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www.defenders.org

March 23, 2020

Wayne National Forest Supervisor's Office c/o Forest Plan Revision Team
13700 US Highway 33
Nelsonville, OH 45764

Attn: Comments on Draft Assessment

Delivered via online comment portal: https://cara.ecosystem-management.org/Public/CommentInput?Project=53485

Dear Supervisor Gilbert:

Thank you for the opportunity to submit these comments on the Wayne National Forest's Draft Assessment, as outlined on the Forest's Planning website.[1] Defenders is a national nonprofit conservation organization dedicated to the protection of all native plants and animals in their natural communities. For over 70 years, Defenders has protected and restored imperiled species throughout North America by securing and strengthening conservation policies, working on the ground, and upholding legal safeguards for wildlife and habitat in the courts. We represent more than 1.8 million members and supporters nationwide.

There is overwhelming global scientific consensus that we are facing a global biodiversity crisis (the looming "Sixth Mass Extinction"). Last spring, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), an independent intergovernmental body representing 130 member countries, delivered a stark and alarming scientific consensus: human activity has devastated the natural world, and biodiversity "is declining faster than at any time in human history."[2] Based on an exhaustive compilation of nearly 15,000 information sources,[3] the IPBES estimates that up to one million species—nearly a quarter of the known life on earth—could face extinction within decades.[4] The drivers of this decline include habitat loss, overexploitation of species, pollution, and climate change, which is already affecting "almost

[1] https://www.fs.usda.gov/detail/wayne/landmanagement/planning/?cid=fseprd695580
[2] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Report of the Plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on the work of its seventh session, Addendum: "Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services," Key Message A. (May 29, 2019). Available at https://www.ipbes.net/system/tdf/ipbes_7_10_add-1-_advance_0.pdf?file=1&type=node&id=35245
[3] United Nations Environment Programme. "IPBES Global Assessment underscores need for transformational change to safeguard life on Earth" (press release) (May 6, 2019). Available at https://www.cbd.int/doc/press/2019/pr-2019-05-06-IPBES-en.pdf
[4] IPBES, Summary for Policymakers *op. cit.*, Key Message A5.

half (47 percent) of threatened terrestrial mammals, excluding bats, and one quarter (23 percent) of threatened birds."[5] In fact, climate change is accelerating and exacerbating the effects of these other threats. At the same time, nature provides tremendous benefits to society. For example, scientists estimate the economic value of ecosystem services for the U.S. and Canada alone at $8.9 *trillion* dollars per year.[6] Thus, the loss of biodiversity and destruction of nature fundamentally harms human society.

Meeting the twin crises of biodiversity loss and climate change is the defining challenge of our time, and National Forest lands are vital component of accomplishing this. The U.S. Forest Service manages more than 193 million acres—over 8 percent of all U.S. lands—an area about the size of Texas and twice the size of the National Park System. The National Forest System comprises 154 national forests, 20 national grasslands and one national prairie (collectively referred to as "national forests"). Located in 42 states, Puerto Rico and the U.S. Virgin Islands, these lands are essential to the conservation of wildlife habitat and diversity. National forests encompass three-quarters of the major U.S terrestrial and wetland habitat and support more than 420 animals and plants listed under the Endangered Species Act (ESA) and 3,250 other at-risk species.

We offer these comments in hopes of improving the Assessment and subsequent Plan Development processes, toward the goal of increasing the Wayne National Forest's role in protecting biodiversity and our climate. Per the direction of Forest personnel, the main focus of these comments is on providing the information specifically requested by the Forest: 1) Are any major changed ecological, economic, or social conditions or trends missing or mischaracterized? And 2) Do any factual changes need to be made?

The Assessment and its supplemental reports have fallen far short of adequately incorporating local information, including both peer-reviewed research from the area, and resources provided by local commenters.

The 2012 Planning Rule requires the responsible official to "use the best available scientific information to inform the planning process." The planning area is home to one of the largest research universities in the state, Ohio University, as well as several other colleges. Professors and students at these institutions have conducted extensive research on the forests, early successional habitats, aquatic ecosystems and wildlife in and around the Wayne National Forest Planning area. Many of these studies have led to peer-reviewed publications that are immediately relevant to questions about the status and trends of biological resources in the planning area. It is frankly shocking that the Assessment cites only a miniscule subset of these

[5] *Ibid.*, Background B14.
[6] IPBES. 2018. *Summary for policymakers of the regional assessment report on biodiversity and ecosystem services for the Americas of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.* Bonn, Germany: IPBES Secretariat. Available at https://ipbes.net/assessment-reports/americas

copious and important resources. We strongly recommend that the Forest should incorporate into its assessment the work of the following researchers, particularly with respect to forest stand dynamics and succession, biogeochemical influences on forest ecology, the ecology of imperiled species (e.g, bobcats and bats) in our region, and biological impacts of various development activities (not an exhaustive list):

Name	University	Department	Selected References
Dr. Jared DeForest	Ohio U	Plant Biology/ Forest Ecology	https://www.ohio.edu/cas/deforest
Dr. Joseph Johnson	Ohio U	Biology	https://www.ohio.edu/cas/jjohnson
Dr. Glenn Matlack	Ohio U	Plant Biology/ Forest Ecology	https://www.ohio.edu/cas/matlack
Dr. Brian McCarthy	Ohio U	Plant Biology/ Forest Ecology	https://www.ohio.edu/cas/mccarthy
Dr. Scott Moody	Ohio U	Biology	https://www.ohio.edu/cas/moody
Dr. Viorel Popescu	Ohio U	Biology	https://www.ohio.edu/cas/popescu
Dr. David Rosenthal	Ohio U	Plant Biology/ Forest Ecology	https://www.ohio.edu/cas/rosentha
Dr. Rebecca Snell	Ohio U	Plant Biology/ Forest Ecology	https://www.ohio.edu/cas/snell

Additionally, during the Assessment public input process, many people provided extensive resources that they intended for the Forest to incorporate into the Assessment and subsequent planning. Of particular note, the Working Group on Ecological Forest Management, Climate Protection and Sustainable Economies submitted a nearly 90-page annotate bibliography of relevant scientific resources, and the Biodiversity Working Group submitted an exhaustively referenced discussion of important ecological topics facing the Forest. We are deeply disappointed that the Forest has incorporated very few of these resources into the Assessment. As we discuss below, several factual gaps and mischaracterizations of current condition result from omissions of these important resources.

Planning rule direction on designation of Species of Conservation Concern (SCCs) and designated areas has been applied inconsistently and incompletely, leading to substantial uncertainties.

Species of Conservation Concern

The Planning Rule stipulates that the contents of the Assessment should include, among other topic items, "Potential species of conservation concern present in the plan area" and "potential need and opportunity for additional designated [wilderness areas and wild and scenic rivers]."[7] Defenders recognizes that identifying SCCs is the responsibility of the regional forester,[8] and that doing so is part of the "process for plan development or revision," but the rule does not specify when during the process it should occur. However, the regional forester should identify SCC early enough that integrating them into the assessment, including the identification of key ecosystem characteristics, does not delay the assessment process.[9] This, in turn, requires that the Forest provide recommendations on SCCs to the regional forester in a timely fashion. Defenders was therefore dismayed at the incompleteness of the "At-Risk Species" Supplemental Report's treatment of animal species. We appreciate that the Forest has cast a wide net in selecting species to evaluate; however, the Supplemental itself only contains evaluations for four species (green salamander, black bear, ruffed grouse, and cerulean warbler). The Forest needs to "show its work" and make public its evaluations recommendations for all of the animal species being considered. This must be done prior to the release of the final assessment, so that the interested public has the opportunity to evaluate and comment on whether the best available science was used, and whether that information supports the Forest's recommendations.

We note further that the planning rule contains only two criteria the regional forester can use to identify SCC:[10]

- The species must be known to occur in the plan area.
- The best available scientific information indicates substantial concern about the long-term persistence capability of the species in the plan area.

The responsible official does not have the discretion to exclude species the regional forester has found to meet these regulatory criteria. Our interpretation is that it is the role of the responsible official to provide the regional forester with information about species occurrence

[7] 36 C.F.R. § 219.6(b)(5) and (15)
[8] 36 C.F.R. § 219.7(c)(3).
[9] See FSH 1901.12, Ch. 10 § 12.13.4.b. The planning handbook also suggests "species at risk" as a key ecosystem characteristic. FSH 1901.12, Ch 10 § 12.13 (Exhibit 01).
[10] 36 C.F.R. § 219.9(c).

and capability to persist in the plan area and to identify "potential" SCC.[11] We reiterate that the Forest should adhere to these criteria in conducting its evaluations of animal species.

Unlike the animal species, the "At-Risk Species Supplemental Report" does contain a preliminary evaluation and recommendation for the potential plant SCCs.[12] For these species, however, we are concerned that the bulleted criteria above were not followed. Numerous species that the Recommendations table affirms are both "known to occur in Plan area" and have "Substantial concern over persistence?" based on threat information provided in the document, but nonetheless receive an Initial Recommendation of "Do Not Include." The rationale given is generally that the species is common outside of the plan area, which is not one of the criteria.

We have attached, as Appendix A, the comments that we submitted to the Wayne's initial call for information for the assessment process, which outlines in full our views of how the Forest should use the Assessment process to build a firm foundation for meeting its obligations under the National Forest Management Act to provide for the diversity of habitat and animals found on national forests.[13]

Designations

There is also a substantial disparity in the level of completeness between the Wild and Scenic Rivers and Wilderness Supplemental Reports. The Wild and Scenic Rivers section completed the evaluation and eligibility analysis for all the creeks and tributaries within the plan area. The Wilderness report, on the other hand, reports the results of only the first step, Inventory. Moreover, the Wilderness report provides no time frame or additional information about when the three subsequent steps (Evaluation, Analysis and Recommendation) will be completed. It is impossible for the public to provide meaningful feedback when the Forest has published such preliminary information.

[11] 36 C.F.R. § 219.6(b)(5), [t]he term "potential" SCC is used in the rule as a requirement for assessments, but is not defined. It should apply to any species that *may* meet the two criteria in 219.19(c). The assessment should include relevant information about the status and trend of all species considered for SCC so that the regional forester can review it and use it in making the decision.

[12] At Risk Species Supplemental, Appendix A. Initial Recommendations of Potential Plant Species of Conservation Concern

[13] 16 U.S.C. § 1604(g)(3)(B)

The Assessment should incorporate substantially more information about the impacts of climate change on at-risk species, frameworks for maximizing resilience and adaptation, and the Forest's contribution to emissions reductions.

At-risk Species

We appreciate the attention paid in the assessment to the role of climate change as driver and stressor and the likelihood that it will impact forest ecosystems in novel ways. Unfortunately, the subject is not handled consistently throughout the documents. While the treatment is thorough in some places, the "At-Risk Species" Supplemental states: "Climate change threats to listed species' habitats may be the most complex and unpredictable in time and space. Climate influences on species' primary constituent elements—the critical needs for species proliferation—are variable, depending on species needs. Comprehensively covering these influences is outside the scope of this document" (page 23). In fact, given the Forest's mandate to provide for diversity, and the importance of evaluating species' long-term persistence in the plan area as a criteria in determining SCCs, providing a robust description of climate change impacts is very much within the purview of the Assessment. Defenders of Wildlife's publication "Planning for Climate Change," which will be re-submitted to the Forest Service along with these comments, may be helpful in this regard.

Resilience and Adaptation

Defenders also provided input to the Wayne during the original pre-assessment comment period, regarding development of resilience and adaptation strategies. This included already-published frameworks (including several Forest Service documents), guides to understanding impacts, and compendia of adaptation strategies. It appears that little of this info was cited in the Assessment or Supplemental Reports. We have reproduced those comments in full as Appendix B of this document and urge the Forest Service not to wait until the Plan Development phase to begin incorporating climate change considerations into planning. We particularly urge the Forest to incorporate the information on Landscape Diversity, Connectedness, and Resilience that was covered quite well in the "USDA Forest Service Section, Subsection, and Landtype Descriptions for Southeastern Ohio."[14]

Carbon Storage and Greenhouse Gas Emissions

The previously provided text in our attached Appendix B also provides numerous references about important role of the Wayne in providing ecosystem services like carbon storage, and about the greenhouse gas emissions from forest management activities like logging. We were disappointed to see that few if any of these references were incorporated into the Forest Carbon Supplemental Report or other Assessment materials. More worryingly, the Carbon report mischaracterizes the findings of Loeffler et al, 2014 (which stated that some, not most,

[14]Iverson, LR, JL Bartig, GJ Nowacki, MP Peters, JM Dyer, TF Hutchinson, SN Matthews, and BT Adams. 2019. USDA Forest Service Section, Subsection and Landtype Descriptions for Southeastern Ohio. Northern Research Station Research Map NRS-10. 70 pp. https://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs10.pdf

carbon is stored in hard wood products), to claim, without evidence that, "Although harvest transfers carbon out of the forest ecosystem, **most** of that carbon is not lost or emitted directly to the atmosphere. Rather, it can be stored in wood products for a variable duration depending on the commodity produced," a notion disputed by several of the references that we provided by that the Forest chose not to cite.

