eastern population center locations (Wayne area) being in lower gradient streams with more agricultural influences, and the western population center location (Shawnee area) being in higher gradient streams with more forest cover. This has created a dichotomy of conditions in the two areas, resulting in much healthier and more abundant populations of *C. theepiensis* in the western population center where the level of sedimentation and silt input to suitable habitat is lower (personal communication, Thoma, 2020).

Population Trend Statewide and in the Plan Area:

Species not discussed in the State Wildlife Action Plan (ODNR 2015). Stable or declining in Ohio (personal communication, Thoma, 2020). The western population center is thriving. However, the eastern population center shows signs of decline. There are nine records of the species in the eastern population center: one from Scioto County, one from Jackson County, and seven from Lawrence County; these are the ones associated with National Forest System lands. Five of the Lawrence County records are historic. From surveys in 2017, one was demonstrated to still exist (Storms Creek), one no longer exists

[12] Loughman et al. 2013 (see NatureServe 2020)

(Kimble Creek), and three have not yet been re-examined. The Storms Creek population does not appear to have greatly declined, because the site is higher quality riffle habitat that has proven to be resilient to silt and sediment buildup. Thoma noted that the effort to recover nine individuals (the same number as historically collected) in 2017 was considerable and took more time than he normally spend at a site. However, Thoma did find four new records in the general area of the Ironton Unit in 2017. One of the new sites ("Ice Creek") in Storms Creek watershed had the most individuals of any site in Lawrence County, and is located within approximately 700 feet of National Forest System land. After comparing historic data and his progression of data points over the years, he concluded: "Though the data points are low in number, they do show a decline in the abundance of *C. theepiensis* in the Ironton section of Wayne National Forest" (personal communication, Thoma, 2020). Although the population may be declining according to Thoma, new locations were discovered in 2017, and until additional surveys can be completed, a population trend is difficult to determine.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers.

Medium sized streams with rock or rubble riffles having low sediment levels (personal communication, Thoma, 2020).

Habitat Trend in Plan Area:

Declining. Moderate-High Integrity. Although larger streams and rivers have moderate-high integrity as a whole across the Wayne (see *Aquatic Ecosystems & Watersheds Supplemental Report*), appropriate habitat in the section of the Ironton Unit which harbors this species is declining and stressed (personal communication, Thoma, 2020). The Scioto River population lives in an area with slightly higher topographic relief and consequently higher gradient streams where sediment is not deposited in suitable habitat. In contrast, in the Lawrence County population, there is less topographic relief and lower gradient streams more subject to sediment accumulation. Furthermore, there is more farming in bottomland habitats, as well as past ditching of larger streams in association with the Lawrence County population, contributing to more degraded habitat for this species. Any efforts that restore the natural flow conditions of the larger streams and reduces the level of sediment and silt input to the system would improve habitat conditions for this species (personal communication, Thoma, 2020).

Relevant Life History & Other Information:

None.

Threats Relevant In or To the Plan Area:

Sediment runoff and habitat degradation associated with ditching of larger streams (personal communication, Thoma, 2020).

Rationale for SCC Determination:

There is insufficient scientific information available to consider this species for potential species of conservation concern listing at this time. This species has a limited overall range and is only found in three counties in Ohio in two population centers. While the western population center that is not associated with national forest system lands appears to be thriving, Thoma's overall impression is that the species is declining in the eastern population center that is associated with National Forest System lands. However, several of the known historic locations have not yet been re-examined for current occupancy and, in 2017, four new location records were confirmed during surveys, one of which has the most individuals of any site in Lawrence County. Although evidence suggests the eastern populations may suffer from habitat quality impairments in some locations, it is difficult to confirm the population trend for the eastern population center from the information provided, because it is currently incomplete and shows both increases and decreases.

Blue Crayfish (*Cambarus monongalensis*)

Group: Crustaceans

Conservation Categories: None; NatureServe rank G5

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Southern Ohio is on the periphery of the known range, which includes West Virginia (where it is widespread), Virginia, and Pennsylvania. The blue crawfish has only recently been documented for the first time in Ohio (personal communication, Thoma, 2020). So far, there are only two localities recorded for the species in Jackson Township of Monroe County. Both are in the immediate vicinity of National Forest System lands, but neither of them is directly in the Wayne. As more data are collected in the future, the species may be documented on National Forest System lands.

Population Trend Statewide and in the Plan Area:

Unknown. The status of this newly documented species in Ohio is unknown, and more data and information are needed. Although the species occupies two disjunct regions within its range, NatureServe (2020) considers it stable and secure within both elements of its range.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Groundwater-dependent systems and

the directly adjacent Dry Oak Forest (Class, C, D) or Dry-mesic Mixed Oak Hardwood Forest (Class, C, D, E).

It is an upland species associated with forested ridgetop and hillside springs and seeps where it burrows. Thoma (2020) frequently finds colonies along abandoned forest roads where water seeps to the surface on the uphill side.

Habitat Trend in Plan Area:

Stable. Groundwater dependent systems habitat integrity is not evaluated, with low-moderate to low habitat integrity in the directly adjacent dry oak or dry-mesic mixed oak hardwood forest.

Relevant Life History & Other Information:

This species collects leaf litter in autumn, and young are born in February and March, remaining in the burrow until September or October (NatureServe 2020). The species is not greatly impacted by management activities and may benefit from old roads that cut into surface water seeps and exposes them for use (personal communication, Thoma, 2020).

Threats Relevant In or To the Plan Area:

The greatest threat to the species is disturbance of groundwater that results in the loss of springs and seeps, the species' preferred habitat (personal communication, Thoma, 2020).

Rationale for SCC Determination:

There is insufficient scientific information available at this time. This species has only recently been documented to occur in Ohio and additional data on distribution, population trends, and local habitat use is needed to evaluate the status of this species. Therefore, it is not possible to consider this species for potential species of conservation concern listing at this time.

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Terrestrial Invertebrates

Monarch (*Danaus plexippus*)

Group: Lepidopterans

Conservation Categories: U.S. Fish & Wildlife Service Species of Concern; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☒YES ☐NO

Distribution and Abundance in the Plan Area:

Extensive range[13] (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). Known to be fairly common in the Wayne in the past. Since 2012, tagging efforts during fall migration showed a drastic decline in local numbers. Anecdotally, observations from 2012 to 2018 in fall migration and during the summer breeding season were almost non-existent until the summer of 2019, when

[13] The State Wildlife Action Plan (ODNR 2015) wrote that the "Periphery of [the monarch's] range is in Ohio," but that does not appear correct, as the breeding range extends well into Canada in the east. The category was changed to "extensive range" for this process (personal communication, Katrina Schultes, 2020).

numbers seem to increase (personal communication, Lynda Andrews, 2020). However, new overwintering numbers from Mexico after the winter of 2019-2020 show numbers are decreasing again (Monarch Watch 2020).

Population Trend Statewide and in the Plan Area:

Unknown trend in Ohio (ODNR 2015). Trend in the Wayne, based on personal observation and tagging of migrating fall individuals, appears to be downward. During the summer season of 2019, more observations of monarchs were being made—a slight improvement from recent past summers (personal communication, Lynda Andrews, 2020). In most of North America, the migratory monarch is no longer considered secure due to its recent severe decline of roughly 90% (NatureServe 2020). Unfortunately, only eleven colonies were located this winter season in Mexico, with a total area of 2.83 hectares, a 53% decrease from 6.05 ha the previous season (Monarchwatch.org).

