POPULATION VIABILITY ASSESSMENT IN FOREST PLAN REVISION: NATIONAL FORESTS OF WISCONSIN AND MINNESOTA

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EXECUTIVE SUMMARY

The purpose of this document is to describe a process for addressing maintenance of viable populations in the Forest Planning process. In July 1999, the Wisconsin and Minnesota National Forests in U.S. Forest Service Region 9 began an effort to develop a process for addressing the maintenance of viability of all native species (and desired non-native species) on the national forests during forest plan revision.

Specifically, this document details the process that we are using for selecting species for population viability assessment, conducting literature reviews, organizing and conducting expert panel sessions to determine species habitat needs and ecological process needs, and compiling and delivering information to the planning teams. The document details the process we are proposing for incorporating information into management plan alternatives and standards and guidelines. It also describes preliminary information on a process to organize and conduct scientific review panels to evaluate draft forest plan alternatives. The process to conduct scientific review panels will be described in more detail in a future document.

The U.S. Forest Service is mandated to manage habitats to maintain viable populations of existing native and desired non-native wildlife, fish, and plant species, as indicated by the following information:

> 36 CFR 219.19: "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area."
>
> Departmental Regulation 9500-4: Manage "habitats for all existing native and desired non-native plants, fish, and wildlife species in order to maintain at least viable populations of such species."
>
> 36 CFR 219.19: "For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area."

The process we are using is based, in part, on the Tongass Population Viability Assessment for Land Management Planning, Columbia River Basin Assessment, Forest Ecosystem Management Assessment Team, Committee of Scientists report, U.S. Forest Service Region 1/Region 4 Terrestrial Protocols, U.S. Forest Service Washington Office Review, and the Conservation Breeding Specialists Group.

The species selected for viability assessment fall into one or more of the following categories: 1) listed on the Regional Forester Sensitive Species (RFSS) List for Region 9, 2) federally listed as threatened or endangered, or proposed, 3) focal species representing ecosystems of concern, and 4) additional species of viability concern that could become RFSS listed during the upcoming planning period.

Species automatically considered for the RFSS List included U.S. Fish and Wildlife Service candidates for listing under the Endangered Species Act (ESA), species removed from the list in the last five years under ESA, and species designated by The Nature Conservancy as G1-G3, T1-T3 and N1-N3. Natural Heritage Program S1, S2, State Threatened and Endangered, and species considered at risk on individual forests were screened using a risk evaluation process including categories of abundance, distribution, population trend, habitat integrity, and population vulnerability.

Ecosystems of concern were identified through a review of literature, including Wisconsin Biodiversity Report; Scientific Roundtable on Biological Diversity; Endangered Ecosystems Report; Natural Heritage Program; National Forest Assessments, Analyses of the Management Situation, Issue Papers, and New Information Report; and Minnesota's Generic Environmental Impact Statement. A preliminary list of focal species for ecosystems of concern was collected by reviewing literature and consulting some of the species experts, asking for their suggestions on species that fit the focal species definition in the proposed planning rule. This includes species that serve an umbrella function in terms of encompassing habitats needed for many other species. The PVA Team then ranked the preliminary list of suggested focal species based on: their sensitivity to threats likely to occur within the ecosystem, their fidelity to the ecosystem or a component of the ecosystem, and the likelihood of being able to collect enough information about the species to design a conservation strategy around it.

The list of species ranked high or medium-high was presented to experts at the panels. Information on the proposed focal species was gathered at the panels in the same way as it was for the remaining species on the population viability assessment list. Panelists were asked to respond to a questionnaire evaluating the proposed focal species. Nearly all the species selected in the initial screening process described above received general approval from the respondents. Panelists made recommendations regarding potential additions or deletions of proposed focal species. These recommendations will be reviewed and considered for addition to or deletion from the population viability assessment process.

The following criteria were used to identify additional species of viability concern: 1) species for which there is extremely high public concern as indicated by their recommendation through a number of published sources and comments from the public <u>and</u> 2) species whose populations are in decline and for which trends indicate a possible future viability concern such that the species could become RFSS listed during the upcoming planning period (10-15 years).

Literature searches, literature reviews, and, in some cases, informal consultations with experts, were conducted for most of the selected species. This information was available for each of the appropriate expert panels.

During the first set of expert panels, experts compiled and synthesized information on habitat needs and ecological process needs for the selected species, including identifying quality, quantity, distribution, and connectivity of habitats and/or quality and quantity of ecological processes needed to maintain the species. A major feature of this work session was the synthesis of information from experts that is both published and unpublished. Species experts developed responses to questions provided. The questions fall into several categories including habitat, landscape structure, ecological processes, alleviation of threats, and population.