The following statement in the Carbon Supplemental Report is at odds with best available science on carbon storage and forest aging:

> The Wayne National Forest age structure indicates that most stands are middle to older aged (over 50 years old) and few stands are young (figure 10). If the Wayne continues on this aging trajectory, more stands will reach a slower growth stage in coming years and decades (figure 10), potentially causing the rate of carbon accumulation to decline and the Wayne may eventually transition to a steady state in the future.

Given that white oak can live 400-500 years, hickories and beech over 300 years, and many other overstory species have similar lifespans,[15] characterization of 50+ year old forests as "aging" seems inappropriate. Furthermore, the characterization of these forests as approaching a "slower growth stage" is not borne out by the science; for instance, one major study of over 400 species found that "for most species mass growth rate increases continuously with tree size. Thus, large, old trees do not act simply as senescent carbon reservoirs but actively fix large amounts of carbon compared to smaller trees; at the extreme, a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree."[16] Closer to home, a 2017 study from Southeast Ohio, which concluded that, "Because most deciduous forest in eastern North America is <80-yr-old, these results suggest that most forest is still accruing biomass and has yet to reach a stable density and composition."[17]

For additional resources, see Appendix B and the reports of the Working Groups on Biodiversity and on Working Group on Ecological Forest Management, Climate Protection and Sustainable Economies.

The Forest Service needs to re-evaluate its oil and gas leasing assessment in light of a recent court decision.

Closely related to issues of climate change are questions about the effects conventional oil and gas exploration and fracking. The climate and other effects of fossil fuel production in the Wayne are a major concern to local communities, as we documented exhaustively in the

[15] Harlow, Harrar, Hardin & White. 1991. Textbook of Dendrology, Seventh Ed. McGraw-Hill.
[16] Stephenson, N., Das, A., Condit, R. *et al.* Rate of tree carbon accumulation increases continuously with tree size. *Nature* **507,** 90–93 (2014). https://doi.org/10.1038/nature12914
[17] Holmes MA and GR Matlack. 2017. Agricultural history drives structure and tree species composition of second growth forest over 100 years in southeastern Ohio, USA. https://doi.org/10.1111/jvs.12516

submission from the Working Group on Ecological Forest Management, Climate Protection and Sustainable Economies.

In a substantial new development since the January 2020 release of the Draft Assessment and Supplemental materials, on March 13, U.S. District Judge Michael Watson said the U.S. Forest Service and U.S. Bureau of Land Management:

> [D]emonstrated a disregard for the different types of impacts caused by fracking in the Forest. The agencies made decisions premised on a faulty foundation: that the 2006 Forest Plan's and 2006 EIS consideration of vertical drilling sufficiently accounted for the impacts of fracking. Each iteration of agency review built upon that faulty foundation—the 2016 EA relied on the 2012 SIR, which relied on a 2012 BLM letter, which relied on the 2006 Forest Plan and 2006 EIS—but neither USFS nor BLM stopped to take that "hard look" that was required of them.

Watson's ruling requires the agencies to redo their environmental analysis of the potential harms from fracking in the Wayne. It is imperative that this analysis fully account for the negative of fracking to the climate, water quality, air quality, wildlife and local rural communities. This replacement EIS should include and analyze a "no fracking" alternative. Furthermore, as the planning process moves forward, the Wayne must commit to a robust and thorough development of planning alternatives examination of the environmental impacts of each.

The Assessment inappropriately takes a narrow view of landscape and habitat context.

The presentation given by Forest Supervisor Gilbert at the Forest Headquarters on March 3, 2020 indicates that a major "Focus" of the Forest's current efforts is "Accelerated oak management with an emphasis on early successional habitat creation." The Assessment itself states, "There is a general overrepresentation of middle-aged forest stands in the Wayne National Forest and a relative underrepresentation in availability of habitats such as early successional forest. . ." and "Forest age class distribution based on plot surveys indicate that 0.1% [roughly 244 acres] of National Forest System land is comprised of forested lands less than 10 years of age," (page 20). This framing of the data seems to imply that the Forest is moving in the direction of concluding that it needs to move in the future toward substantially larger amounts of logging, under the pretense of correcting this purported "underrepresentation" of early successional habitat.

Importantly, however, these figures are based only on the currently held National Forest System Lands, not the broader Proclamation Boundary, let alone the wider 17-county Planning and Study Area. This is inconsistent with how that Assessment and Supplemental Reports have treated other aspects and conditions of the plan area. In assessing habitat across the landscape,

it is of vital importance to place the forest in the context of the full plan area. The "USDA Forest Service Section, Subsection, and Landtype Descriptions for Southeastern Ohio"[18] report does exactly this, characterizing the ecological landtypes of the entire 17-county planning area. Each of the subsections described within this report is characterized as having substantially higher amounts of grassland and shrubland than the 0.1% that Assessment reports for Forest Service System Lands. Further, this study does not report age classes of forested land in the 17-county area, and should therefore be supplemented by data on the age classes of forested lands throughout the 17-county area.

The Assessment must place its view of the Forest's role in providing early successional habitat into this larger scale, plan-area context. At a minimum, the Forest should report on trends of agricultural abandonment and private lands logging that influence the amount of early successional, old-field, shrub and young forests throughout the plan area. To give one example, in late 2018, a 300-acre parcel of private land in The Plains, just outside the proclamation boundary, was clearcut, reportedly for development, but no associated permits have been issued or plans posted,[19] suggesting that that area may remain as early successional habitat for years to come. Similarly, the forest must place its percentage of older stands (reported at 29%) into the full planning area context. It may turn that the National Forest System Lands within the Wayne are uniquely positioned to provide mature forest habitat, and the surrounding plan area be able to contribute to early successional habitats; knowing this might dramatically alter the needs and priorities moving into the plan development phase.

The Assessment is incomplete in its evaluation of several other aspects of forest ecology and the impacts of management practices.

More detail is also needed to ensure that the Assessment has fully incorporated the best available science regarding the following topics:

The impact of prescribed fire and mechanical thinning on species other than oak, particularly understory and herbaceous species.

The Assessment discusses at length the role of prescribed fire and mechanical thinning in promoting the regeneration of white oak, but the Assessment should also discuss the impact of these treatments on understory and herbaceous species. Given the large number of potential SCC plants, the Assessment should discuss how the treatments aimed at increasing oak recruitment might impact these species. The assessment should also incorporate new research, conducted in our region, which suggests that maple species, which have arbuscular mycorrhizal

[18]Iverson, LR, JL Bartig, GJ Nowacki, MP Peters, JM Dyer, TF Hutchinson, SN Matthews, and BT Adams. 2019. USDA Forest Service Section, Subsection and Landtype Descriptions for Southeastern Ohio. Northern Research Station Research Map NRS-10. 70 pp. https://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs10.pdf

[19] https://www.athensnews.com/news/local/major-development-site-or-just-an-ugly-clearcut/article_3ec9cfe0-1439-11e9-8cb5-cb00f32c0c9a.html

fungi, outcompete oaks, which have ectomycorrhizal fungi, in lower organic matter, mineral soils that result when leaf litter is burned.[20] This research suggests that burning might actually be counterproductive if the goal is oak regeneration.

The Assessment is incomplete in its survey of pests and pathogens and their impacts on forest species.

The rise in non-native insects and pathogens that are impacting tree species. The Assessment gives particular attention to pests and pathogens that impact oak regeneration, but neglects other important insect pests and pathogens that have the potential to impact other species, such as the hemlock woolly adelgid, Emerald ash borer, butternut canker, beech bark disease, Asian long-horned beetle, and all of the various white pine diseases. The Assessment should also include a robust discussion of how a warming climate might exacerbate the impacts of these pests, through decreased winter die-off, shortened generation times, drought stress that impedes tree defense, and other mechanisms.

The Assessment does not discuss the current status of pesticide use on the Forest, or to describe the terrestrial and aquatic ecosystem impacts of herbicide and insecticide use.

The Assessment makes passing mention of chemical herbicides, in the section on promoting pollinators (page 27) and in a footnote on page 25, which reads: "Additional consultation may be necessary during plan development and effects analysis to determine the extent to which national forest activities affect newly listed species under different alternatives, considering the biological effects of herbicides on not only mussel species themselves but the fish host species in which mussels rely for reproduction." We argue that this information should be presented more thoroughly within the Assessment, rather than waiting for plan development. There may well be a need to change pesticide use in order to promote pollinators, insect populations more generally, and aquatic species health, including amphibians and aquatic insects in addition to mussels and fish. With so little information presented in the Assessment, it is difficult to know if there is a need to change.

The Forest Service Should clarify the relationship between the "Assessment" document and the Supplemental reports.

The ten "Supplemental Reports" released with the Assessment document form an important knowledge base about the status and trends of many important conditions in the planning area and truly are the actual "Assessment." The document titled "Assessment" is a summary and does not fully capture the information that the Service has compiled. The documents should be renamed to reflect this, with the "Supplemental" information being officially recognized as forming the core of the Assessment.

Thank you for your attention to the comments of Defenders of Wildlife. We look forward to working with the Wayne National Forest to ensure that the final Forest Plan meets the mandates under NFMA to provide for diversity and the viability of species, in a manner that

[20] DeForest JL and RS Snell. 2020. Tree growth response to shifting soil nutrient economy depends on mycorrhizal associations. New Phytologist https://doi.org/10.1111/nph.16299

also ensures that the Forest can provide ecosystem services, like watershed protection, carbon sequestration, clean air, and opportunities for recreation and education, far into the future.

Sincerely,

Aimee Delach

Senior Policy Analyst, Climate Adaptation

ATTACHMENTS: Appendix A begins on page 12; Appendix B begins on page 48.

APPENDIX A. Defenders of Wildlife's 2018 Comments Regarding Planning for Diversity, Connectivity and Climate Change

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May 21, 2018

Wayne National Forest
Attn: Plan Revision
13700 US HWY 33
Nelsonville, OH 45764

Delivered via email to: WaynePlanRevision@fs.fed.us

Dear Lisa Swiderski:

Thank you for the opportunity to contribute to the development of the Wayne National Forest (WNF) forest plan revision assessment. This letter is in response to the Notice initiating the assessment phase of the forest plan revision for the WNF (83 FR 17359), and its invitation to participate in the development of the assessment. We are providing information about ecological conditions important to wildlife species that we have identified as a priority for management. We offer suggestions on the assessment process that we believe will both improve conservation outcomes and help fulfill the obligations for forest planning.

Developing and implementing robust, science-based forest plans under the 2012 Planning Rule (planning rule) (36 C.F.R. § 219) will result in public confidence that the Forest Service is fulfilling its mission and conservation obligations and enabling integrated landscape-level decision making and more efficient project-level implementation.

These comments draw from Defenders of Wildlife's extensive history of engagement in the development and implementation of the 2012 Planning Rule, particularly the contents of our three publications on forest planning, wildlife and habitat, all of which are attached as appendices to this document:

1) *Planning for Diversity*
2) *Planning for Connectivity*

3) *Planning for Climate Change* (draft)

The assessment should present information provided by the forest plan and other monitoring and other data collection to allow the responsible official and interested parties to identify how current conditions and trends can be influenced directly or indirectly by Forest Service management, and based on this, identify specific needs for change in plan components. The assessment should therefore seek to answer relevant questions focused on the "need for change." This should focus on experience with the current plan and provide the basis for evaluating whether specific direction should be changed. The assessment should be forward-looking, anticipating future stressors, such as those driven by climate change, and facilitating projections of future trends in the condition of the plan area.

Our comments are comprised of the following sections:

1. Authority of Forest Service to Manage Wildlife
2. Best available scientific information
3. Assessing "Diversity of plant and animal communities"

   Step 1: Which federally protected, potential species of conservation concern, and potential focal species occur in the forest?
   Step 2: What are the ecosystems and habitat types that exist across the forest?
   Step 3: What are the key ecosystem characteristics and ecological conditions that are necessary for at-risk species?
   Step 4: What key areas support target species?
   Step 5: What conditions and trends are necessary for evaluating ecological integrity?
   Seven questions on past, current and future conditions
4. Appendix 1: State Listed Animals and Species of Concern
5. Appendix 2: State Listed Plants

Please let us know if you have any comments or questions regarding the content of this letter. We look forward to working with you on the next phase of the forest plan revision.