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Dry Oak Forest (Class A); Dry-mesic Mixed Oak Hardwood Forest (Class A); Rolling Bottomlands Mixed Hardwood Forest (Class A); Reclaimed Grasslands.

Habitat is a complex issue for this species. In general, breeding areas are virtually all patches of milkweed (*Asclepias* spp.) in North America. Larval hosts are milkweeds. Adult food is nectar from all milkweeds, but early in the season before milkweeds bloom, monarchs visit a variety of flowers including dogbane, lilac, red clover, lantana, and thistles. In the fall, adults visit composites, including goldenrods, blazingstars, ironweeds, and tickseed sunflowers (NatureServe 2020).

Habitat Trend in Plan Area:

Decreasing. Wildlife openings and other open areas are not being maintained, and are being invaded by trees, shrubs, and non-native invasive species without active management. There is also a substantial under-representation of open, early successional classes with native flowering plants (see *Terrestrial Ecosystems Supplemental Report*). Habitat integrity ranges from low-moderate to low integrity; with reclaimed grasslands integrity not evaluated.

Relevant Life History & Other Information:

Long distance migrant to Mexico. Apparently, once they cluster in the high altitude fir trees, monarchs usually do not feed until early spring (late February) and live off their lipid reserves. During this time they need low temperatures to reduce metabolic rate, but adult Monarchs are not highly freeze-tolerant, and sometimes depend on the dense forest canopy to moderate temperature on very cold nights, as well as to provide shelter and keep them dry during storms. Those that survive the winter in the Mexican mountains mate, lay eggs, and fly north in about March, but few of these get north of Texas. Stable isotope analysis confirms that most Monarchs reaching the United States Midwest in late

spring originate from larvae in Texas, but a few females from Mexico reach farther north or east. Monarchs begin reaching the core (Corn Belt) breeding range in April and May—about when milkweed foliage becomes available. A few from this generation reach as far east as New Jersey. Some usually reach Maine and southern Canada by June. Can contain poisons derived from their larval foodplant that help avoid predation by birds.

Threats Relevant In or To the Plan Area:

Pesticides - The potential use of Btk (*Bacillus thuringiensis* serotype *kurstaki*) in the Stop the Spread program for gypsy moth could affect this species.

Non-Native Invasive Plants - Garlic mustard and other non-native plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Mowing - If done at sensitive times, mowing (e.g., highway departments, farming communities, and sometimes rights-of-ways) eliminates nectar and caterpillar habitat sources during breeding and migrating seasons.

Habitat Degradation & Destruction - NatureServe (2020): **"**Overwintering habitats in Mexico are primarily in a few hectares or less each and have been under pressure from logging, agricultural and urban development...However, recent analyses and reviews concluded that the recent large-scale decline of North American monarchs is primarily the result of changes in the core breeding habitat, not the wintering habitat, apparently largely the recent loss of milkweed as a result of two changes in agricultural practices: 1) widespread adoption of genetically modified herbicide-tolerant corn and soybeans and use of the herbicide glyphosate on these crops; and 2) placing approximately 25,000,000 additional acres of mostly Roundup Ready corn since 2007."

Rationale for SCC Determination:

While well-distributed across its range, there are signs of drastic declines, including at known locations in the Wayne. Monarchs are particularly susceptible to management actions, such as spraying Btk for gypsy moth control, roadside mowing during the active period, and herbicide use that limit their host plants. Without concerted efforts to reestablish quality migratory and summer habitats, the whole eastern North American population may crash. Therefore, there is substantial concern for long-term persistence of this species in the planning area and it is recommended for consideration as a potential species of conservation concern at this time.

Silvery Blue (*Glaucopsyche lygdamus*)

Group: Lepidopterans

Conservation Categories: Ranked #22 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is common (11-29 counties) (ODNR 2015). No locations in GIS database. iNaturalist has observations in the Wayne's Athens Unit, Dorr Run (2016). A second observation in iNaturalist is in Scioto County from the Shawnee State Forest, west of the plan area, so it is possible there are additional occurrences in between, including across the Wayne. More species-specific surveys are needed to understand southern Ohio distribution of this species.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class A); Dry-mesic Mixed Oak Hardwood Forest (Class A); Rolling Bottomlands Mixed Hardwood Forest (Class A).

Where found in forested places, it is mainly in openings, edges, outcrops, and on roadsides. Caterpillar hosts are species in the pea family. Adult food is nectar from flowers.

Habitat Trend in Plan Area:

Stable with diverse habitat use, including roadsides. Integrity ranges from low-moderate to low integrity.

Relevant Life History & Other Information:

Non-migratory. Caterpillars feed on flowers, seedpods, and young leaves, and are tended by ants. Chrysalids hibernate. One flight from March-June at low elevations, June-August at high elevations.

Threats Relevant In or To the Plan Area:

Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. It is stable in Ohio, and there is no evidence of habitat decline in the Wayne. However, little is known about its distribution or abundance across the plan area.

Gray Comma (*Polygonia progne*)

Group: Lepidopterans

Conservation Categories: Ranked #23 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is common (11-29 counties) (ODNR 2015). Spatial data has locations from the Ironton Unit, at Kenton Lake (2019). iNaturalist has a location in the Athens Unit on Portie-Flamingo Road, Perry County (2019).

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Found in bogs and fens, forested wetlands, riparian areas; and conifer, hardwood, and mixed forest habitats. Larvae feed primarily on species of *Ribes,* but have occasionally been reported on elms and other plants. Adults occasionally visit flowers, but more often sip from moist soil, rotting fruit, sap, dung, etc.

Habitat Trend in Plan Area:

Stable with diverse habitat use. Low habitat integrity.

Relevant Life History & Other Information:

Non-migratory. In most of the range there are apparently two broods. Adults occur from the end of March into October in much of the range (NatureServe 2020). Overwinter as adults. Adults feed on sap, rarely flower nectar.

Threats Relevant In or To the Plan Area:

Changing climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. This species is declining in Ohio, but no evidence of habitat decline in the Wayne. However, little is known about its distribution or abundance across the plan area.

Dusky Azure (*Celastrina nigra*)

Group: Lepidopterans

Conservation Categories: Ranked #26 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is uncommon (6-10 counties) (ODNR 2015). GIS database has a location in the Ironton Unit, Buckeye Creek (2012). The Ohio Lepidopterist Society Data Snapshot (2012) has records well distributed from the counties containing all three units.

Population Trend Statewide and in the Plan Area:

Increasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class D); Dry-mesic Mixed Oak Hardwood Forest (Class D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Moist deciduous forests, especially shaded areas. Butterflies and Moths of North America states that caterpillar host plant is goat's beard (*Aruncus dioicus*) in the rose family (Butterflies and Moths of North America 2020). Adult Food is flower nectar, including wild geranium (NatureServe 2020).

Habitat Trend in Plan Area:

Mesic forests are increasing in the Wayne (see *Terrestrial Ecosystems Supplemental Report*). Low-moderate to low integrity.

Relevant Life History & Other Information:

Non-migratory. Butterflies and Moths of North America (2020) states that there is one brood and males patrol for females. Eggs are laid singly under young leaflets of host plant. Caterpillars feed on leaves, and chrysalids hibernate.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Plants - Garlic mustard and other non-native invasive plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.

Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

Abundant and well-distributed in the Wayne. Both the species and its habitat seem to have an increasing trend. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Zebra Swallowtail (*Eurytides*[14] *marcellus*)

Group: Lepidopterans

Conservation Categories: Ranked #25 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

[14] Some recent studies have placed this species into the genus *Protographium.*

Periphery of range is in Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). GIS database contains eight locations within the Wayne National Forest proclamation boundary from 2013-2017: Athens Unit and also abundant surrounding the unit, and two in the Ironton Unit and a few surrounding.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Rolling Bottomlands Mixed Hardwood Forest (Class B, C).

The zebra swallowtail is a woodland species. It is usually found in river bottoms where the caterpillar host plant, pawpaw, abounds (they prefer young plants). Adults known to nectar on blackberry, lilac, redbud, dogbane, and common milkweed. They are also fond of mud puddles.

Habitat Trend in Plan Area:

Stable with diverse habitat use. Low habitat integrity.

Relevant Life History & Other Information:

Males patrol favored flightways during the warmest part of the day looking for females, and will often fly uphill to locate a mate. This hill-topping behavior is favored by many species of swallowtails. Two or three broods (generations) of zebra swallowtails are produced annually.

Threats Relevant In or To the Plan Area:

Habitat - Variable successional stages of forests are necessary for the species (Butterflies and Moths of North America 2020).

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.

Changing climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

Abundant and well-distributed in the Wayne. No evidence of decline for species or its habitat. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Falcate Orangetip (*Anthocharis midea annickae*)

Group: Lepidopterans

Conservation Categories: Ranked #28 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G4G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is common (11-29 counties) (ODNR 2015). Ohio Lepidopterist Society Online has well-distributed records across all of southeast Ohio. iNaturalist has records for the Athens Unit, New Straitsville area (2019). Diane Brooks (a recognized Ohio expert on lepidopterans) has them documented from her property one-quarter mile from the Wayne in the Wildcat Hollow area from 2002 thru 2019 (personal communication, Diane Brooks, 2019).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry Oak Forest (Class B, C); Dry-mesic Mixed Oak Hardwood Forest (Class B, C); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Found in forested wetlands, riparian zones, open areas in deciduous forests or pine barrens (especially in moist riparian areas or on dry open ridge tops), glades, and various kinds of barrens (such as serpentine and shale). Becoming increasingly rare in richer forests due to invasive non-native plant species, especially garlic mustard, but populations in xeric habitats are generally unaffected. Adults and larvae are not found more than a few meters from trees, but ecotones between fields and woods are common habitats. Since pupation is up in small trees or shrubs, this species can utilize plowed or burned fields successfully as long as such disturbances are not during the larval period. Larval hosts are plants of the mustard (Brassicaceae) family. Adult food is flower nectar, including flowers of mustards, violets, and others (NatureServe 2020).

Habitat Trend in Plan Area:

Stable with diverse habitat use. Low-moderate to low integrity.

Relevant Life History & Other Information:

Non-migratory. Males patrol for females. Only one egg is laid per host plant, singly on a flower stalk. Caterpillars feed on buds, flowers, and seed pods. Chrysalids hibernate. Only one flight per year, March-June (Butterflies and Moths of North America 2020).

Threats Relevant In or To the Plan Area:

Non-Native Invasive Plants - Garlic mustard and other non-native plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.

Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

Stable and well-distributed in Ohio. No evidence of species or habitat decline in the Wayne. Therefore, there is not substantial concern for long-term persistence of this species in the plan area.

Northern Metalmark (*Calephelis borealis*)

Group: Lepidopterans

Conservation Categories: Ranked #28 as terrestrial invertebrate Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G3G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is common (11-29 counties) (ODNR 2015). Ohio Lepidopterist Society Online has well distributed records across all of southeast Ohio. iNaturalist has records from Athens Unit, New Straitsville area (2019). Three records in Athens Unit; Greens Run-Sunday Creek HUC from 2014-2018. Known from several areas in the Athens Unit, particularly in the Baileys Tract area. Additionally, rediscovered (2018) in the Ironton Unit in two historically known areas, but in very low numbers.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Dry Oak Forest (Class A, B); Dry-mesic Mixed Oak Hardwood Forest (Class A, B, C).

While habitats are generally considered openings within forested or wooded areas such as natural outcrops, shale or limestone barrens, glades, or powerline right of ways (NatureServe 2020), this has not been observed in the Wayne. All Wayne-specific observations are along roadsides with dappled lighting. However, there must be another factor involved, because there are many roads in the area with dappled light and host plants, but no metalmarks observed after multiple, in-season searches. Andrews has never personally located this butterfly within open areas or utility corridors either, despite many days spent searching within these habitats in project areas (personal communication, Lynda Andrews, 2020). Larvae feed on the leaves of *Senecio obovatus*. There is some speculation, but no evidence of any kind, that other composites might be used as larval foodplants. In particular, no populations are associated with the similar *Senecio aureus*. Adults take nectar from a variety of flowers (NatureServe 2020).

Habitat Trend in Plan Area:

Appears stable; however, certain human activities during the active period can destroy adults and larvae and leave them with no suitable habitat during these critical periods. They are particularly susceptible to management actions, such as spraying Btk for gypsy moth control, which kills larvae; roadside mowing along the many county and township roads during the active period; and prescribed burning along roadside habitats during the larval stage. Low-moderate habitat integrity.

Relevant Life History & Other Information:

Non-migratory. One brood in most places. Adults appear in late June to mid-July and are finished by the end of July. The range of 13 June to 31 July in Ohio may include both the earliest and latest known dates for single brooded populations. Overwinter as larvae, probably under the basal rosettes of the foodplant, perhaps a bit into the soil (NatureServe 2020).

Threats Relevant In or To the Plan Area:

Limited Distribution - Isolation of small colonies.

Habitat Degradation & Destruction - Mowing roadsides by highway departments during the active period has been a problem, destroying occupied habitat and killing individuals. Most roads passing through the Wayne are county and township roads, so the Wayne does not have jurisdiction over the management of roadside management within the right-of-way. However, this issue could be addressed with communication and

partnerships with local entities about where and when the sensitive areas and times are. Prescribed fire events during the overwintering larval stage can kill all the larvae, leaving no next generation. However, this can be mitigated with measures added to burn plans, such as ignition within the treeline, rather than along the grassy edge.

Non-Native Invasive Plants - Garlic mustard and other non-native plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moths could affect this species by killing the larvae, since the metalmark is in larval form at the same time as the gypsy moth. This could be addressed with communication and partnerships with local entities about where the sensitive areas are that need to be protected.

Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

This species is regarded as well-distributed across southeastern Ohio, and the statewide trend is considered stable. As such, this species cannot be recommended for consideration as a potential species of conservation concern at this time. However, questions remain about the species' status and use of habitats across the Wayne. They have a patchy distribution across the plan area, and the abundance of individuals at known locations in the Wayne appear to be relatively low and at risk. They are particularly susceptible to management actions, such as spraying Btk for gypsy moth control, roadside mowing during the active period, and prescribed burning along roadside habitats during the larval stage. Without specific protections afforded local populations during routine management actions, the northern metalmark may decline sharply in the Wayne in the future. Additional study is warranted. This species has a distinctive role or contribution within the broader landscape, therefore, plan components should be included in the revised forest plan to maintain or protect it.

Leonard's Skipper (*Hesperia leonardus*)

Group: Lepidopterans

Conservation Categories: Ranked #41 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). GIS database has one observation in the Athens Unit, East Branch Sunday Creek (2012). No other observations exist for the Wayne. More species-specific surveys are needed to understand distribution and abundance in the plan area.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class A, B, C); Dry-Mesic Mixed Oak Hardwood Forest (Class A, B).