The questions tie to Outcomes A through E, with an emphasis on Outcomes A and C. The Outcomes are based on the associated quality, quantity, and distribution of habitat as well as the level of interactions of the selected species. For example, Outcome A is described as follows: "Habitat is distributed broadly across the taxon's historic range and is of sufficient quality to support the type and degree of intrademe and metapopulation interactions that the taxon would characteristically engage in if it were not habitat limited." For Outcome C: "Habitat across the taxon's historic range is reduced in quality or quantity. Local demes have been extirpated. Metapopulation interactions are adversely altered throughout most of the taxon's range. The geographic extent of the taxon is reduced."

Each of the expert panels had a facilitator and scribe to aid in the process of gathering and recording information. Resource management specialists were available to answer questions, as appropriate. The Population Viability Assessment Team and CBSG directed the overall process.

The information obtained in the first set of expert panels is being compiled and will be delivered to the Forest Plan Interdisciplinary Teams for development of Draft management plan alternatives and standards and guidelines.

After alternatives are developed, there will be a second set of expert panels. Experts will review draft Forest Plan alternatives and standards and guidelines. Specifically, there will be an evaluation of the likelihood that each of the conditions described in the outcome statements would be achieved under each of several draft alternatives.

BACKGROUND

The purpose of this document is to describe a process for addressing maintenance of viable populations in the Forest Planning process. In July 1999, the Wisconsin and Minnesota National Forests in U.S. Forest Service Region 9 began an effort to develop a process for addressing the maintenance of viability of all native species (and desired non-native species) on the national forests during forest plan revision.

Specifically, this document details the process that we are using for selecting species for population viability assessment, conducting literature reviews, organizing and conducting expert panel sessions to determine species habitat needs and ecological process needs, and compiling and delivering information to the planning teams. The document details the process we are proposing for incorporating information into management plan alternatives and standards and guidelines. It also describes preliminary information on a process to organize and conduct scientific review panels to evaluate draft forest plan alternatives. The process to conduct scientific review panels will be described in more detail in a future document.

The U.S. Forest Service is mandated to manage habitats to maintain viable populations of existing native and desired non-native wildlife, fish, and plant species, as indicated by the following information:

> 36 CFR 219.19: "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area."
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> 36 CFR 219.19: "For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained habitat must be provided to support at least a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.

The process we are using is based, in part, on the Tongass Population Viability Assessment for Land Management Planning (Shaw 1999), Columbia River Basin Assessment (Quigley et al. 1997), Forest Ecosystem Management Assessment Team (FEMAT), Committee of Scientists report (USDA 1999a), U.S. Forest Service Region 1/Region 4 Terrestrial Protocols (USDA 1996), U.S. Forest Service Washington Office Review, and the Conservation Breeding Specialists Group (CBSG; Byers et al. 1999).

The management goals are as follows. By the end of the planning period:

- Ecosystem sustainability will be enhanced or maintained by ensuring the viability of all native plant and animal species
- Measurable contributions are made to the recovery of federally listed plants and animals
- There will be less need to designate sensitive species (USDA 1999b).

STEPWISE PROCESS

Select species for population viability assessment

The species selected for viability assessment fall into one or more of the following categories: 1) listed on the Regional Forester Sensitive Species (RFSS) List for Region 9, 2) federally listed as threatened or endangered, 3) focal species representing ecosystems of concern, and 4) additional species of viability concern that could become RFSS listed during the upcoming planning period.

Select species of current viability concern

Species that were listed as federally threatened or endangered were automatically included in the group of species selected for evaluation by the panelists.

Species that were candidates for listing as R9 Regional Forester Sensitive Species (RFSS) were also automatically included in the group of species considered of current viability concern. Regional Forester Sensitive Species candidates were proposed during the summer of 1999 by applying specific criteria to determine eligibility. Species automatically considered for the RFSS List included U.S. Fish and Wildlife candidates for listing under the Endangered Species Act (ESA), species removed from the list in the last five years under ESA, and species designated by The Nature Conservancy as G1-G3, T1-T3, and N1-N3.

The Nature Conservancy's Natural Heritage Program state ranks of S1 or S2, State of Minnesota or Wisconsin Threatened or Endangered, and other species considered at risk on individual National Forests were screened using a risk evaluation process including categories of abundance, distribution, population trend, habitat integrity, and population vulnerability.