Sincerely,

Peter Nelson, Director, Federal Lands Program
Lauren McCain, Senior Federal Policy Lands Analyst
Aimee Delach, Senior Policy Analyst {and local contact: *adelach@defenders.org*}

I. Authority of the Forest Service to manage wildlife

Some national forests engaged in management plan revision processes have mistakenly indicated that states, represented by their wildlife agencies, have ultimate management authority over wildlife. The courts have consistently upheld that the federal government has supremacy over its lands under the Property Clause of the U.S. Constitution (Article IV, Section 3), which grants Congress the "Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States." In Kleppe v. New Mexico the Court stated, "the 'complete power' that Congress has over public lands necessarily includes the power to regulate and protect the wildlife living there." 426 U.S. 529, 541 (1976). The Court in Kleppe also clearly addressed the limited nature of state powers: "those powers exist only in so far as [their] exercise may be not incompatible with, or restrained by, the rights conveyed to the Federal government by the Constitution." Id. at 545. While the Forest Service clearly has the authority to manage wildlife habitat, it also has the power to manage species populations. This includes managing the public's use of wildlife on national forests, grasslands, and prairies.

II. Best available scientific information

The assessment phase of the planning process provides the scientific foundation for the remainder of the planning process. The assessment report should provide a common understanding of the science underpinning the management issues facing the national forest, which will facilitate a more transparent and collaborative approach to resolving those management issues and a more productive discussion of plan components for the revised plan.

The assessment must be informed by the best available scientific information (BASI).[21] The assessment report must document which information is the most accurate, reliable and relevant to the issues considered, the basis for that determination and relevant information needs.[22] We will include below some information relevant to particular species.

Assessments must consider information from studies, monitoring reports, plans, other assessments and documents.[23] It should reference specific information in these sources that supports its conclusions and that it determines is the BASI. Assessments should also include the review of the conservation planning and land-use policies of other entities required by

[21] 36 C.F.R. § 219.3, 219.6(a)(3).
[22] 36 C.F.R. § 219.6(a)(3).
[23] 36 C.F.R. § 219.6(a)(1).

219.4(b)(2). Information for listed species should include relevant portions of applicable recovery plans, and assessments of progress towards recovery.

The assessment should consider the results of prior monitoring of the existing plan. The assessment report should include a summary of what was learned from that monitoring, focusing on the effects and effectiveness of existing plan components.

It is also important to get the assessment done before attempting to move forward to other planning steps. It is true that the "planning framework" is an iterative process, and the three phases may overlap.[24] However, each step in the planning process depends on the steps before it, and if additional work is done on a prior step, additional work will also be needed on any subsequent steps that have been taken. For example, if information is added to the assessment after a "need for change" has been determined, the need for change will need to be revisited and documented. It does not shorten the planning process to move ahead without completing the assessment. (However, if new information, meaning it was previously not "available," is found, it should be considered.)

III. **Assessing "Diversity of plant and animal communities"**

During the assessment phase, the Forest Service collects and evaluates ecological information to develop plan components associated with ecosystem diversity, integrity, and species persistence.[25] Assessments evaluate conditions and trends for ecosystems and species in the context of a broader landscape.[26] This context is especially important to at-risk species, because their risk of persistence in the plan area is related to circumstances affecting their broader status, and for some species it is their "contribution" to that broader scale status that is important to complying with the planning rule.[27] Assessments are then used during plan

[24] 36 C.F.R. § (219.5(a))
[25] 36 C.F.R. § 219.19 defines *ecological integrity* as, "[t]he quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence." There is an obligation to, "provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area" under 219.9(b)(1). The rule defines v*iable population* as, [a] population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments" at § 219.19.
[26] 36 C.F.R. § 219.5(a)(1).
[27] 36 C.F.R. § 219.9(b)(2).

revision to determine if changes to the existing plan are needed and to inform the development of plan components.[28]

The planning rule requires the assessment to identify and evaluate fifteen categories of existing information relevant to the plan area.[29] The requirements that relate most directly to "diversity" include the following subsections:

1. Terrestrial ecosystems, aquatic ecosystems, and watersheds;
3. System drivers, including dominant ecological processes, and stressors, and the ability of ecosystems to adapt to change; and,
5. Threatened, endangered, proposed and candidate species, and potential species of conservation concern (SCC).

Though outlined as 15 discrete topics in the 2012 rule, we recommend that assessments integrate tasks 1, 3, and 5 because these serve as the basis for evaluating the ecological condition of the landscape. Planning directives support this integrative approach.[30]

An assessment is also used to guide the development of the monitoring program.[31] A monitoring evaluation report must in turn be used to "inform adaptive management of the plan area."[32] The assessment should therefore be developed with adaptive management in mind – by identifying assumptions associated with ecosystem integrity or species persistence that could be tested during plan implementation and monitoring, for example. The assessment should also identify missing information so that it can be collected and evaluated later to determine if the plan components need to change. The assessment report must document that missing information[33] and address other key considerations. We recommend the following step-wise process.

Step 1: Which federally protected, potential species of conservation concern, and potential focal species occur in the forest?

[28] 36 C.F.R. § 219.7(c)(2).
[29] 36 C.F.R. § 219.6(b).
[30] FSH 1909.12, ch.10 § 12.1, "[s]ections 12.1 through 12.55 of this Handbook describe considerations for assessing ecological topics. While these sections cover topics individually, Responsible Officials are encouraged to integrate these topics together in the assessment report.
[31] 36 C.F.R. § 219.5(a)(3), "[t]he plan-level monitoring is informed by the assessment phase…"
[32] 36 C.F.R. § 219.12(d)(2).
[33] 36 C.F.R. § 219.6(a)(3), "[t]he report should document information needs relevant to the topics…"

The planning rule requires that the combination of ecosystem and species-specific plan components provide ecological conditions necessary for at-risk species. It is important to keep this overriding objective in mind from the beginning of the process to ensure the revised plan meets the rule's requirements at the end.[34]

To improve the effectiveness of ecosystem plan components in meeting the needs of individual species, and to generally improve the efficiency of the planning process, we strongly recommend that the "coarse filter" conservation strategy be designed with selected species in mind.

Consequently, the first factor that should be considered in assessing "diversity" is the set of target species for the forest plan. Specifically, the habitat and other ecological needs of some individual species should be included when defining ecosystems and selecting their key characteristics. Target species would be selected from among:

1. Federally threatened, endangered, proposed and candidate species
2. Species of Conservation Concern identified pursuant to 219.9(b)
3. Focal species selected pursuant to 219.12(a)(5)(iii)
4. Species commonly enjoyed and used by the public selected pursuant to 219.10(a)(5)

We focus on 1-3. Federally protected species and SCC are collectively referred to as "at-risk" species.

<u>Federal endangered, threatened, proposed, and candidate species relevant to the planning process</u>

Federally recognized species (endangered, threatened, proposed, candidate) must be identified through the coordination with Endangered Species Act (ESA) consulting agencies. The assessment phase provides an ideal opportunity for the WNF to seek and utilize species-specific information from consulting agencies, in this case the U.S. Fish and Wildlife Service (USFWS), that may be used to design the forest plan. Early engagement with these government agencies complies with the planning rule.[35] Early contributions to a forest plan by the USFWS can help make more efficient the Section 7(a)(2) consultation process for the plan and increase the

[34] 36 C.F.R. § 219.9(b).

[35] 36 C.F.R. § 219.4(a)(1) directs the responsible official to "engage the public—including" … "Federal agencies"… "early and throughout the planning process where feasible and appropriate." Under 219.6(a)(2), the regional forester should coordinate with and provide opportunities for government agencies "to provide existing information for the assessment."

likelihood of contributing to recovery of listed species and avoiding listing of proposed and candidate species under Section 7(a)(1) of the ESA.[36] Federally recognized species must be addressed by plan components if they "may be present" in the plan area[37] or if they are not present but would be expected to occur there to contribute to recovery. They should be included as target species documented in the assessment.

According to the U.S. Fish and Wildlife Service[38], the following listed animals and plants are found within the twelve counties that comprise the three units[39] of WNF. The Forest should assess whether these species are present within the plan area or could benefit from management prescriptions within the forest plan area:

Species	**Category**	**State Status**	**Federal Status**	**Counties**
Aconitum noveboracense Northern Monkshood	Plant	Endangered	Threatened	Hocking
Cryptobranchus alleganiensis alleganiensis Eastern Hellbender	Amphibian - Salamander	Endangered	Candidate	Athens, Monroe, Scioto, Vinton, Washington
Cyprogenia stegaria Fanshell	Invert. - fw bivalve	Endangered	Endangered	Athens, Gallia, Lawrence, Morgan, Scioto, Washington
Epioblasma obliquata obliquata Purple Cat's Paw	Invert. - fw bivalve	Endangered	Endangered	Washington (extirpated?), Scioto
Epioblasma torulosa rangiana Northern Riffleshell	Invert. - fw bivalve	Endangered	Endangered	Washington (extirpated?), Scioto
Epioblasma triquetra Snuffbox	Invert. - fw bivalve	Endangered	Endangered	Athens, Gallia, Hocking, Lawrence, Morgan, Scioto, Washington
Lampsilis abrupta Pink Mucket	Invert. - fw bivalve	Endangered	Endangered	Gallia, Lawrence, Scioto, Washington

[36] 16 U.S.C. §§ 1536(a)(1)-(2).
[37] 50 C.F.R. 402.12(c)(1), (d).
[38] http://ecos.fws.gov
[39] Athens Unit: Athens, Hocking, Morgan, Perry, Vinton, and Washington Counties; Ironton Unit: Gallia, Jackson, Lawrence, Scioto Marietta Unit: Monroe, Noble, and Washington Counties.

Isotria medeoloides Small Whorled Pogonia	Plant	Endangered	Threatened	Hocking, Scioto
Lampsilis orbiculata Pink Mucket	Invert. - fw bivalve	Endangered	Endangered	Athens, Morgan
Myotis septentrionalis Northern Long-eared Bat	Mammal	Species of Concern	Threatened	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Noble, Perry, Scioto, Vinton, Washington
Myotis sodalis Indiana Myotis	Mammal	Endangered	Endangered	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Perry, Scioto, Vinton, Washington
Nicrophorus americanus American Burying Beetle	Insect – beetle	Endangered	Endangered	Athens, Hocking, Morgan, Perry, Vinton
Plethobasus cyphyus Sheepnose	Invert. - fw bivalve	Endangered	Endangered	Athens, Gallia, Lawrence, Scioto, Washington
Pleurobema clava Clubshell	Invert. - fw bivalve	Endangered	Endangered	Athens, Hocking, Morgan, Scioto, Washington
Quadrula cylindrica cylindrica Rabbitsfoot	Invert. – fw bivalve	Endangered	Threatened	Washington (extirpated?)
Spiraea virginiana Appalachian Spiraea	Plant	Endangered	Threatened	Scioto
Trifolium stoloniferum Running Buffalo Clover	Plant	Endangered	Endangered	Hocking, Jackson, Lawrence, Vinton
Villosa fabalis Rayed Bean	Invert. – fw bivalve	Endangered	Endangered	Scioto

The ESA requires the Forest Service and other federal agencies to, "in consultation with and with the assistance of the Secretary (listing agencies), utilize their authorities in furtherance of

the purposes of this Act by carrying out programs for the conservation[40] of (listed species)."[41] Therefore the ESA requires that the Forest Service must use its authorities, including National Forest Management Act (NFMA) and its planning process and resulting plans, in furtherance of recovery of listed species.[42] Since forest plans govern all national forest management actions, the Preamble to the planning rule acknowledged that forest plans should be considered the program by which the agency complies with Section 7(a)(1).[43]

There is an existing process for interagency coordination that should be used to answer the question that the planning rule poses: *Does a forest plan contribute to recovery of listed species?* The Consultation Handbook used by the listing agencies describes "proactive conservation reviews" under ESA Section 7(a)(1).[44] According to this Handbook, such reviews are appropriate for major national programs, and they are also "appropriate for Federal agency planning." They would be especially helpful in confirming that the plan has included the ecological conditions necessary for recovery of listed species.[45] We recommend that the WNF work with the USFWS to conduct a Section 7(a)(1) conservation review for the WNF forest plan revision.

A forest plan should provide ecological conditions necessary for a recovered population. The assessment should provide the basis for this determination, and should therefore focus on identifying these ecological conditions with the participation of the USFWS. The Forest Service Planning Handbook recognizes recovery plans by stating that their "conservation measures and actions" should be considered.[46] The assessment should also evaluate progress made by the

[40] "Conservation" is defined by the ESA to mean "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."
[41] 16 U.S.C. §§ 1536(a)(1).
[42] 36 C.F.R. § 219.9(b)(1) requires that each forest plan include plan components that "provide the ecological conditions necessary to contribute to the recovery of threatened and endangered species …"
[43] "These requirements (to contribute to recovery) will further the purposes of § 7(a)(1) of the ESA, by actively contributing to threatened and endangered species recovery and maintaining or restoring the ecosystems upon which they depend." 77 Fed. Reg. 21215.
[44] "Endangered Species Consultation Handbook," U. S. Fish & Wildlife Service and National Marine Fisheries Service (1998), Section 5.1. (https://www.fws.gov/ENDANGERED/esa-library/pdf/esa_section7_handbook.pdf)
[45] The Consultation Handbook also encourages consultation at broader scales such as "ecosystem-based" consultations.
[46] FSH 1909.12, Ch. 20 § 23.13a, and additionally, the Handbook also suggests consideration of "limiting factors" and "key threats" (which should include those that were the basis for listing the species). Finally, the Handbook states that the planning team should, "Engage with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, as appropriate, in the evaluation of existing conditions for threatened and endangered species. The direct use of recovery plans for forest planning should be a goal, and more than a "consideration," but it is unlikely that recovery plans would provide complete answers to what the necessary ecological conditions are in the plan area.