Habitats can include very open oak, pine, or mixed woodlands, oak savannas, rights-of-way in dry oak woods or pine barrens, edges of airport grasslands, grassy rock outcrops, native sand plain grasslands, and dry meadows. Colonies are usually on dry sand or rocky situations eastward, and not restricted to undisturbed natural grasslands there. Many reports from wetlands and wet meadows eastward probably refer mostly to adults visiting nectar plants in such habitats, and many are single adults. Larval hosts are various perennial grasses, including little bluestem, blue grama, and bentgrass. Adult food is flower nectar, especially from blazingstar, but also thistles, asters, teasel, and others (NatureServe 2020).

Habitat Trend in Plan Area:

Decreasing. Low-moderate integrity. Savannah and barrens-type habitats, as well as large open grassy areas and wildlife openings, are being invaded by trees, shrubs, and non-native invasive species without active management.

Relevant Life History & Other Information:

Non-migratory. Males perch or patrol near nectar plants to find receptive females. Eggs are scattered on or near the host plants. Caterpillars feed on leaves and live in shelters of tied leaves. First-stage caterpillars hibernate. One brood from August-October.

Threats Relevant In or To the Plan Area:

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.
Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync

with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. This species is stable and well-distributed in Ohio; however, habitat is degrading in the Wayne, and there is only one known observation. There is a lack of understanding about distribution, abundance, and population trends in the plan area.

Appalachian Blue (*Celastrina neglectamajor*)

Group: Lepidopterans

Conservation Categories: Ranked #45 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is common (11-29 counties) (ODNR 2015). Species is known to occur within 10 km of National Forest System lands in the counties associated with the Athens and Ironton Units, but presence in the Wayne itself has not been specifically determined. More species-specific surveys are needed to understand distribution and abundance in the plan area.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Dry-mesic Mixed Oak Hardwood Forest (Class C, D, E); Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Hardwood and mixed hardwood forests in rich woods (especially near streams) with the caterpillar host bugbane (*Cimicifuga*[15] *racemosa*). Adult food is flower nectar (NatureServe 2020).

[15] Species has recently been placed back in the genus *Actaea* by some.

Habitat Trend in Plan Area:

Appears stable. Low-moderate to low integrity.

Relevant Life History & Other Information:

Non-migratory. One flight from May-June in the Appalachians. Not much information available.

Threats Relevant In or To the Plan Area:

Non-Native Invasive Plants - Garlic mustard and other non-native plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Changing Climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. The species is presumed present on National Forest System lands, since the species has been documented within 10 km and suitable habitat is present. However, little is known about the distribution and abundance of the species in the plan area, or general life history information. Therefore, more data are needed to understand the status of this species within the plan area.

Pepper and Salt Skipper (*Amblyscirtes hegon*)

Group: Lepidopterans

Conservation Categories: Ranked #45 as terrestrial invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Ohio Lepidopterist Society Online data shows presence in all counties containing the Wayne except Monroe and Noble. Diane Brooks' data shows

present in the Athens Unit (2018) (personal communication, Diane Brooks, 2019). However, more species-specific surveys are needed to understand distribution and abundance in the plan area.

Population Trend Statewide and in the Plan Area:

Increasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Dry Oak Forest (Class D); Dry-mesic Mixed Oak Hardwood Forest (Class D, E); Rolling Bottomlands Mixed Hardwood Forest (Class D).

Glades, wood edges, roadsides, and along streams in conifer, hardwood, and mixed forests—often in rather heavily forested settings. Larval hosts are Kentucky bluegrass, Indiangrass, and Indian woodoats. Adult food is nectar from flowers, including viburnum and blackberry (NatureServe 2020).

Habitat Trend in Plan Area:

Appears stable. Low-moderate to low integrity.

Relevant Life History & Other Information:

Non-migratory. One brood from April-July. Not much information available.

Threats Relevant In or To the Plan Area:

Non-native invasive plants - Garlic mustard and other non-native plant species may outcompete and replace required host plants (Butterflies and Moths of North America 2020).

Pesticides - The potential use of Btk in the Stop the Spread program for gypsy moth could affect this species.

Changing climate - A warming climate has caused plant species to bloom an average of a half day earlier each year, and the growing season of some species now begins up to a month earlier compared to 45 years ago. This can cause pollinators to become out of sync with the plants they have historically pollinated, but information on specific species is currently not available.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Increasing and well-distributed in Ohio, but there is a lack of understanding about distribution, abundance, and population trends in the plan area.

Green-Faced Clubtail (*Hylogomphus* [*Gomphus*] *viridifrons*)

Group: Odonata

Conservation Categories: Ohio Threatened; Ranked #21 as Ohio aquatic invertebrate Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G3G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. Verified within a quarter-mile of National Forest System lands on the Little Muskingum River in 2002, and then verified again in 2011 about one mile south of the Wayne's Lane Farm Recreation Area at the Marietta College Beiser Field Station. These two sightings are approximately 5.5 miles apart (straight line) with National Forest System lands and suitable habitat in between. An older record (1994) exists in Monroe County 10 miles northeast of the 2002 record. However, none were documented within the plan area during the recent (2017-2019) Ohio Dragonfly Survey.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Compared to the original 1991-2001 Ohio Dragonfly Survey, 30 green-faced clubtails were documented across Ohio, but only one was observed during the recent Ohio Dragonfly Survey (2017-2019) for the whole state, and not within the plan area.

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Primary Headwater Streams; Larger Streams & Rivers; Rolling Bottomlands Mixed Hardwood Forest: Small Stream Riparian Forest, Large Stream Floodplain and Riparian Forest (Class C, D).

Found in small to large moderate-gradient rivers; free-flowing with high water quality; larvae burrow in silt, adults forage in trees.

Habitat Trend in Plan Area:

Larval habitat is stable. Adult habitat appears stable but at-risk. Moderate-High Integrity; Moderate-High Integrity; Low Integrity. The Marietta Unit has many high quality streams and stream systems, such as the Little Muskingum River (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

This species does not exhibit migratory behavior; however, it is a relatively strong flier and is capable of dispersing several kilometers in a day along stream corridors. River currents can also carry eggs or young larvae downstream, potentially dispersing them to suitable, but unoccupied, habitat (Pennsylvania Natural Heritage Program 2020).

Threats Relevant In or To the Plan Area:

Habitat - The most significant threats to this species are alteration and destruction of habitat from impoundments, channelization, sedimentation, and other alterations of stream channels; water quality degradation from urbanization, acid mine drainage, agriculture, pesticides, and other chemicals; spread of invasive aquatic species; fragmentation of forests around headwater streams; and loss of riparian forest. Tied to good water quality (highly oxygenated) and exposed rocks within river corridor (Pennsylvania Natural Heritage Program 2020).

The Little Muskingum River is probably the highest quality riverine system in the Wayne. It has been designated by the Ohio EPA as an exceptional warmwater habitat. However, although scenic and of exceptional water quality, there are habitat threats in and around the plan area that may impact this species including agricultural runoff, farming or grazing to the river's edge, and cattle-access (Austin 2006). Impacts from past management (and lack thereof) remain in the Wayne. Several areas adjacent to the Little Muskingum River remain without woody riparian growth and consequently have sloughing banks. A broken-down concrete crossing remains in the river allowing siltation to build up behind it. A considerable portion of the Little Muskingum River has State Route 26 running immediately adjacent to it, and a large portion of the riverside habitat under private ownership is lacking a forested riparian corridor. Sloughing banks are located throughout the mainstem and major tributaries (personal communication, Lynda Andrews, 2020).