The definitions for the priority rankings are based on information from Natural Heritage Program (1996). The "G" ranks are for interpreting the global (i.e., range wide) conservation status rank. "T" ranks are for interpreting the status of subspecies or varieties. "N" ranks are based on populations and occurrences in the United States (including Alaska and Hawaii). "S" ranks are based on populations and occurrences within the state. The numeric ranking of one through three ranges from critically imperiled to rare or uncommon.

Potential sources for forests to identify "species at risk" included: USFWS Management Concern species, Partners in Flight, other NHP tracked species, State Special Concern or Watch species, Audubon State Watch lists, Tribal and Regional lists or other documented references. See Appendix A for USFS Region 9 sensitive species risk evaluation instructions and form.

This selection process resulted in 74 plant species and 56 animal species totaling 130 species of current viability concern. The actual number of species considered of current viability concern, however, has changed since this initial selection and is likely to continually change. In the course of conducting the panels, experts made new suggestions for species at risk and several of those species were addressed during the panels. The designation of RFSS was February 29, 2000, after most of the panels were conducted. Several designated RFSS had not been identified as candidates (or as species otherwise at risk) and therefore were not included in the expert panels. These will have to be addressed in the future. Further, the RFSS list is a flexible list: species may be added to or dropped from RFSS designation based on new information or changes in status or risk.

Select proposed focal species

Focal species population status and trends provide insight to the integrity of the larger ecological system to which it belongs. Focal species act as surrogate measures in the evaluation of ecological integrity. They can encompass habitats needed for many other species, play key roles in ecological processes, or convey information about the status and integrity of the larger ecosystem in which they occur (USDA 1999a).

The Committee of Scientists (USDA 1999a) define focal species as including indicator species, keystone species, ecological engineers, umbrella species, link species, and species of concern (See glossary for definitions of terms). Use of focal species is consistent with that of the Committee of Scientists Report (USDA 1999a) and is addressed elsewhere in the literature by Lambeck (1997). These sources provide explanations of the characteristics of focal species, although definitions and process recommendations vary slightly among the different sources. Appendix B gives a description of the difference between focal species and Management Indicator Species (MIS).

Selection of focal species should result in a suite of species whose requirements for ecosystem management encapsulate the needs of numerous other species. The needs of the focal species define the minimum requirements, or thresholds, that must be exceeded in order to maintain species viability or continued existence in the planning area. By applying this approach, it is possible to specify what is required in a landscape, in what quantities, and in what configurations in order to meet the needs of the species present.

The specific definition we used for the selection of focal species is taken from the draft planning regulations:

> Focal species are used as surrogate measures in the evaluation of ecological integrity, including the diversity of native and desired non-native species. The key characteristic of a focal species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs. Individual species, or groups of species that use habitat in similar ways or that perform similar ecological functions, may be identified as focal species because they serve an umbrella function in terms of encompassing habitats needed for many other species, play a key role in maintaining community structure or processes, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological integrity. Also, certain focal species may be identified for the purpose of evaluating ecological conditions needed to provide for the viability of some other species.

The PVA Team identified ecosystems of concern through a review of literature, including Wisconsin Biodiversity Report (Addis et al. 1995); Scientific Roundtable on Biological Diversity (USDA 1992); Endangered Ecosystems Report (Noss et al. 1995); Natural Heritage Program; USFS--Chequamegon-Nicolet National Forest Assessments, Analyses of the Management Situation, and New Information Report; USFS—Minnesota National Forest's Analyses of the Management Situation and Issue Papers; and the State of Minnesota's Generic Environmental Impact Statement (Jaakko Poyry 1994). See Appendix C for a list of ecosystems of concern.

A preliminary list of suggested focal species was collected by reviewing literature and consulting some of the species experts, asking for their suggestions on species that fit the focal species definition in the proposed planning rule. This includes species that serve an umbrella function in terms of encompassing habitats needed for many other species. The PVA Team then ranked the preliminary list of suggested focal species, based on: their sensitivity to threats likely to occur within the ecosystem, their fidelity to the ecosystem or a component of the ecosystem, and the likelihood of being able to collect enough information about the species to design a conservation strategy around it.

The list of species ranked high or med-high was presented to experts at the panels. From this initial process, we proposed a set of focal species to represent ecosystems of concern (Appendix C). Some were already on the population viability assessment list either as RFSS listed; federally listed as threatened, endangered, or proposed; or additional species of viability concern. See section entitled "Evaluate proposed focal species" for additional screening information.