WNF under the current plan to conserve and recover endangered and threatened species and achieve recovery plan objectives (where species recovery plans exist).

Potential Species of Conservation Concern in the plan area

While the responsible official for most forest planning decisions is the supervisor of the national forest, identifying SCC is the responsibility of the regional forester.[47] It is part of the "process for plan development or revision," but the rule does not specify when during the process it should occur. The regional forester should identify SCC early enough that integrating them into the assessment, including the identification of key ecosystem characteristics, does not delay the assessment process.[48]

The rule contains only two criteria the regional forester can use to identify SCC:[49]

- The species must be known to occur in the plan area.
- The best available scientific information indicates substantial concern about the long-term persistence capability of the species in the plan area.

The responsible official does not have the discretion to exclude species the regional forester has found to meet these regulatory criteria. Our interpretation is that it is the role of the responsible official to provide the regional forester with information about species occurrence and capability to persist in the plan area and to identify "potential" SCC.[50]

While a literal translation of "known to occur" might exclude species not presently found there, the Planning Handbook adds a broader criterion of "is becoming established in the plan area." This calls for a more rigorous analysis that should also encompass species that are likely to become established in the plan area over the "long-term" (as that term is used in the definition of SCC). In addition, lack of recent occurrence records should not be the sole basis for not selecting species that were formerly found in the plan area. The Forest should evaluate the reasons and potential for reestablishment.

[47] 36 C.F.R. § 219.7(c)(3).
[48] See FSH 1901.12, Ch. 10 § 12.13.4.b. The planning handbook also suggests "species at risk" as a key ecosystem characteristic. FSH 1901.12, Ch 10 § 12.13 (Exhibit 01).
[49] 36 C.F.R. § 219.9(c).
[50] 36 C.F.R. § 219.6(b)(5), [t]he term "potential" SCC is used in the rule as a requirement for assessments, but is not defined. It should apply to any species that *may* meet the two criteria in 219.19(c). The assessment should include relevant information about the status and trend of all species considered for SCC so that the regional forester can review it and use it in making the decision.

The directives make an important distinction between species of broader-scale concern and those where there is local conservation concern. All but one of the categories in the directives address the former by encompassing concerns expressed by NatureServe or government agencies about viability of the species at a broader scale than the plan area. The overall approach is to cast a wide net so that the Regional Forester can consider species where concern about persistence is indicated for either or both of these reasons. Local conditions in a plan area are relevant at the SCC identification stage as a basis for including additional species for which there might not be broader concern; not as a sole basis for rejecting species for which there is a broader concern.

For some species, range-wide viability risk has already been reliably determined using the best available scientific information. Under our interpretation of the rule, these species should be identified as SCC if they are known to occur in the plan area based on the ecological principle that a species at-risk range-wide is necessarily at-risk wherever it is found. We note that the assessment must evaluate information "relevant" to species that occur in the plan area; not just about the status of species within the plan area.[51]

The Regional Forester should also include species listed as sensitive by the Forest Service. A sensitive species is a "plant or animal species identified by a regional forester for which population viability is a concern" due to significant current or predicted downward trends in population numbers or density, or habitat capability.[52] If a sensitive species is known to occur in a plan area, it should therefore be identified as an SCC for that area. State strategic wildlife action plans and tribal sensitive species lists should also be considered as well as other authoritative sources, including, for example, Fish and Wildlife Service birds of conservation concern.

There may also be concerns about risks to persistence for other species known to occur in a plan area. The regional forester should evaluate any suggested potential species against the criteria in 219.9(c) on request.

If the information about a potential SCC's abundance, distribution, threats, trends, or response to management indicates that the species may not continue to persist over the long term in the plan area with a sufficient distribution to be resilient, the regional forester must either select it as an SCC or document the rationale for finding it does not meet the SCC criteria. When credible organizations express concern for a species, the burden should be on the Forest

[51] 36 C.F.R. § 219.6(b), FSH 1909.12, Ch. 10 § 12.52a.2.
[52] FSM 2670.5.

Service to demonstrate that the species is secure in the plan area, taking into account the broader scale circumstances and their effect on the species' persistence in the plan area. Species considered as potential SCC but not meeting the criteria in 219.9(c) may be selected as public interest species or focal species.

It is not appropriate under the planning rule to determine that a species is secure in the plan area simply because the Forest Service chooses to minimize impacts on the species. That calculus plays into the viability determination for a proposed plan (i.e., a finding that the forest plan sufficiently protects the species) [53] rather than the identification of SCC.

Identification of SCC by the regional forester is a preliminary planning step. It involves applying regulatory criteria to species in the plan area based on best available scientific information. Identifying SCCs requires the exercise of professional judgment, but permits no discretion. The determination of "substantial concern" is referring to scientific concern that has been expressed that is applicable to species persistence in the plan area, not a subjective concern by the regional forester. We will take a close look at the regional forester's scientific basis for rejecting species as SCC when there are documented viability concerns.

In our opinion, it is appropriate and necessary for this determination to occur prior to most of the assessment process. However, selection of SCC may be revisited throughout the planning process as required by new information applicable to the two criteria in 219.9(c), and would not become final until the forest plan is approved.

Defenders has compiled lists of the species from the Ohio Department of Natural Resources' state listed plants and animals[54] found within the twelve counties that comprise the three units of WNF and may be appropriate to be SCCs. These are included as **Appendix 1 (Animals)** and **Appendix 2 (Plants)**, following these comments. Other forest-dependent species that could be candidates for SCC determination are the bobcat (*Felis rufus*), which was recently removed from the state's endangered species list, and the fisher (*Pekania* [=*Martes*] *pennanti*), which has repatriated parts of Pennsylvania and West Virginia and may be returning to Ohio as well.

<u>Existing information relevant to the plan area for potential SCC must be part of the assessment[55]</u>

[53] 36 C.F.R. § 219.9(b).
[54] http://wildlife.ohiodnr.gov/species-and-habitats/state-listed-species/state-listed-species-by-county
[55] 36 C.F.R. § 219.6(b)(5).

This includes the information compiled by the responsible official that is applicable to the criteria for identification of SCC. The assessment must provide information about the relative contribution of the plan area to range-wide species persistence to address the possibility that species that are selected as SCC may need to be evaluated where conditions for viable populations are beyond the authority of the Forest Service or capability of the plan area.[56] The assessment should also document the application of best available science concerning the SCC and any uncertainty associated with the inclusion or exclusion of SCC that should be addressed in the monitoring program.[57]

Potential focal species

The rule only discusses focal species in conjunction with the plan monitoring program developed by the responsible official.[58] However, the purposes of a focal species are to permit "inference to the integrity of the larger ecological system to which it belongs" and to provide "meaningful information regarding the effectiveness of the plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the plan area."[59] Therefore, it makes sense that focal species will be a topic of discussion within the ecological integrity assessment; for example, we expect they will play a large role in the process for identifying key ecosystem characteristics. Given the scale and crosscutting nature of ecosystems, we recommend that the regional forester play a role in identifying focal species. It is also important to note that effective monitoring may require that some SCCs be selected as focal species.

Step 2: What are the ecosystems and habitat types that exist across the forest?

The planning rule specifies evaluating the integrity of three kinds of land units: 1) terrestrial ecosystems and watersheds; 2) aquatic ecosystems and watersheds; 3) riparian areas. It also requires an evaluation of the diversity of ecosystems and habitat types.[60] Rare floral and faunal communities should be included.[61]

[56] 36 C.F.R. § 219.9(b)(2).
[57] 36 C.F.R. § 219.12(a)(4)(i), The responsible official must consider, "[i]nformation needs identified through the planning process as most critical for informed management of resources on the plan area…"
[58] 36 C.F.R. § 219.12(a)(5)(iii).
[59] 36 C.F.R. § 219.19.
[60] 36 C.F.R. § 219.9(a)(1), "the plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore their structure, function, composition, and connectivity," and 36 C.F.R. § 219.9(a)(2), "[t]he plan must include plan components, including standards or guidelines, to maintain or restore the diversity of ecosystems and habitat types throughout the plan area."
[61] FSH 1909.12, Ch. 10 § 12.11.

Ecosystems are defined by ecological features rather than political or administrative boundaries. The evaluation of ecological integrity and species viability requires an understanding of the broader landscape influencing and influenced by the ecosystems in the plan area. Consequently, selected ecosystems must include portions of the plan area but are likely to extend beyond it (see definition of "landscape"[62]).

To facilitate planning across unit and jurisdictional boundaries, we recommend that regional foresters take the lead in identifying ecosystems and watersheds in coordination with states and other entities operating at a broad scale. Consistent use of ecosystems for planning will also facilitate the Regional Forester's identification of SCC and lead to better and more efficient broader-scale monitoring of ecosystems and wildlife.[63]

The choice of ecosystems should consider the appropriate scale for assessing and planning for ecosystem characteristics. The rule allows planning at the most appropriate scale to address issues and resource concerns specific to a plan area,[64] and these planning topics should be identified early in the assessment process. The scale for evaluating ecosystem integrity should recognize the scale of dominant disturbance regimes. To describe the relative contribution of the plan area to ecological sustainability, ecosystems may also need to be delineated at a broader scale. Nested ecosystems at multiple scales may need to be identified. We recommend that the assessment include maps identifying the various ecosystem units that will be used in the planning process.

The planning rule also states that plans must include plan components to maintain or restore the ecological integrity of riparian areas[65] and identify "riparian management zones" where riparian-dependent resources receive primary emphasis.[66] The assessment should therefore identify "riparian areas,"[67] which may include parts of both terrestrial and aquatic ecosystems.

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[62] 36 C.F.R. § 219.19, As defined by the planning rule, *landscape* means, "[a] defined area irrespective of ownership or other artificial boundaries, such as a spatial mosaic of terrestrial and aquatic ecosystems, landforms, and plan communities, repeated in similar form throughout such a defined area."
[63] 36 C.F.R. § 219.12(b).
[64] 77 Fed. Reg. 21191.
[65] 36 C.F.R. § 219.8(a)(3).
[66] 36 C.F.R. § 219.19 defines *riparian management zones* as, [p]ortions of a watershed where riparian-dependent resources receive primary emphasis, and for which plans include plan components to maintain or restore riparian functions and ecological functions."
[67] 36 C.F.R. § 219.19 defines riparian areas as, "[t]hree Three-dimensional ecotones of interaction that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course at variable widths."

To comply with the requirements for riparian areas in the plan, the assessment should also address the seven factors listed for riparian areas.[68]

Step 3: What are the key ecosystem characteristics and ecological conditions that are necessary for at-risk species?

Plan components must provide ecological conditions necessary for at-risk species (i.e., species classified under the ESA and species identified as SCC). The planning rule's approach relies on the use of key characteristics in assessment, planning and monitoring to represent the condition of ecosystems. These characteristics are identified, selected, and used during the assessment phase.[69] In order for the forest plan to effectively provide ecological conditions for at-risk species, the key characteristics chosen for assessment and carried forward for plan component development should capture the ecological conditions needed for at-risk species.

Attributes include those associated with the ecological conditions necessary for the persistence of at-risk species, including the include amount, quality, distribution and connectivity of habitat. "Ecological conditions" include "habitat and other influences on species and the environment," including structural developments and human uses.[70] It is critical that the assessment identify the specific ecological conditions and ecosystem characteristics most relevant and useful for developing plan components that meet the diversity requirements of the rule.

It is very important that the assessment carefully consider human structures and uses as an attribute of ecological conditions. Identification of these ecological conditions during the assessment is necessary to provide a basis for plan components that manage human structures and uses. In most cases, roads and their use are likely to be the predominant direct human influence on diversity in the plan area, so information concerning the impact of roads on species persistence should be incorporated into the assessment.[71]

There should be overlap between biophysical ecosystem characteristics for ecological integrity and ecological conditions necessary for at-risk species. It is critical for the assessment to

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[68] 36 C.F.R. § 219.8(a)(3)(i) calls for including "aquatic and terrestrial habitats," "ecological connectivity" and widths of potential riparian zones.

[69] FSH 1909.12, Ch. 10 § 12.13.

[70] 36 C.F.R. § 219.19 defines *ecological conditions* as, The biological and physical environment that can affect the diversity of plant and animal communities, the persistence of native species, and the productive capacity of ecological systems. Ecological conditions include habitat and other influences on species and the environment. Examples of ecological conditions include the abundance and distribution of aquatic and terrestrial habitats, connectivity, roads and other structural developments, human uses, and invasive species.