Direct Mortality - Death as a result of vehicle collisions where roads intersect habitat can harm populations.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude the species is still present within the plan area; therefore, it cannot be considered for listing as a potential species of conservation concern at this time. The species has only ever been recorded near National Forest System lands, and a more systematic survey approach may be needed to confirm presence or probable absence of the species in the plan area. Recent statewide dragonfly surveys (2017-2019) suggest a steep decline. Observers only found one green-faced clubtail in Ohio compared to 30 in the original survey, and none in the plan area. The most recent record for the plan area was in 2011, approximately 1-mile south of National Forest System lands, but neither this nor the older record from 2002 were reconfirmed during the 2017-2019 Ohio Dragonfly Survey. More information or

surveys are needed to document presence on National Forest System lands to potentially consider this species as a species of conservation concern in the future.

Elusive Clubtail (*Stylurus notatus*)

Group: Odonata

Conservation Categories: Ranked #29 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G3

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS database contains record of one location within Marietta Unit: Wingett Run-Little Muskingum River HUC, Hune Bridge (2005). Elusive and difficult to observe; more species-specific surveys are needed to understand the southern Ohio distribution of this species.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). However, none were documented or added to the database in the state during the second Ohio Dragonfly Survey (2017-2019). As the name implies, it is difficult to find in adult form and, consequently, not many have been documented.

This species moves rapidly (estimated 10 kilometers, or 6 miles, per day) along the waterway. As a result, the species' overall population is not considered fragile. Localized extirpations would likely be re-inhabited very quickly (less than 2 years) after habitat recovery, with catchment extirpations requiring somewhat more time (less than 5 years).

Habitat:

Moderate environmental specificity: Generalist or community with some key requirements scarce. Larger Streams & Rivers; Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class A-D).

Lotic. Ohio River tributaries. Overall habitat appears to usually be large, clear rivers with moderate current and gravel or sandy bottom.

Habitat Trend in Plan Area:

Larval habitat appears stable. Adult habitat appears stable but at risk. The Marietta Unit has many high quality streams and stream systems, such as the Little Muskingum River

(see *Aquatic Ecosystems & Watersheds Supplemental Report*). Rolling bottomland mixed hardwood forests have low integrity (see *Terrestrial Ecosystems Supplemental Report*).

Relevant Life History & Other Information:

Adults probably mostly stay near the breeding areas, but this species has a reputation for being difficult to find in that stage. Adults usually live in treetops on the sides of valleys, with males patrolling far out over the water. They presumably feed mostly among or above the trees, but will forage in grassy or brushy places in non-forested places.

Threats Relevant In or To the Plan Area:

This species can tolerate decreased water quality, but populations are higher in pristine areas. Damming and channelization can lead to habitat loss.

Rationale for SCC Determination:

Although none were observed during the recent Ohio Dragonfly Survey, it is known that this species is difficult to observe as adults, since they spend their time in treetops. The species is considered across the state. Given the large geographic range and apparently stable population and habitat trends, there is not a substantial concern for long-term persistence of this species in the plan area and it is recommended for consideration as a potential species of conservation concern at this time.

Aurora Damselfly (*Chromagrion conditum*)

Group: Odonates

Conservation Categories: Ranked #30 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is broadly distributed (>30 counties) (ODNR 2015). GIS database contains records in all three units of the Wayne, with one to two observations in each of seven HUCs (2009-2019), mostly in the Athens Unit.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Wetlands; Primary Headwater Streams.

Inhabits wetlands, primary headwater streams, and small inland streams. Generalist species with broad habitat tolerance requiring low-floating plant richness, a narrow emergent zone width, low to intermediate tolerance to disturbance, and fine to intermediate substrates. Some marsh and swamp locations are noted in the Wayne.

Habitat Trend in Plan Area:

Appears stable. Primary headwater streams and wetlands both have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Often perch with wings half open; making for a good field mark at a distance. Males will perch on vegetation in the open, but spend much time in slow flight over water. Males and pairs most common at water at midday. Flight season is relatively early.

Threats Relevant In or To the Plan Area:

Habitat - Dewatering of aquatic resources, such as constructed wetlands, can occur without dam maintenance. Dam integrity can be at risk from unchecked mammal burrowing and tree growth, both of which can compromise the integrity of the dam.

Rationale for SCC Determination:

Due to its large range and broad use of diverse habitat types and relative abundance across the plan area, there is not substantial concern for long-term persistence of this species in the plan area.

Sedge Sprite (*Nehalennia irene*)

Group: Odonates

Conservation Categories: Ranked #36 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) – which includes Ohio; common (11-29 counties) (ODNR 2015). GIS database contains two observations within the Athens Unit in Lost Run-Monday Creek HUC (2017 and 2018). Of those two observations, one was in

Perry County (county record) by Lynda Andrews on National Forest System land, and the other in Hocking County by Nina Harfman, also on National Forest System land. These were the only two observations, one with multiple individuals, recorded during the 2017-2019 Ohio Dragonfly Survey in southeastern Ohio (personal communication, Lynda Andrews, 2020). This species appears rare in the plan area; the majority of observations of this Odonate is in northern Ohio. Southern Ohio appears to be on the southernmost limit of its natural range, which is mostly Canada and the northern United States.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown. The lack of observations in the Wayne could be due to the lack of observers in this particular region of the state, or the fact that the Wayne is on the edge of its range.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Wetlands; Lakes, Ponds, & Reservoirs.

Generalist species with broad habitat tolerance requiring variable floating-plant richness, a variable emergent zone width, low to intermediate tolerance to disturbance, and fine to intermediate substrates.

Habitat Trend in Plan Area:

Appears stable. Wetlands have moderate-high integrity, while lakes, ponds, and reservoirs have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many smaller waterbodies in the Wayne are of unknown integrity. Suitable habitat appears to be available forestwide.

Relevant Life History & Other Information:

Often more common than first apparent, as many individuals are deep in vegetation both short and tall. One site in the Wayne was found alongside a gravel road in a grassy area adjacent to a pond. These were the most populous Odonates seen there at the time.

Threats Relevant In or To the Plan Area:

Habitat - Dewatering of aquatic resources, such as constructed wetlands, can occur without dam maintenance. Dam integrity can be at risk from unchecked mammal burrowing and tree growth, both of which can compromise the integrity of the dam.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. The species has broad environmental specificity (a generalist species using broad-scale or diverse habitats). While habitat appears to be available across the Wayne, there are a lack of observations of this species which could be due to the lack of observers in this particular region of the state, or the fact that the Wayne is on the edge of its range. The

majority of observations of this Odonate is in northern Ohio. Therefore, the population trend for the species is currently unknown in the plan area and requires additional time and effort to document its trends and use of the national forest.

Allegheny River Cruiser (*Macromia alleghaniensis*)

Group: Odonates

Conservation Categories: Ranked #49 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4 (Note: Global ranking last reviewed in 2004 and may be outdated)

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is uncommon (6-10 counties) (ODNR 2015). One location known from the Marietta Unit along the Little Muskingum River at Lane Farm Recreation Area (2003). None were found anywhere in the state during the recent Ohio Dragonfly Survey (2017-2019). More species-specific surveys are needed to understand the southern Ohio distribution of this species.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Not seen within the plan area since 2003. NatureServe lists this species as Imperiled in Ohio.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Primary Headwater Streams; Larger Streams and Rivers.

Slow-flowing streams and rivers, rocky or not, mostly associated with Ohio River tributaries. Very scarce information is available on this species.