[71] That should include information from roads analysis (FSM 7712) relevant to diversity (such as the effect of existing roads as a stressor), and should be integrated with the infrastructure portion of the assessment.

establish the connection between coarse-filter ecosystem characteristics/habitat conditions and the species that depend upon them for persistence. The assessment must also establish the connection between changes in ecological conditions and changes in species populations.

The suitability of habitat for at-risk species cannot be divorced from the spatial distribution of that habitat. The rule does not directly address the landscape pattern of ecosystems and patches, but these patterns are inherent to the concepts of ecosystem and landscape composition, structure, function and, especially, connectivity. The spatial arrangement, size, shape, number and kind of patches determine the structure of a landscape. Consequently, it is of paramount importance that the assessment identifies appropriate patch metrics as key ecosystem characteristics for at-risk species where possible.

During the planning phase, the responsible official must determine whether the likely future ecological conditions under the plan will maintain a viable population of SCC in the plan area that will persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments.[72] It is therefore critical that the assessment address species population distributions as key ecosystem characteristics.

To demonstrate that plan components will be effective in maintaining a "viable population" in the plan area, the assessment must provide a means of determining a "sufficient distribution." The assessment should describe the relationship between connectivity and the distribution of species necessary for persistence, especially with regard to stressors like climate change. It is important that the assessment evaluate how species move, what barriers to those movements may exist and how the forest plan can reduce the impact of those barriers within the context of recovery, conservation and viability. The nature of the relationship between all of these attributes and the actual condition of the species should be documented so that this fundamental relationship can be tested as a "relevant assumption" under the monitoring program.[73]

Step 4: What key areas support target species?

[72] 36 C.F.R. § 219.19.

[73] 36 C.F.R. § 219.12(a)(2) states, "[t]he plan monitoring program sets out the plan monitoring questions and associated indicators. Monitoring questions and associated indicators must be designed to inform the management of resources on the plan area, including by testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives. Questions and indicators should be based on one or more desired conditions, objectives, or other plan components in the plan, but not every plan component needs to have a corresponding monitoring question."

For many species, some places within the WNF plan area will be more important than others. Some places may serve as source habitat, secure habitat, breeding grounds, or strongholds that export individuals, while others may be areas where survival and successful reproduction are more challenging. Similarly, some portions of the planning area may provide connectivity between populations or source habitats. Potential refugia under future climate conditions should also be considered. It is vital that the assessment pinpoint these areas of high-value to at-risk species so that plan components can be developed for application to these areas with the benefit of this information. The assessment should be as spatially explicit as possible.

The assessment must also recognize the relative importance of different areas at scales appropriate to each species. The assessment should identify specific ecosystems, watersheds or sites that provide relatively high-quality habitat for a target species in the plan area. Providing this context for developing plan components may indicate that species persistence depends on more protective management of portions of the plan area, or of the plan area as a whole, relative to other areas.

Species assessments are also a part of the wilderness, wild and scenic rivers, and research natural area evaluations that should occur during the assessment process. This information should help provide a spatial context for the ecological components of the assessment, and may be useful for identifying priority areas for conservation.

Step 5: What conditions and trends are necessary for evaluating ecological integrity?

For each of the key ecosystem characteristics and ecological conditions for at-risk species, the assessment should 1) identify existing relevant information and 2) evaluate that information.[74] A key purpose is to identify the causes of trends in the attributes to determine the role that forest plan components should play in maintaining or restoring integrity.

For each attribute, this evaluation should answer the seven questions below that address conditions, trends and sustainability and their relationship to the land management plan.[75]

1. <u>What was the historic condition of the forest (when such information exists)?</u>

The concept of ecological integrity is used to represent the condition of an ecosystem. When its key ecosystem characteristics occur within the natural range of variation (NRV), an ecosystem is

[74] 36 C.F.R. § 219.6(b).
[75] 36 C.F.R. § 219.5(a)(1).

considered to have integrity.[76] NRV can be thought of as a reference condition reflecting resilient "natural" conditions that can be estimated using information from historical reference ecosystems or by other science-based methods. The planning rule directs the Forest Service to manage key characteristics in light of these reference conditions, for the purpose of sustaining ecosystems and wildlife.

The NRV requires identification of a range of values that occur over time in a defined area. Such ranges are often best displayed as frequency distributions for the selected ecosystem characteristics showing the portion of the plan area within each category of values. This important process can involve extensive evaluation of the assessment information, especially information compiled for key ecosystem characteristics. The determination of the NRV, like all aspects of the planning process, is subject to the requirement for using best available scientific information to inform the process.[77]

We recognize that data for quantifying NRV may not exist for some ecological conditions necessary for viability of at-risk species. We encourage thoughtful consideration and documentation of decisions regarding the choice of key ecosystem characteristics and how they provide the basis for assessing and planning for at-risk species. In some cases a qualitative treatment of a more relevant ecological condition may be better than a more quantitative treatment of a less relevant condition.

2. <u>What is the current condition?</u>

Departures from the NRV for key ecosystem characteristics indicate that the ecological integrity of the ecosystem may not be sustainable,[78] and therefore diversity would not be achieved.[79] However, looking solely at the NRV for dominant biological characteristics ignores how other human factors can affect diversity. Roads and other human uses and structures can affect connectivity by reducing the ability of wildlife to reach habitat with desired biological characteristics and the security that allows wildlife to fully utilize those characteristics if they do reach it.

[76] 36 C.F.R. § 219.19 defines *ecological integrity* as, "The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence.
[77] 36 C.F.R. § 219.3.
[78] 36 C.F.R. § 219.8(a).
[79] 36 C.F.R. § 219.9(a).

Evaluating ecological integrity should provide a foundation for evaluating species persistence and viability. However, integrity is a "coarse filter" approach; additional analysis is needed at a species level. The current conditions of ecosystem characteristics that are necessary for individual at-risk species should be included in the assessment.

3. <u>What are the relevant drivers and stressors of these conditions?</u>

The assessment should identify stressors related to these conditions, including stressors from outside of the plan area that may affect a species. In particular, the planning rule focused on the importance of taking climate change into account. Section 219.6(b)(3) requires the assessment to identify and evaluate information regarding "the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change." It is therefore critically important that the assessment consider possible future scenarios for climate change and other so-called "system drivers" and identify those most likely to occur based on the best available scientific information. That information should be incorporated into specific projections for ecosystem and species sustainability, so that the revised forest plan and plan components can address the vulnerability and sustainability of ecosystems and species under probable climate-change scenarios. The WNF assessment should draw on the Forest Service Northern Research Station's 2015 "Central Appalachians Forest Ecosystem Vulnerability Assessment and Synthesis,"[80] a detailed assessment of the climate change impacts to forest ecosystems and processes. The WNF assessment should further extrapolate the findings of that report to the potential impacts of these changes to the at-risk species within the Plan area.

Another likely stressor not under the control of the Forest Service is private land development. It manifests itself in the wildland-urban interface (WUI) and the limitations imposed on management there to promote ecological integrity. It is important to identify the areas that have been and are likely to be included as WUI as continuing stressors, and consider their juxtaposition with important habitat for at-risk species. According to Ohio's State Wildlife Action Plan,[81] housing and urban areas has a "high" threat impact for both forests and for headwater and small inland streams.

Of the stressors and drivers likely to be under the control of the Forest Service within the plan area, Ohio's State Wildlife Action Plan ranks the following as "high" for forest habitats:

[80] General Technical Report NRS-146, February 2015.
[81] http://wildlife.ohiodnr.gov/Portals/wildlife/pdfs/proposed%20rule%20changes/OHIO%202015%20SWAP.pdf. Table 19.

- energy production and mining (oil & gas extraction and mining & quarrying) - "can directly damage and destroy forest habitat, and indirectly have negative impacts by altering hydrology and causing chemical contamination"
- Introduction and/or spread of invasive plants and animals

Similarly, for headwater and inland small stream habitats,[82] the "high" ranking threats that will likely be under the control of the Forest Service within the plan area are:

- Energy production and mining: oil & gas drilling
- Transportation and service corridors: roads and railroads
- Biological resource use: logging & wood harvesting
- Natural system modifications: dams & water management/use
- Pollution: agriculture and forestry effluents
- Climate change and severe weather: habitat shifting and alteration

The Plan assessment should robustly assess each of these stressors and drivers.

4. <u>How has management of the plan area contributed to the current condition?</u>

In order to develop appropriate plan components, it is necessary to understand how management of the plan area has influenced ecological conditions in the past. Management activities should have been identified as stressors in the previous step, and the manner in which those activities are governed by the existing plan should be identified. It is also important to identify ways that the WNF could be managed that would address and mitigate the effects of external stressors like climate change.

5. <u>What scenario is most likely for external future drivers and stressors, including climate change?</u>

The planning handbook invokes "scenario planning" as a tool for assessing stressors.[83] For the purpose of this assessment, this simply recognizes that planning must make assumptions about future conditions, and plan components must be developed that will provide for sustainability in the most likely scenario (or the broadest range of scenarios). The assessment must document those assumptions. With respect to climate change scenarios, many reports, including the

[82] Ibid, Table 17
[83] FSH 1909.12, Ch. 10 § 12.31.2, 12.32.2.

Forest Service's 2015 "Central Appalachians Forest Ecosystem Vulnerability Assessment,"[84] utilize climate change scenarios known as the "B1" (lower emissions) and "A1FI" (higher emissions) scenarios, developed by the Intergovernmental Panel on Climate Change (IPCC) in 2000. In 2013, however, the IPCC developed a new set of scenarios that are less tied to certain technological and sociological assumptions, and instead project four "representative concentration pathways" (RCPs) of radiative forcing, namely +2.6, +4.5, +6.0 and +8.5 watts per square meter by 2100. These new scenarios have been adopted by the U.S. Global Change Research Program and are now the standard in its publications, including the 2017 "Climate Science Special Report: Volume I of the Fourth National Climate Assessment"[85] and are now considered the best available information on future climate. For practical purposes, there is good correspondence between B1 and RCP +4.5, and between A1FI and RCP +8.5.

The assessment should also consider how current and future patterns of energy use and generation type preferences will influence energy generation opportunities and permit requests. The WNF is already a leader in solar energy generation, with a 302-panel array providing nearly 20% of the Forest Headquarters building's electricity use.[86] The assessment should consider whether there are additional appropriate areas for solar generation in the WNF, pursuant to FSM sections 2724.15 and 2726.23, including rooftops, parking lots, and mine spoil areas that are not appropriate for restoration to grassland habitats.

6. <u>What will the future trend in ecological conditions be as a result of those drivers and stressors?</u>

In order to facilitate a meaningful need for change analysis and determination, as well as to develop future plan components that are responsive to changing conditions, the assessment should strongly consider the effects of possible future scenarios for stressors and other relevant factors beyond control of the agency (including climate change) on target planning resources (e.g. necessary ecological conditions or key ecosystem characteristics). Likely future scenarios should be systematically applied to the target planning resources, and the scenarios should be based on the best available scientific information.

7. <u>What will the likely future condition be managing under the current plan?</u>

[84] General Technical Report NRS-146, February 2015
[85] U.S. Global Change Research Program. https://science2017.globalchange.gov/downloads/
[86] https://www.sunnyportal.com/Templates/PublicPageOverview.aspx?page=f65ddbe3-b9d3-4c04-98df-13b8add91994&plant=4733c887-d473-4e77-896a-13648df054a5&splang=en-US

The planning rule provides direction on how to evaluate the information compiled during the assessment about "trends, and their sustainability and their relationship to the land-management plan within the context of the broader landscape." This provision requires the assessment to evaluate "existing and possible future conditions and trends of the plan area."[87] The planning handbook explicitly requires that the assessment, "Describe the current and likely future status of the ecological conditions necessary to meet the requirements of 36 C.F.R. 219.9(b) for each at-risk species, assuming management continues under the current plan."[88]

Although it is not appropriate for the assessment to determine a need to change plan components, the assessment *should* clearly identify future ecosystem integrity conditions under the current plan (considering likely future environments and stressors) and compare those parameters to reference conditions (NRV or otherwise), so that a meaningful need for change analysis can occur during the planning phase.

[87] 36 C.F.R. § 219.5(a)(1).
[88] FSH 1909.12, Ch. 10 § 12.55.3.a.

Appendix 1: State Listed Animals and Species of Concern

Species	Category	State Status	County Occurrence
Accipiter striatus Sharp-shinned Hawk	Bird	Species of Concern	Athens, Lawrence, Noble, Scioto, Washington
Acris crepitans crepitans Eastern Cricket Frog	Amphibian - Frog / Toad	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Scioto, Vinton
Alasmidonta marginata Elktoe	Invert. - fw bivalve	Species of Concern	Lawrence, Morgan, Scioto, Washington
Ambystoma laterale Blue-spotted Salamander	Amphibian - Salamander	Endangered	Scioto
Ammocrypta pellucida Eastern Sand Darter	Fish	Species of Concern	Athens, Gallia, Hocking, Lawrence, Morgan, Scioto, Vinton, Washington
Ammodramus henslowii Henslow's Sparrow	Bird	Species of Concern	Athens, Jackson, Vinton, Washington
Aneides aeneus Green Salamander	Amphibian - Salamander	Endangered	Lawrence, Scioto
Anguilla rostrata American Eel	Fish	Threatened	Scioto
Brachycentrus numerosus	Insect - caddisfly	Endangered	Athens
Caprimulgus carolinensis Chuck-will's-widow	Bird	Special Interest	Vinton
Carpodacus purpureus Purple Finch	Bird	Special Interest	Washington
Catharus guttatus Hermit Thrush	Bird	Special Interest	Athens
Catocala maestosa	Insect - moth	Special Interest	Hocking
Chytonix sensilis	Insect - moth	Species of Concern	Hocking
Cistothorus palustris Marsh Wren	Bird	Species of Concern	Vinton
Clemmys guttata Spotted Turtle	Reptile - Turtle	Threatened	Athens, Morgan, Vinton
Colinus virginianus Northern Bobwhite	Bird	Species of Concern	Athens, Gallia, Jackson, Lawrence, Noble, Scioto, Vinton, Washington
Coragyps atratus Black Vulture	Bird	Species of Concern	Jackson

Crotalus horridus Timber Rattlesnake	Reptile - Snake	Endangered	Athens, Gallia, Hocking, Jackson, Lawrence, Scioto, Washington
Cycleptus elongatus Blue Sucker	Fish	Threatened	Gallia, Scioto, Washington
Cyclonaias tuberculata Purple Wartyback	Invert. - fw bivalve	Species of Concern	Jackson (extirpated?), Lawrence (extirpated?), Morgan, Scioto, Washington
Dendroica cerulea Cerulean Warbler	Bird	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Noble, Scioto, Vinton, Washington
Dendroica magnolia Magnolia Warbler	Bird	Special Interest	Athens
Dolichonyx oryzivorus Bobolink	Bird	Species of Concern	Washington
Ellipsaria lineolata Butterfly mussel	Invert. - fw bivalve	Endangered	Gallia, Lawrence (extirpated?), Morgan, Scioto, Washington
Elliptio crassidens crassidens Elephant-ear	Invert. - fw bivalve	Endangered Invert. -	Gallia, Jackson (extirpated?), Lawrence Scioto, Washington
Empidonax minimus Least Flycatcher	Bird	Special Interest	Athens, Jackson, Noble, Scioto
Eptesicus fuscus Big Brown Bat	Mammal	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Noble, Perry, Scioto, Vinton, Washington
Erimyzon sucetta Lake Chubsucker	Fish	Threatened	Jackson
Erythroecia hebardi Hebard's Noctuid Moth	Insect - moth	Endangered	Scioto
Esox masquinongy Muskellunge	Fish	Species of Concern	Monroe, Scioto, Vinton, Washington
Etheostoma tippecanoe Tippecanoe Darter	Fish	Threatened	Hocking, Monroe, Scioto, Vinton, Washington
Euchlaena milnei Milnei's Looper Moth	Insect - moth	Species of Concern	Scioto
Euchloe olympia Olympia Marble	Insect - butterfly	Special Interest	Lawrence
Fagitana littera	Insect - moth	Threatened	Athens
Fundulus diaphanus menona Western Banded Killifish	Fish	Endangered	Washington
Fusconaia ebena Ebonyshell	Invert. - fw bivalve	Endangered	Gallia, Morgan (extirpated?), Scioto, Washington (extirpated?)

Fusconaia maculata maculata Long-solid	Invert. - fw bivalve	Endangered	Gallia, Morgan, Scioto, Washington
Helocordulia uhleri Uhler's Sundragon	Insect - odonate	Endangered	Hocking, Scioto
Hemidactylium scutatum Four-toed Salamander	Amphibian - Salamander	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Scioto, Vinton
Hemileuca maia Buck Moth	Insect - moth	Species of Concern	Athens, Hocking, Jackson (extirpated?), Morgan, Scioto,Vinton
Heterodon platirhinos Eastern Hognose Snake	Reptile - Snake	Species of Concern	Athens, Hocking, Morgan, Perry, Scioto, Vinton
Hiodon alosoides Goldeye	Fish	Endangered	Lawrence, Scioto
Hydroptila chattanooga	Insect - caddisfly	Species of Concern	Monroe
Hydroptila koryaki	Insect - caddisfly	Threatened	Vinton
Ichthyomyzon bdellium Ohio Lamprey	Fish	Endangered	Vinton, Washington
Ictalurus furcatus Blue Catfish	Fish	Species of Concern	Gallia
Junco hyemalis Dark-eyed Junco	Bird	Special Interest	Morgan
Lampsilis fasciola Wavy-rayed Lampmussel	Invert. - fw bivalve	Species of Concern	Washington (extirpated?)
Lampsilis ovata Sharp-ridged Pocketbook	Invert. - fw bivalve	Endangered Jackson	Gallia, Jackson (extirpated?), Morgan, Scioto, Washington
Lampsilis teres Yellow Sandshell	Invert. - fw bivalve	Endangered	Gallia, Lawrence (Extirpated?), Scioto, Washington (Extirpated?)
Lasionycteris noctivagans Silver-haired Bat	Mammal	Species of Concern	Athens, Monroe, Scioto
Lasiurus borealis Red Bat No 1980	Mammal	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Noble, Perry, Scioto, Vinton, Washington,
Lasiurus cinereus Hoary Bat	Mammal	Species of Concern	Lawrence, Monroe, Noble, Scioto
Lasmigona compressa Creek Heelsplitter	Invert. - fw bivalve	Species of Concern	Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Noble, Vinton, Washington

Lepisosteus platostomus Shortnose Gar	Fish	Endangered	Scioto
Ligumia nasuta Eastern Pondmussel	Invert. - fw bivalve	Endangered	Morgan
Ligumia recta Black Sandshell	Invert. - fw bivalve	Threatened	Athens, Gallia, Hocking Jackson (extirpated?), Lawrence, Morgan, Scioto, Washington
Macrhybopsis hyostoma Shoal Chub	Fish	Endangered	Gallia, Lawrence
Megalonaias nervosa Washboard	Invert. - fw bivalve	Endangered	Gallia, Scioto, Washington
Microtus ochrogaster Prairie Vole	Mammal	Species of Concern	Athens, Gallia, Jackson, Lawrence, Morgan, Scioto, Vinton
Microtus pinetorum Woodland Vole	Mammal	Species of Concern	Athens, Hocking (extirpated?), Jackson, Lawrence, Morgan, Scioto, Vinton
Moxostoma carinatum River Redhorse	Fish	Species of Concern	Gallia, Lawrence, Morgan, Monroe, Perry, Scioto, Vinton, Washington
Myotis leibii Eastern Small-footed Myotis	Mammal	Species of Concern	Hocking, Perry
Myotis lucifugus Little Brown Bat	Mammal	Species of Concern	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Noble, Perry, Scioto, Vinton
Neotoma magister Allegheny Woodrat	Mammal	Endangered	Athens (extirpated?), Hocking, Jackson (extirpated?)
Notropis ariommus Popeye Shiner	Fish	Endangered	Scioto
Notropis boops Bigeye Shiner	Fish	Threatened	Scioto
Noturus eleutherus Mountain Madtom	Fish	Threatened	Morgan, Washington
Noturus stigmosus Northern Madtom	Fish	Endangered	Morgan
Nycticeius humeralis Evening Bat	Mammal	Special Interest	Jackson, Perry
Obliquaria reflexa Threehorn Wartyback	Invert. - fw bivalve	Threatened	Athens, Gallia, Lawrence Morgan, Scioto, Washington
Opheodrys aestivus aestivus Northern Rough Greensnake	Reptile - Snake	Species of Concern	Athens, Scioto, Vinton

Orconectes (Crokerinus) obscurus Allegheny Crayfish	Invert. - decapod	Species of Concern	Monroe, Washington
Percina copelandi Channel Darter	Fish	Threatened	Athens, Gallia, Lawrence, Monroe, Scioto, Washington
Percina evides Gilt Darter	Fish	Endangered	Gallia
Percina shumardi River Darter	Fish	Threatened	Athens, Gallia, Monroe Scioto, Washington
Perimyotis subflavus Tri-colored Bat	Mammal	Species of Concern	Gallia, Jackson, Lawrence, Monroe Noble, Perry, Scioto, Vinton,
Peromyscus maniculatus Deer Mouse	Mammal	Species of Concern	Athens, Gallia, Perry, Scioto, Vinton, Washington
Pleurobema cordatum Ohio Pigtoe	Invert.- fw bivalve	Endangered	Gallia, Lawrence (extirpated?), Monroe (extirpated?), Morgan, Scioto, Washington
Pleurobema rubrum Pyramid Pigtoe	Invert. - fw bivalve	Endangered	Lawrence (extirpated?), Scioto, Washington,
Pleurobema sintoxia Round Pigtoe	Invert. - fw bivalve	Species of Concern	Athens, Gallia Hocking Jackson (extirpated?), Monroe, Morgan, Scioto, Washington
Polyodon spathula Paddlefish	Fish	Threatened	Scioto
Protonotaria citrea Prothonotary Warbler	Bird	Species of Concern	Washington
Pseudotriton montanus diastictus Midland Mud Salamander	Amphibian - Salamander	Threatened	Athens, Gallia, Jackson, Lawrence, Scioto, Vinton
Ptychobranchus fasciolaris Kidneyshell	Invert. - fw bivalve	Species of Concern	Athens (extirpated?), Hocking, Jackson (extirpated?), Morgan, Scioto, Washington
Pyrgus centaureae wyandot Grizzled Skipper	Insect – butterfly	Endangered	Athens, Hocking, Morgan, Vinton
Quadrula metanevra Monkeyface	Invert. - fw bivalve	Endangered	Gallia, Scioto, Washington
Quadrula nodulata Wartyback	Invert. - fw bivalve	Endangered	Scioto
Regina septemvittata Queensnake	Reptile - Snake	Species of Concern	Athens, Hocking, Scioto
Reithrodontomys humulis Eastern Harvest Mouse	Mammal	Threatened	Scioto, Vinton

Rhinichthys cataractae Longnose Dace	Fish	Species of Concern	Washington
Scaphiopus holbrookii Eastern Spadefoot	Amphibian - Frog / Toad	Endangered	Athens, Lawrence, Morgan, Scioto Washington
Scincella lateralis Little Brown Skink	Reptile - Lizard	Species of Concern	Scioto, Vinton
Simpsonaias ambigua Salamander Mussel	Invert. - fw bivalve	Species of Concern	Morgan, Scioto, Washington
Smerinthus cerisyi One-Eyed Sphinx	Insect - moth	Species of Concern	Vinton
Sorex fumeus Smoky Shrew	Mammal	Species of Concern	Athens, Gallia, Hocking Lawrence, Scioto, Vinton
Sorex hoyi Pygmy Shrew	Mammal	Species of Concern	Athens, Hocking, Vinton
Speyeria idalia Regal Fritillary	Insect - butterfly	Endangered	Athens, Gallia, Hocking, Jackson, Monroe, Vinton, Washington
Synaptomys cooperi Southern Bog Lemming	Mammal	Species of Concern	Athens, Gallia, Hocking (extirpated?), Jackson, Lawrence, Scioto, Vinton
Taxidea taxus Badger	Mammal	Species of Concern	Athens, Gallia
Terrapene carolina carolina Eastern Box Turtle	Reptile - Turtle	Species of Concern	Athens, Gallia, Lawrence, Scioto
Truncilla donaciformis Fawnsfoot	Invert. - fw bivalve	Threatened	Athens, Jackson (extirpated?), Morgan, Scioto, Washington
Truncilla truncata Deertoe No	Invert. - fw bivalve	Species of Concern	Athens, Gallia Scioto, Washington
Uniomerus tetralasmus Pondhorn	Invert. - fw bivalve	Threatened	Jackson
Ursus americanus Black bear	Mammal	Endangered	Athens, Gallia, Hocking, Jackson, Lawrence, Monroe, Morgan, Noble Perry, Scioto, Vinton, Washington
Villosa lienosa Little Spectaclecase	Invert. - fw bivalve	Endangered	Gallia, Jackson, Lawrence, Scioto, Vinton