Habitat Trend in Plan Area:

Appears stable. Moderate-high integrity. The Marietta Unit has many high quality streams and stream systems, such as the Little Muskingum River (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

May prefer to fly late in afternoon. Will cruise up and down roads through woodlands in sun and shade, or fly up higher into forest canopy.

Threats Relevant In or To the Plan Area:

Habitat - Some Ohio River tributaries are affected by acid mine drainage from old mines and past mining activity in the area. Sedimentation, channelization, and agricultural enrichment also occurs within drainages.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term.

Smokey Rubyspot (*Hetaerina titia*)

Group: Odonates

Conservation Categories: Ranked #42 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. GIS database shows it is common in the Athens and Marietta Units in four HUCS (Wingett Run-Little Muskingum River, Eightmile Creek-Little Muskingum River, West Branch Sunday Creek, and Dorr Run-Hocking River (all during the recent Ohio Dragonfly Survey)). The majority of observations of this Odonate were in southeastern Ohio.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Larger Streams & Rivers and directly adjacent Rolling Bottomlands Mixed Hardwood Forest: Large Stream Floodplain & Riparian Forest (Class C).

Inhabits slower streams in woodlands, and tends to be in more heavily shaded areas than American rubyspot. Also less likely at rocky riffles. Aquatic vegetation or rootlets from

stream bank trees is essential for oviposition. It is mostly associated with Ohio River tributaries.

Habitat Trend in Plan Area:

Appears stable. Perennial primary headwater streams and larger streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*), with rolling bottomlands having low integrity. The recent aquatic organism passage project in the area near a smokey rubyspot occurrence in the Marietta Unit helped to reduce a sedimentation source.

Relevant Life History & Other Information:

Perch higher than American rubyspots, usually on shaded pools rather than low on open riffles. Females not at water unless mating.

Threats Relevant In or To the Plan Area:

Habitat - Some Ohio River tributaries are affected by acid mine drainage from old mines and past mining activity in the area. Sedimentation, channelization, and agricultural enrichment also occurs within drainages.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. The majority of observations in southeastern Ohio, made during the recent Ohio Dragonfly Survey, were in the Hocking River and Little Muskingum River mainstems. Thus, the species appears common in the plan area, but there is little information about the population trend in the plan area. Additional information is needed to document its trends and use of National Forest System lands.

Gray Petaltail (*Tachopteryx thoreyi*)

Group: Odonates

Conservation Categories: Ranked #46 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). GIS database shows it is common in and around the Athens

Unit (West Branch Sunday Creek, East Branch Raccoon Creek, with the most observations in Lost Run-Monday Creek HUC), and a few observations in the Ironton Unit (Storms Creek and Camp Creek-Symmes Creek (2015-2019)).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Groundwater-Dependent Systems and directly adjacent Rolling Bottomlands Mixed Hardwood Forest (Class C, D).

Inhabits forested wetlands, and hardwood or mixed forests and woodlands. Breeding habitats are seepage areas in forests. The Ohio Department of Natural Resources (2016) states that the larvae are partially terrestrial, crawling above the waterline of seeps between layers of leaves kept wet by capillary action.

Habitat Trend in Plan Area:

Appears stable. Wetlands have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Rolling bottomland mixed hardwood forests have low integrity, but both dry-mesic mixed oak forests and dry oak forests have low-moderate integrity. Groundwater dependent systems, like seeps, are generally not created nor destroyed in the plan area.

Relevant Life History & Other Information:

Commonly perches vertically on tree trunks from waist height up to 15 feet, also on large stones and rock walls closer to the ground, where it is easy to approach. Adults can live up to seven weeks. Can be encountered in forest clearings and edges, sometimes at some distance from seeps. Females oviposit into wet soil or tiny puddles. Larvae develop in wet mud, usually under leaves.

Threats Relevant In or To the Plan Area:

Habitat - The main threat to this species involves destruction or degradation to its habitat. Because the gray petaltail requires seeps and other groundwater-dependent systems for reproduction, anything that pollutes the water or degrades the seep or system itself will negatively impact populations. Such actions include deforestation around the seep or spring, increased sedimentation in the water, and climate change induced warmer ambient air temperatures in the summer.

Rationale for SCC Determination:

Several new records of this species were documented within and near the plan area from the recent Ohio Dragonfly Surveys, and this species' population trend is considered stable. Habitat trends in the plan area also appear stable. Therefore, there is no substantial concern for long-term persistence of this species in the plan area and it is not

recommended for consideration as a potential species of conservation concern at this time.

Uhler's Sundragon (*Helocordulia uhleri*)

Group: Odonates

Conservation Categories: Ranked #53 as Ohio aquatic invertebrate Species of Greatest Conservation Need; Forest Service Regional Forester Sensitive Species for the Wayne National Forest; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is rare (<5 counties) (ODNR 2015). There are observations from one location in the Athens Unit (Dorr Run-Hocking River HUC in 2004), and one in the Marietta Unit Wingett Run-Little Muskingum River HUC in 2019). The Ohio EPA's Macroinvertebrate GIS database also lists one Athens Unit site near Creola (from 2000), and larvae documented at multiple Ironton Units sites along tributaries to Symmes Creek, Johns Creek, Aaron Creek, Miller Creek, Little Buffalo Creek, and Sharps Creek (from 2016). There have been modest increases in observations, although not a lot.

Population Trend Statewide and in the Plan Area:

Declining in Ohio (ODNR 2015). NatureServe lists this species as Critically Imperiled in Ohio. Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Primary Headwater Streams.

Odonata Central (2020) states that small, rapid forest streams, often with impeded flow, and occasionally lakes, are known habitats.

Habitat Trend in Plan Area:

Appears stable outside of acid mine drainage impacted primary headwater streams in select areas of the Athens Unit. Primary headwater streams have moderate-high integrity across the Wayne, and the Marietta Unit has the highest concentration of high-quality streams of any of the three units (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Males fly rapidly along streams below knee height, often just off shore. They may also hover. They are difficult to see when flying in shade. Both sexes feed in flight in sunny clearings, including over paths through woodlands. They have been recorded flying after sundown, and observed considerable distances from breeding habitat (Glotzhober and McShaffrey 2002).

Threats Relevant In or To the Plan Area:

Habitat - Evans (2002) stated the distribution dragonflies can be negatively impacted by the pollution of stream habitat from the effects of past coal mining, which is very prevalent in the Athens Unit. Evans (2002) also mentioned the removal of riparian vegetation can increase water temperature and siltation levels in streams, which can reduce aquatic vegetation growth and possibly negatively impact dragonfly distribution. In addition, it was noted that hydrological stability to headwater areas should be protected to ensure persistence of the species.

Mortality - Dragonfly mortality from car collisions along roads can be significant to rare species.

Rationale for SCC Determination:

There is currently insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. There have been an increase of records for this species in the Wayne recently, from both Ohio EPA records of larvae in streams within the Ironton Unit, as well as adults documented within the plan area from both the Athens and Marietta Units during the recent Ohio Dragonfly Survey. However, given the decline statewide, it is difficult to know whether the species trend is increasing or whether better data was just recently obtained. More information is needed about Uhler's sundragon to document population trends and use of the national forest.