Appendix 2: State Listed Plants

SPECIES	State Status	County Occurrence
Aconitum noveboracense Northern Monkshood	Endangered	Hocking
Aconitum uncinatum Southern Monkshood	Endangered	Scioto
Ageratina aromatica Small White Snakeroot	Endangered	Gallia, Jackson, Scioto
Amelanchier sanguinea Rock Serviceberry	Threatened	Hocking
Andropogon glomeratus Bushy Broom-sedge	Endangered	Lawrence
Anomobryum filiforme Common Silver Moss	Endangered	Hocking, Scioto
Arabis pycnocarpa var. *adpressipilis* Southern Hairy Rock Cress	Potentially Threatened	Athens
Aristida purpurascens Purple Triple-awned Grass	Potentially Threatened	Hocking, Jackson
Asclepias amplexicaulis Blunt-leaved Milkweed	Potentially Threatened	Gallia, Hocking, Jackson, Lawrence, Scioto, Vinton, Washington
Asclepias variegata White Milkweed	Potentially Threatened	Gallia, Jackson, Lawrence, Scioto, Vinton
Asplenium bradleyi Bradley's Spleenwort	Endangered	Athens, Washington
Astragalus canadensis Canada Milk-vetch	Threatened	Monroe, Scioto, Vinton
Aureolaria pedicularia var. *pedicularia* Woodland Fern-leaved False Foxglove	Endangered	Athens
Botrychium biternatum Sparse-lobed Grape Fern	Endangered	Hocking, Lawrence, Monroe, Scioto, Washington
Botrychium lanceolatum Triangle Grape Fern	Threatened	Hocking
Buchnera americana Bluehearts	Threatened	Jackson
Calamagrostis porteri ssp. *insperata* Bartley's Reed Grass	Threatened	Jackson, Vinton
Campylostelium saxicola Rock-loving Swan-necked Moss	Endangered	Gallia, Hocking
Canoparmelia amabilis Obed Shield Lichen	Endangered	Washington
Cardamine dissecta Narrow-leaved Toothwort	Potentially Threatened	Athens, Gallia, Hocking, Perry, Washington

Carex albolutescens Pale Straw Sedge	Potentially Threatened	Gallia, Hocking, Jackson, Lawrence
Carex bushii Bush's Sedge	Threatened	Jackson
Carex complanata Flattened Sedge	Threatened	Athens, Gallia, Jackson, Vinton
Carex crinita var. *brevicrinis* Short-fringed Sedge	Threatened	Jackson, Scioto, Vinton
Carex gigantea Large Sedge	Endangered	Gallia
Carex louisianica Louisiana Sedge	Endangered	Gallia, Jackson
Carex lupuliformis False Hop Sedge	Potentially Threatened	Gallia, Jackson
Carex mesochorea Midland Sedge	Threatened	Lawrence, Perry, Washington
Carex purpurifera Purple Wood Sedge	Threatened	Scioto
Carex reznicekii Reznicek's Sedge	Threatened	Hocking, Jackson, Lawrence, Scioto
Carex straminea Straw Sedge	Potentially Threatened	Jackson
Carex striatula Lined Sedge	Threatened	Lawrence
Chimaphila umbellata Pipsissewa	Threatened	Hocking, Monroe
Chionanthus virginicus Fringe-tree	Potentially Threatened	Gallia, Jackson, Lawrence, Scioto, Vinton
Chrysogonum virginianum Golden-knees	Threatened	Athens, Washington
Cirsium carolinianum Carolina Thistle	Threatened	Athens, Lawrence, Scioto, Vinton
Clintonia umbellulata Speckled Wood-lily	Endangered	Washington
Clitoria mariana Butterfly-pea	Potentially Threatened	Jackson, Scioto, Washington
Collinsonia verticillata Early Stoneroot	Endangered	Scioto
Corallorhiza maculata Spotted Coral-root	Potentially Threatened	Scioto
Corallorhiza wisteriana Spring Coral-root	Potentially Threatened	Athens, Lawrence, Scioto
Corydalis sempervirens Rock-harlequin	Threatened	Athens, Hocking
Crataegus uniflora Dwarf Hawthorn	Potentially Threatened	Gallia, Lawrence, Scioto
Croton willdenowii Willdenow's Croton	Endangered	Jackson
Cuscuta compacta Sessile Dodder	Endangered	Jackson
Cuscuta cuspidata Cuspidate Dodder	Endangered	Lawrence

Cyperus lancastriensis Many-flowered Umbrella-sedge	Endangered	Jackson
Cyperus refractus Reflexed Umbrella-sedge	Endangered	Gallia, Lawrence
Cyperus retrofractus Rough Umbrella-sedge	Endangered	Jackson
Cystopteris tennesseensis Tennessee Bladder Fern	Potentially Threatened	Athens, Gallia, Hocking, Lawrence, Monroe, Vinton, Washington
Delphinium exaltatum Tall Larkspur	Potentially Threatened	Hocking
Descurainia pinnata Tansy Mustard	Threatened	Scioto
Dibaeis absoluta Pink Dot Lichen	Threatened	Athens, Hocking, Lawrence, Vinton
Dichanthelium lindheimeri Lindheimer's Panic Grass	Threatened	Jackson
Dichanthelium scoparium Velvet Panic Grass	Endangered	Jackson
Dichanthelium villosissimum Villous Panic Grass	Potentially Threatened	Jackson, Lawrence, Scioto, Washington
Dichanthelium yadkinense Spotted Panic Grass	Potentially Threatened	Gallia, Hocking, Jackson, Lawrence, Scioto, Vinton
Dichelyma capillaceum Awned Dichelyma Moss	Endangered	Gallia
Draba brachycarpa Little Whitlow-grass	Endangered	Lawrence
Eleocharis engelmannii Engelmann's Spike-rush	Endangered	Jackson
Eleocharis tenuis Slender Spike-rush	Threatened	Jackson, Monroe
Eleocharis wolfii Wolf's Spike-rush	Endangered	Jackson
Eryngium yuccifolium Rattlesnake-master	Potentially Threatened	Athens, Jackson, Lawrence, Scioto
Erythronium rostratum Golden-star	Endangered	Scioto
Eupatorium album White Thoroughwort	Threatened	Jackson, Scioto
Eupatorium godfreyanum Godfreys Thoroughwort	Endangered	Lawrence
Eupatorium hyssopifolium Hyssop Thoroughwort	Endangered	Jackson
Eupatorium pilosum Rough Boneset	A (sic)	Lawrence
Eurybia surculosa Creeping Aster	Endangered	Scioto
Fissidens hyalinus Filmy Fissidens	Endangered	Hocking, Vinton
Fleischmannia incarnata Pink Thoroughwort	Threatened	Gallia, Lawrence
Gentiana alba Yellowish Gentian	Endangered	Athens, Gallia

Gentiana villosa Sampson's Snakeroot	Endangered	Gallia, Jackson, Lawrence, Scioto
Gentianopsis procera Small Fringed Gentian	Potentially Threatened	Hocking
Gratiola virginiana Round-fruited Hedge-hyssop	Threatened	Gallia, Jackson, Lawrence, Scioto, Vinton
Gratiola viscidula Short's Hedge-hyssop	Potentially Threatened	Gallia, Jackson, Scioto
Helianthus mollis Ashy Sunflower	Threatened	Jackson, Monroe
Heteranthera reniformis Mud-plantain	Endangered	Lawrence
Heuchera longiflora Long-flowered Alum-root	Threatened	Scioto
Heuchera parviflora Small-flowered Alum-root	Threatened	Gallia, Lawrence, Scioto
Heuchera villosa Hairy Alum-root	Endangered	Gallia, Lawrence
Hexalectris spicata Crested Coral-root P	Potentially Threatened	Lawrence
Hypericum denticulatum Coppery St. John's-wort	Endangered	Jackson
Iris verna Dwarf Iris	Threatened	Lawrence, Scioto
Isoetes engelmannii Appalachian Quillwort	Endangered	Gallia, Jackson, Scioto
Isotria medeoloides Small Whorled Pogonia	Endangered	Hocking, Scioto
Juncus interior Inland Rush	Threatened	Jackson
Juncus platyphyllus Flat-leaved Rush	Endangered	Gallia, Scioto
Juncus secundus One-sided Rush	Potentially Threatened	Hocking, Jackson, Scioto, Vinton
Juncus subcaudatus Woodland Rush	Endangered	Jackson
Krigia dandelion Potato-dandelion	Threatened	Jackson
Krigia virginica Virginia Dwarf-dandelion	Threatened	Lawrence
Lactuca hirsuta Hairy Tall Lettuce	Threatened	Lawrence, Scioto
Lathyrus venosus Wild Pea	Endangered	Lawrence
Lechea minor Thyme-leaved Pinweed	Threatened	Athens, Jackson
Lechea tenuifolia Narrow-leaved Pinweed	Potentially Threatened	Athens, Noble, Scioto
Liatris cylindracea Slender Blazing-star	Threatened	Athens
Liatris scariosa Large Blazing-star	Threatened	Scioto

Ligusticum canadense American Lovage	Endangered	Lawrence
Lilium philadelphicum Wood Lily	Endangered	Scioto
Linaria canadensis Old-field Toadflax	Endangered	Washington
Luzula bulbosa Southern Woodrush	Potentially Threatened	Athens, Scioto
Lycopodium lagopus One-coned Club-moss	Endangered	Jackson
Magnolia macrophylla Bigleaf Magnolia	Endangered	Jackson
Magnolia tripetala Umbrella Magnolia	Potentially Threatened	Gallia, Hocking, Jackson, Scioto, Vinton
Malaxis unifolia Green Adder's-mouth	Potentially Threatened	Athens, Gallia, Hocking, Lawrence, Perry, Scioto, Vinton, Washington
Melampyrum lineare Cow-wheat	Endangered	Hocking
Opuntia humifusa Common Prickly Pear	Potentially Threatened	Gallia, Hocking, Lawrence, Washington
Orbexilum pedunculatum False Scurf-pea	Potentially Threatened	Jackson, Scioto, Vinton
Packera paupercula Balsam Squaw-weed	Threatened	Lawrence
Parmotrema madagascariaceum Madagascar Ruffle Lichen	Endangered	Vinton
Paspalum repens Riverbank Paspalum	Threatened	Lawrence, Scioto
Passiflora incarnata Maypop	Threatened	Gallia, Lawrence
Penstemon canescens Gray Beard-tongue	Threatened	Lawrence
Penstemon pallidus Downy White Beard-tongue	Threatened	Athens, Gallia, Jackson, Lawrence, Vinton, Washington
Phacelia bipinnatifida Fern-leaved Scorpion-weed	Potentially Threatened	Scioto
Phacelia covillei Blue Scorpion-weed	Endangered	Lawrence
Phacelia dubia Small-flowered Scorpion-weed	Endangered	Scioto
Phaseolus polystachios Wild Kidney Bean	Potentially Threatened	Jackson, Lawrence, Scioto, Vinton, Washington
Phegopteris connectilis Long Beech Fern	Potentially Threatened	Hocking, Jackson
Phyllanthus caroliniensis Carolina Leaf-flower	Threatened	Jackson, Scioto

Piptochaetium avenaceum Black-seeded Needle Grass	Endangered	Lawrence
Plagiothecium latebricola Lurking Leskea	Threatened	Hocking
Platanthera ciliaris Yellow Fringed Orchid	Threatened	Hocking, Scioto, Washington
Pleopeltis polypodioides Little Gray Polypody	Potentially Threatened	Athens, Hocking, Lawrence
Pluchea camphorata Camphor-weed	Endangered	Washington
Polygala curtissii Curtiss' Milkwort	Endangered	Jackson
Polygala incarnata Pink Milkwort	Threatened	Jackson, Lawrence, Scioto
Potamogeton pulcher Spotted Pondweed	Endangered	Jackson, Scioto
Potamogeton tennesseensis Tennessee Pondweed	Threatened	Jackson, Scioto, Vinton
Prenanthes trifoliolata Gall-of-the-earth	Endangered	Scioto
Prosartes maculata Nodding Mandarin	Threatened	Scioto
Pycnanthemum verticillatum var. *pilosum* Hairy Mountain-mint	Threatened	Hocking
Quercus falcata Spanish Oak	Threatened	Gallia, Jackson, Lawrence, Scioto
Quercus marilandica Blackjack Oak	Potentially Threatened	Gallia, Lawrence, Scioto
Ramalina farinacea Dotted Ramalina	Endangered	Athens, Lawrence
Ramalina intermedia Rock Ramalina	Endangered	Gallia, Hocking
Ramalina pollinaria Chalky Ramalina	Threatened	Gallia, Hocking, Jackson, Vinton, Washington
Ranunculus pusillus Low Spearwort	Threatened	Jackson, Scioto
Rhododendron calendulaceum Flame Azalea	Endangered	Jackson
Rhododendron maximum Great Rhododendron	Threatened	Hocking, Jackson, Scioto
Rhododendron periclymenoides Pinxter-flower	Threatened	Gallia, Lawrence, Monroe, Scioto
Rosa blanda Smooth Rose	Potentially Threatened	Scioto
Saccharum alopecuroides Silver Plume Grass	Endangered	Gallia, Lawrence, Scioto
Sagina decumbens Southern Pearlwort	Endangered	Scioto

Salix caroliniana Carolina Willow	Potentially Threatened	Scioto
Scleria oligantha Tubercled Nut-rush	Potentially Threatened	Lawrence, Scioto
Scleria pauciflora Few-flowered Nut-rush	Potentially Threatened	Hocking, Jackson, Scioto
Scleria triglomerata Tall Nut-rush	Potentially Threatened	Gallia, Jackson, Lawrence
Scutellaria saxatilis Rock Skullcap	Threatened	Gallia, Lawrence, Monroe, Scioto, Vinton, Washington
Sericocarpus linifolius Narrow-leaved Aster	Threatened	Jackson, Scioto
Sida hermaphrodita Virginia-mallow	Potentially Threatened	Gallia, Lawrence, Scioto
Silene caroliniana ssp. *wherryi* Wherry's Catchfly	Threatened	Scioto
Silphium laciniatum Compass-plant	Endangered	Lawrence
Solidago odora Sweet Goldenrod	Threatened	Jackson, Lawrence, Scioto
Solidago sphacelata False Goldenrod	Endangered	Lawrence
Solidago squarrosa Leafy Goldenrod	Threatened	Scioto
Spermacoce glabra Smooth Buttonweed	Potentially Threatened	Gallia, Lawrence, Scioto, Washington
Sphenopholis obtusata var. *obtusata* Prairie Wedge Grass	Threatened	Jackson
Spiraea virginiana Appalachian Spiraea	Endangered	Scioto
Spiranthes lucida Shining Ladies'-tresses	Potentially Threatened	Scioto
Stenanthium gramineum Feather-bells	Potentially Threatened	Gallia, Jackson, Lawrence, Scioto
Symphyotrichum oblongifolium Shale Barren Aster	Threatened	Hocking
Triadenum tubulosum Large Marsh St. John's-wort	Threatened	Gallia, Jackson, Scioto, Vinton
Triadenum walteri Walter's St. John's-wort	Threatened	Gallia, Jackson
Trichomanes boschianum Appalachian Filmy Fern	Endangered	Hocking
Trichostema dichotomum var. *lineare* Narrow-leaved Bluecurls	Endangered	Jackson
Trifolium stoloniferum Running Buffalo Clover	Endangered	Hocking, Jackson, Lawrence, Vinton

Uniomerus tetralasmus Pondhorn	Threatened	Jackson
Verbesina occidentalis Yellow Crown-beard	Endangered	Gallia, Lawrence
Viburnum rufidulum Southern Black-haw	Potentially Threatened	Scioto
Viola lanceolata Lance-leaved Violet	Potentially Threatened	Athens, Hocking, Jackson, Perry, Scioto
Viola pedata Birdfoot Violet	Threatened	Scioto
Viola primulifolia Primrose-leaved Violet	Endangered	Jackson, Scioto
Viola tripartita var. *glaberrima* Wedge-leaved Violet	Threatened	Athens, Scioto
Xyris torta Twisted Yellow-eyed-grass	Threatened	Scioto

APPENDIX B. Defenders' 2018 Comments to the Wayne Assessement Process on Climate Change Adaptation and Mitigation

Climate Change and the Wayne National Forest

The 2012 Planning Rule directs the Wayne NF to assess, among other things: "System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change;" [36 CFR § 219.6(b)(3)].

The 2006 Forest Plan is virtually silent on the topic of climate change; understanding of and interest in the topic have increased substantially during the intervening years. Therefore the next forest plan for the Wayne NF should fully incorporate both climate change ***adaptation***, (adjustment in natural or human systems in response to actual or expected climatic effects, which moderates harm or exploits beneficial opportunities) as well as climate change ***mitigation*** (reducing greenhouse gas emissions, and removing greenhouse gases from the atmosphere.) (IPCC 2015).

According to the 2018 National Climate Assessment, "Global average temperature has increased by about 1.8°F from 1901 to 2016, and observational evidence does not support any credible natural explanations for this amount of warming; instead, the evidence consistently points to human activities, especially emissions of greenhouse or heat-trapping gases, as the dominant cause" (Hayhoe et al., 2018). The region of the Wayne NF has to date experienced an observed temperature increase of about 1°F, and by mid-century temperatures are projected to increase by 2 to 3°F under a low emissions scenario (RCP 4.5) and 4 to 5°F under the higher emissions scenario (RCP8.5). The region has also experienced a 42% increase in the proportion of annual precipitation falling in heavy events. Projected impacts for the region of the Wayne NF include an increase of extreme high temperatures and severe storm events (Hayhoe et al., 2018).

Furthermore by mid-century southeast Ohio is projected to experience 30 to 50 more days per year with high temperatures above 90°F, and 20 to 30 fewer days with temperatures below 32°F (Vose et al., 2017). A 10 to 13% increase in 20-year return period for daily precipitation is also projected for the area (Easterling, et al., 2017). Vapor pressure deficit is projected to increase, leading to drier plants and soils.

The Forest Service has a long history of working on climate change, dating to its 2008 Strategic Framework and 2010 National Roadmap for Responding to Climate Change. We recommend that the WNF fully utilize this wealth of expertise and background, including the following publications where Forest Service was a lead author or partner organization:

"Effects of Climatic Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the U.S. Forest Sector,"(Vose, Peterson, & Patel-Weynand, 2012)

"Changing Climate, Changing Forests: The Impacts of Climate Change on Forests in the Northeastern United States and Canada," (Rustad et al., 2012)

"Responding to Climate Change in National Forests: A Guidebook for Developing Adaptation Options" (Peterson et al., 2011);

"Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment" (Glick et al., 2011)
"Climate-Smart Conservation: Putting Adaptation Principles into Practice" (Stein et al., 2014)
"Central Hardwoods Ecosystem Vulnerability Assessment and Synthesis: A Report from the Central Hardwoods Climate Change Response Framework Project," (Brandt et al., 2014)

"Forest Service Central Appalachians Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Central Appalachians Climate Change Response Framework Project," (Butler, et al., 2015)
"Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers," 2nd edition (Swanston et al., 2016)

Climate Change Impacts to Wayne NF and its Habitats

The Forest Assessment should include a robust treatment of the various individual and interacting threats to the WNF's habitats and species. The Wayne NF should undertake a vulnerability assessment of key species of plants and wildlife on the forest, utilizing standard tools and frameworks. This assessment can be informed by the Forest Service's own Central Appalachians regional assessment, which covered the southern unglaciated Alleghany plateau (Butler et al. 2015). It found that the most vulnerable ecosystem types in the region are hemlock, dry calcareous and riparian forests.
The Wayne should build on this assessment to better understand the following climate-related stressors and drivers that are mentioned in the Regional Assessment and elsewhere (Swanston et al., 2018): climate-related stresses like drought stress, wildfire frequency and severity, acid deposition and carbon dioxide fertilization, altered nutrient cycling, changes in invasive species, insect pests, and forest diseases, the effects of herbivory on young regeneration and interactions among these factors. In particular, the Wayne should assess the potential effects of ecological drought (Clark et al., 2016; Crausbay et al., 2017; Millar & Stephenson, 2015), the role of climate in mediating infestations of forest pests like emerald ash borer (DeSantis, et al., 2013) and hemlock wooly adelgid (Paradis, et al., 2008) and others (Weed, et al., 2013, Dukes et al. 2009), non-native flora (Fisichelli, et al., 2014, Lui et al. 2017), species range shifts and changes in composition (Jump, et al., 2009; Ma et al., 2016; Woodall et al. 2009, Iverson et al. 2008, Fei et al. 2017).

Climate Change Adaptation: Implications of Activities and Management on WNF

Maintaining biodiversity in the face of environmental change is key to maintaining ecosystem services and functioning (Oliver et al., 2015; Tilman, Isbell, & Cowles, 2014) and should be prioritized in forest planning. There is an extensive body of literature on development of climate change adaptation options, both in general (Stein, B.A. & P. Glick, 2014, Bierbaum et al. 2013), and targeted to forest management (Peterson et al., 2011, Janowiak et al., 2014, Millar et al. 2007, Littell et al. 2012, Keenan 2015).
The Wayne NF should plan to engage in climate change adaptation activities for species and habitats. A large suite of potential options has been catalogued (Heller & Zavaleta, 2009).

Successful climate change adaptation will likely require a diversity of adaptation options and a mix of strategies to "resist climate impacts, enhance resilience or transition systems" (Ontl et al., 2018). This could include: identify and protect climate refugia (Michalak, et al., 2018; Morelli et al., 2016) and geophysical settings that are conducive to presence of rare species (Anderson & Ferree, 2010); identify movement corridors that will allow species to shift their ranges in response to climate changes (Carroll, et al., 2018; McGuire, et al., 2016); and identify actions to improve resilience to disturbance by ameliorating other threats (like invasive species, unsustainable harvest, etc.).
Climate change should also inform Species of Conservation Concern identification. Climate change is increasingly being considered in conservation measures for species of concern, particularly through state wildlife action plans (Staudinger, et al., 2015).

Wayne NF Baseline Carbon Stocks

Baseline assessment of carbon stocks is a required element of the forest Assessment [36 CFR § 219.6(b)(4)]. There have been several efforts to assess carbon stocks in Ohio's forests since the 2006 forest plan. The Ohio Department of Natural Resources' 2010 Statewide Forest Assessment (Lytle, 2010) cites Forest Service data from 2008 (link non-functioning) in its statewide assessment of the carbon content of live trees (277 million short tons), dead trees (39 million short tons), understory plants (7 million short tons), leaf litter (41 million short tons) and soil (227 million short tons). A 2011 study indicated that Ohio's forests contain more than 597 million tons of carbon and that carbon stocks have increased substantially in recent years as forests have matured (Widmann et al. 2011), a fact which highlights the need for an updated assessment. Both studies agreed that the highest levels of forest biomass in the state were found in the planning region.

Climate change mitigation: Greenhouse Gas Implications of Activities and Management on WNF

Timber Harvest.

Baseline assessment of carbon stocks forms the basis of a quantitative understanding of the WNF's potential to help mitigate climate change. As the need to reduce global greenhouse gas emissions to prevent catastrophic climate change has become more apparent (DeAngelo et al., 2017), recent research has generated considerable interest in carbon uptake and storage by photosynthetic systems, including forests. One recent study found that "conservation, restoration and improved land management actions" in natural ecosystems like forests, wetlands and grasslands, can provide over one-third of the CO_2 mitigation needed through 2030 (Griscom et al., 2017). Indeed, Article 5 of the Paris Climate Agreement, to which the United States remains a party until 2020 at the earliest, states that "(1) Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests." A major synthesis of forests and carbon storage concluded that:
"Because forest carbon loss contributes to increasing climate risk and because climate change may impede regeneration following disturbance, avoiding deforestation and promoting regeneration after disturbance should receive high priority as policy considerations. Policies to encourage programs or projects that influence forest carbon sequestration and offset fossil fuel emissions should also consider major items such as

leakage, the cyclical nature of forest growth and regrowth, and the extensive demand for and movement of forest products globally, and other greenhouse gas effects, such as methane and nitrous oxide emissions, and recognize other environmental benefits of forests, such as biodiversity, nutrient management, and watershed protection. Activities that contribute to helping forests adapt to the effects of climate change, and which also complement forest carbon storage strategies, would be prudent." (Mckinley et al., 2011). Protection of remnant primary, intact forests, along with restoration and reforestation of degraded landscapes, is therefore an underutilized aspect of climate protection; however, due to perverse incentives and gaps in greenhouse gas reporting, "forest protection and restoration in the United States has been largely ignored as a climate imperative while accelerated logging [for biomass energy and wood products] is often proposed as a climate solution" (Moomaw & Smith 2017). Logging activities are, in fact, a major threat to the ability of forests to store carbon. Carbon emissions attributable to harvest currently account for 85% of the annual forest carbon loss from U.S. forests (86% in Ohio), dwarfing that of losses from insects, fire, wind and drought combined (Harris et al., 2016). It has further been calculated that wood products, which are sometimes touted as a form of carbon sequestration, provide long-term storage for only about 1% of the carbon that was originally stored in the living forest (Ingerson, 2011).

The Wayne National Forest assessment should include a robust analysis of the Forest's contribution to carbon sequestration, and an assessment of the extent to which logging activities hinder that critically important ecosystem service.

Oil and Gas Drilling and Mining. Working Groups providing input to the Wayne National Forest have extensively documented concerns about the impacts oil and gas drilling and mining, particularly hydraulic fracturing, to biodiversity, air and water quality, water supply, and local health. We incorporate by reference here those comments.

A recent analysis of federal lands energy development found that nationwide emissions from these fossil fuel developments are 1.52 billion tons CO_2eq per year, and must be reduced by at least 25% if the U.S. hopes to keep climate warming to 2^{o}C or less (TWS 2018).

The USGS, in calculations "Combining the fossil fuel extraction and combustion emissions with the ecosystems emissions and sequestration estimates provides an informative summary result that includes both anthropogenic emissions and sequestration by ecosystems on Federal lands," found that Ohio's federal lands (comprised mainly of the WNF), in 2014 were a nets source of carbon sequestration, at a rate of 0.6 million metric tons CO_2 eq. Concerningly, this figure represents a decline from previous years (the figure was 2.5 mmt CO_2 eq in 2011) (Merrill et al., 2018). Given that further extraction of fossil fuels conflicts with the clear need to reduce greenhouse gas emissions, the Wayne should include the goal of climate protection in its assessment of the potential impacts of drilling and mining.

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