Lilypad Forktail (*Ischnura kellicotti*)

Group: Odonates

Conservation Categories: Ohio Endangered; Ranked #60 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5 (Note: Global ranking last reviewed in 1990 and may be outdated)

Known to Occur in the Plan Area?..... ☐YES ☒NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is rare (<5 counties) (ODNR 2015). Although fairly common around and near the Athens Unit, there are only two observations within the Wayne's proclamation boundary, from the Dotson Creek-Sunday Creek and East Branch Raccoon Creek HUCs (2018). None have been confirmed from within the plan area. They are associated with large lakes, like Burr Oak Lake, Dow Lake, and Lake Hope, where there are water lilies present.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). NatureServe lists this species as Critically Imperiled in Ohio. No populations known from the Wayne.

Habitat:

Very narrow environmental specificity: Specialist or requires key ecosystem characteristics that are scarce in the area of interest. Lakes, Ponds, and Reservoirs.

Pond breeding requires intermediate to high floating-plant richness, a narrow to intermediate emergent zone width, low to intermediate tolerance to disturbance, and fine to intermediate substrates. Prefers extensive beds of water lilies. Larger waterbodies with water lilies are not common across the Wayne.

Habitat Trend in Plan Area:

Apparently stable but extremely limited, if even present in the Wayne. Very few water sources in the Wayne are known to have water lilies in them. Moderate-high integrity.

Relevant Life History & Other Information:

Invariably perch flat on lilypads with abdomen curled down near end to touch the leaf. It is possible that females only mate once. Larvae live under water lily leaves. There are few other Odonates so closely tied to a single type of plant.

Threats Relevant In or To the Plan Area:

Habitat - The main threat to habitat is the removal of water lilies. Water lilies are sometimes removed for recreational purposes, as the plants can grow rather densely and can prevent motorized boat access thru the water or make fishing difficult.

Rationale for SCC Determination:

Although this species has been documented nearby, it is not currently known to occur by any water resources on National Forest System lands. The required suitable habitat—large waterbodies with water lilies—is not currently known to exist on National Forest System lands. Until the species or suitable habitat is verified to be present, it cannot be considered as occurring on national Forest System lands, even though it may be present nearby in suitable habitat. Therefore, this species cannot be considered as a potential species of conservation concern.

Russet-Tipped Clubtail (*Stylurus plagiatus*)

Group: Odonates

Conservation Categories: Ranked #60 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Periphery of range is in Ohio, where it is uncommon (6-10 counties) (ODNR 2015). While a few observations exist near the Marietta Unit, only one was confirmed within the Wayne's proclamation boundary. The Ohio Dragonfly Survey noted a single site just off of the Wayne (within 1 km) in the extreme southeastern edge of the Marietta Unit on the Ohio River, Monroe County (2016). Additional observations were on the southwest end of the unit within Marietta (2017) and near Devola (2018). Suitable habitat lies on National Forest System land between the three recent observations. However, more species-specific surveys are needed to understand the southern Ohio distribution of this species.

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Larger Streams & Rivers; Lakes, Ponds, & Reservoirs.

Inhabits Ohio River tributaries, human-made lakes, and ponds. Odonata Central (2020) states habitat as being weedy rivers, streams, and lakes with moderate to little current.

Habitat Trend in Plan Area:

Appears stable. Larger streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Males patrol for mates in back-and-forth flight over breeding habitats, usually over riffles and often hovering. Active throughout the day, with females rarely seen.

Threats Relevant In or To the Plan Area:

Habitat - Sedimentation, channelization, and agricultural enrichment occurs within drainages where this Odonate is known to occur. The clearing of banks and dredging of rivers (for barge traffic and mooring) could also remove suitable habitat.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. The species has not been located on National Forest System land, but has been found both east and west (close proximity) of the Marietta Unit. All known locations are connected to each other by suitable habitat, the Ohio River. However, more information on possible locations within National Forest System land is needed.

Ocellated Darner (*Boyeria grafiana*)

Group: Odonates

Conservation Categories: Ranked #64 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is disjunct from main portion of its range. Ohio EPA Macroinvertebrate GIS database contains abundant records of larvae in southeast Ohio, including a dozen Marietta Unit locations (2000 and 2015). No adults were recorded in the Wayne during the recent Ohio Dragonfly Survey (2017-2019).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). However, only two observations of adults were recorded in the state during the recent Ohio Dragonfly Survey (2017-2019). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers; Lakes, Ponds, & Reservoirs.

Usually in swift, rocky, forested rivers of uplands and headwaters, but also less often found in lakes and ponds.

Habitat Trend in Plan Area:

Appears stable. Primary headwater streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Usually roosts in forest shade for much of the day, then begins flight low over river in late afternoon (or all day when cooler).

Threats Relevant In or To the Plan Area:

Habitat - Evans (2002) stated the distribution dragonflies can be negatively impacted by the pollution of stream habitat from the effects of past coal mining, which is very prevalent in the Athens Unit. Evans (2002) also mentioned the removal of riparian vegetation can increase water temperature and siltation levels in streams, which can reduce aquatic vegetation growth and possibly negatively impact dragonfly distribution. In addition, it was noted that hydrological stability to headwater areas should be protected to ensure persistence of the species.

Collision - Dragonfly mortality from car collisions on roads can be significant to rare species.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. Larvae have been found in the Marietta Unit by the Ohio EPA; however, no adults have been observed. More information is needed to assess abundance, distribution, and trends in the Wayne.

Common Sanddragon (*Progomphus obscurus*)

Group: Odonates

Conservation Categories: Ranked #68 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5 (Note: Global ranking last reviewed in 2005 and may be outdated)

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Ohio EPA Macroinvertebrate GIS database contains a single

site record in the Athens Unit in West Branch Sunday Creek north of McLeish (2001), and nearly a dozen Ironton Unit sites relevant to National Forest System lands (2010 and 2016). Adult found and photographed at Greendale Wetland, Athens Unit, in 2018 (personal communication, Lynda Andrews, 2020). This species was only found in Southeastern Ohio during the recent Ohio Dragonfly Survey. Out of those 13 total observations: one was on National Forest System lands, two were extremely close to be considered within the plan area, nine were in counties with National Forest System Lands but were markedly not within the plan area, and one was in a county without any National Forest System lands (personal communication, Lynda Andrews, 2020).

Population Trend Statewide and in the Plan Area:

Increasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers; Lakes, Ponds, & Reservoirs.

A generalist species that prefers rivers and streams in much of its range. Found in Ohio River tributaries, human-made lakes and ponds, and headwater and small inland streams. Habitats include clear, sandy-bottomed lakes, ponds, streams, and rivers. Nymphs inhabit sand bars in small streams, and shallows of wide lakes.

Habitat Trend in Plan Area:

Appears stable, but most likely with localized decreases and increases due to local factors. Primary headwater streams, larger streams and rivers, and larger lakes, ponds, and reservoirs all have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Males usually perch on sand beaches of pools, right at the edge facing the water. Prefers open rather than shrubby banks. Abdomen elevated when perched, on ground or on twigs, and obelisks dramatically at midday.

Threats Relevant In or To the Plan Area:

Habitat - Some Ohio River tributaries are affected by acid mine drainage from old mines and past mining activity in the area. Sedimentation, channelization, and agricultural enrichment also occurs within drainages.

Rationale for SCC Determination:

Numbers appear to be increasing in southeastern Ohio and within the plan area; however, there is currently insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. It is difficult to determine whether more were documented because surveyors were

looking during the recent Ohio Dragonfly Survey, or whether there is an upward population trend, especially since they appear to declining statewide.

Twin-Spotted Spiketail (*Cordulegaster maculata*)

Group: Odonates

Conservation Categories: Ranked #69 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). No recent observations from the Wayne, but it was found in 2018 about 2.5 miles east of the Athens Unit's proclamation boundary. Prior to that, two older observations (1994 and 1995) were made in the Marietta Unit. All other observations listed around the Athens Unit are not near the proclamation boundary and are very old. More species-specific surveys are needed to understand distribution and abundance in the plan area.

Population Trend Statewide and in the Plan Area:

Stable to Increasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams; Larger Streams & Rivers.

Small to mid-sized rocky streams with good current and muddy pools, typically in forest. Occasionally seen patrolling on larger rivers.

Habitat Trend in Plan Area:

Appears stable. Larger streams and rivers have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Not averse to winding their way through dense branches and flying through tunnels. May fly around your legs if standing in water. May become more noticeable later in the afternoon, and often fly on cloudy and even rainy days. Both sexes feed low in clearings

in woodlands, where they can be found when away from water. Typically oviposit in running water.

Threats Relevant In or To the Plan Area:

Habitat - Some Ohio River tributaries are affected by acid mine drainage from old mines and past mining activity in the area. Sedimentation, channelization, and agricultural enrichment also occurs within drainages.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. While it appears stable or increasing in the state, no observations from National Forest System lands have been made within the last 20 years.

Arrowhead Spiketail (*Cordulegaster obliqua*)

Group: Odonates

Conservation Categories: Ranked #69 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G4

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☐YES ☒NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). In the Wayne, there are three observations in the GIS database from 2001-2018 in the Athens Unit (Dorr Run-Hocking River and East Branch Sunday Creek HUCs) and in Marietta Unit (Eightmile Creek-Little Muskingum River HUC).

Population Trend Statewide and in the Plan Area:

Stable in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Primary Headwater Streams.

Inhabits headwater and small inland streams, as well as streams reduced to series of small pools during drier weather.

Habitat Trend in Plan Area:

Appears stable. Primary headwater streams have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). The Marietta Unit has the highest concentration of high-quality streams compared to the other units.

Relevant Life History & Other Information:

Adults spend a week or more away from water until they sexually mature. Both sexes hang in shrubs at waist to chest height at, or near, water.

Threats Relevant In or To the Plan Area:

Habitat - Some streams are affected by acid mine drainage from old mines and past mining activity in the area. Sedimentation, channelization, and agricultural enrichment also occurs within drainages.

Rationale for SCC Determination:

There is insufficient scientific information available to conclude there is a substantial concern about this species' capability to persist in the plan area over the long-term. While it appears stable or increasing in the state, few observations from National Forest System lands have been made within the last 20 years.

Comet Darner (*Anax longipes*)

Group: Odonates

Conservation Categories: Ranked #74 as Ohio aquatic invertebrate Species of Greatest Conservation Need; NatureServe rank G5 (Note: Global ranking last reviewed in 1985 and may be outdated)

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). In the Wayne, there are six observations in the GIS database from 2012-2019 in the Athens Unit (Dotson Creek-Sunday Creek, Lost Run-Monday Creek HUCs) and Ironton Units (Lick Run-Pine Creek and Johns Creek-Indian Guyan Creek HUCs). This species was found statewide in pretty decent numbers during the Ohio Dragonfly Survey. The lack of observations in southeastern Ohio (although there were several) and northwestern Ohio follows the pattern of a low number of observers in these two regions of the state. Comet darners are very hard to photograph, so that may also contribute to the lack of observations in iNaturalist. A few of the southeastern Ohio

observations were on National Forest System land (personal communication, Lynda Andrews, 2020).

Population Trend Statewide and in the Plan Area:

Increasing in Ohio (ODNR 2015). Trend in the Wayne unknown.

Habitat:

Narrow environmental specificity: Specialist or requires key ecosystem characteristics that are common in the area of interest. Wetlands; Lakes, Ponds, & Reservoirs.

Inhabits wetlands and human-made lakes and ponds, typically with extensive beds of grasses and lacking fish.

Habitat Trend in Plan Area:

Appears stable. Wetlands have moderate-high integrity, while ponds, lakes, and reservoirs have moderate-high integrity (see *Aquatic Ecosystems & Watersheds Supplemental Report*). Many smaller waterbodies in the Wayne are of unknown integrity. Some ponds and lakes are stocked with fish, which can be detrimental to Odonates.

Relevant Life History & Other Information:

Males fly along or offshore, usually at waist to chest height. Females may come to water in some numbers on cloudy mornings, when males are not present. Comet darner larvae are probably the top predators in occupied wetlands.

Threats Relevant In or To the Plan Area:

Predation - The introduction of fish into wetlands by the public can be detrimental to Odonates.

Habitat - Destruction of habitat by draining or breaching of ponds and wetlands for various reasons or due to lack of maintenance can harm populations.

Rationale for SCC Determination:

A substantial increase of records for this species were found in or near the plan area during the recent Ohio Dragonfly Survey, and they are considered increasing in Ohio. Their habitat appears to be stable with moderate-high integrity. Andrews does not see a concern with this species persisting in the area long-term (personal communication, Lynda Andrews, 2020). Therefore, there is not a substantial concern for long-term persistence of this species in the planning area and it is not recommended for consideration as a potential species of conservation concern at this time.

Blue Corporal (*Ladona deplanata*)

Group: Odonates

Conservation Categories: NatureServe rank G5 (Note: Global ranking last reviewed in 1990 and may be outdated)

Known to Occur in the Plan Area?..... ☒YES ☐NO

Is there sufficient scientific information available about this species' population & habitat trends within the plan area? ..... ☒YES ☐NO

Is this species identified as a potential SCC, because there is a substantial concern for long-term persistence in the plan area?..... ☐YES ☒NO

Distribution and Abundance in the Plan Area:

Extensive range (multiple states/Canada) which includes Ohio, where it is common (11-29 counties) (ODNR 2015). Very common in the Wayne with observations in all three units from 2003-2019 in 11 HUCs, with one to two observations per HUC. Recent Ohio Dragonfly Surveys (2017-2019) recorded numerous records of this species, particularly in the southern half of Ohio.

Population Trend Statewide and in the Plan Area:

Unknown (ODNR 2015). The recent Ohio Dragonfly Survey (2017-2019) seems to indicate this species is increasing in Ohio (personal communication, Lynda Andrews, 2020). This is a southern species that appears to be extending its range northward.

Habitat:

Broad environmental specificity: Generalist or community with all key requirements common. Lakes, Ponds & Reservoirs; Larger Streams and Rivers.

Occurs at lakes, ponds, slow streams, and ditches with wooded or open borders and at least some mud.

Habitat Trend in Plan Area:

Appears stable. Lakes, ponds, and reservoirs have moderate-high integrity, while larger streams have moderate-high integrity as well (see *Aquatic Ecosystems & Watersheds Supplemental Report*).

Relevant Life History & Other Information:

Both sexes commonly perch on the ground in clearings, on roads and paths, and on the sunny side of tree trunks and buildings; also on plant stems at times. It can be common in optimal habitats and one of the earliest Odonates to emerge in spring in its range.

Threats Relevant In or To the Plan Area:

Habitat - Destruction of habitat by draining or breaching of ponds and wetlands for various reasons or due to lack of maintenance.

Rationale for SCC Determination:

Numbers appear to be increasing in the state and within the plan area according to the recent Ohio Dragonfly Survey, although the Ohio Department of Natural Resources

considers this species' population trend as unknown. Habitat trends in the plan area also appear stable. Therefore, there is no substantial concern for long-term persistence of this species in the planning area and it is not recommended for consideration as a potential species of conservation concern at this time.

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