The needs of focal species will be used to develop guidelines for management to provide the amount, composition, and configuration of habitat needed by the species. Monitoring will be established to test the assumption that landscapes designed and managed according to the needs of focal species will also conserve other species.

Select species of near-future viability concern

The following criteria were used to identify species of near-future viability concern: 1) species for which there is extremely high public concern as indicated by their recommendation through a number of published sources and comments from the public and 2) species whose populations are in decline and for which trends indicate a possible future viability concern such that the species could become RFSS listed during the upcoming planning period (10-15 years). Over 300 additional species were screened during this process, resulting in the addition of 18 species to be evaluated by panelists. See Appendix D for a list of the animal species selected and Appendix E for a list of the plant species selected.

Conduct literature review on selected species

A thorough literature review was conducted for most of the species selected for evaluation. This information gathering process included collecting available published information on the species' biology and ecology by conducting scientific literature review. Species experts were contacted informally to provide literature sources or offer expert opinions in completion of some information items.

Temporary Forest Service employees were hired to complete this work. Data items of interest are listed in the species literature review forms (Appendix F). This information was made available for each of the appropriate expert panels and served as background information for the expert panels.

Organize and conduct expert panel sessions to determine species habitat needs and ecological process needs

Purpose of conducting panels

During the first set of expert panels, experts compiled and synthesized information on habitat needs and ecological process needs for the selected species, including identifying quality, quantity, distribution, and connectivity of habitats and/or quality and quantity of ecological processes needed to maintain the species.

A major feature of these panel sessions was the synthesis of information from experts that is both published and unpublished. Conservation Breeding Specialist Group has observed that perhaps 80% of useful information for species risk assessment and management for species viability is in the minds of the experts, is not published, and is not likely to be available in printed form for problem solving.

Identify and recruit species experts

We approached the selection of species experts under guiding principles established during the Tongass Land and Resource Management Plan revision (Shaw 1999), the Columbia River Basin Assessment (Quigley et al. 1997), and in consultation with the Forest Service National Wildlife Ecologist (Richard Holthausen), the Forest Service Research Decision Support Specialist (David Cleaves), and CBSG.

1. The success and perceived validity of expert panel workshops depends, to a large part, upon participation of recognized experts. Accordingly, great care should be taken to recruit a selection of recognized specialists on the taxa under review.
2. A species expert is someone who is recognized by his or her peers as having expertise in the biology/ecology of species under review. This expertise may have been gained through research, education, study, or experience.
3. It is important that the invited experts have reputations for objectivity, initial lack of local bias, and for active transfer of required skills for panel participation (i.e., "people skills") in addition to technical expertise.
4. A limited number of true experts are available for each species or species groups.
5. Panels operate most successfully with from 4 to 10 species experts.
6. It is generally necessary to identify and invite 2 to 3 times more experts than desired on the assumption that many will be unable to attend. Even with the best efforts, the unavailability of some experts may limit the diversity of the experts' background.
7. Species experts can generally best be located using local professional networks, government agencies, academic facilities, national institutes, wildlife or natural history societies, etc. Another source, though not as satisfactory as the preceding, is the published scientific literature.

The identification, selection, and invitation of experts was an iterative process that occurred over several months. The Population Viability Assessment Team brainstormed and drafted an initial list of potential species experts to be considered as panelists. We identified the species or species group for which they had expertise and their professional affiliation. They included representatives from: North Central Forest Experiment Station; Minnesota and Wisconsin Department of Natural Resources (DNR); U.S. Fish and Wildlife Service; universities in Wisconsin, Minnesota, and Michigan, and other states; Fond du Lac and Leech Lake Reservations; Great Lakes Indian Fish and Wildlife Commission (GLIFWC); Potlatch; Boise Cascade; Natural Resources Research Institute; etc.

The Population Viability Assessment Team e-mailed the list of potential panelists to all Minnesota, Wisconsin, and Michigan National Forests and Region 9 wildlife biologists, botanists, and ecologists asking for review, comment, and additional suggestions. We e-mailed this request three times at approximately two-week intervals. The response was low, but we got additional recommendations and support for the appropriateness of experts we had identified.

The Population Viability Assessment Team sent invitations to the identified experts to request their participation in panels that were initially scheduled for December 1999. We attached the list of experts and welcomed them to provide comments or additional suggestions. Again, response was low, but we got a number of additional suggestions.

The panel workshops were rescheduled for January 2000. We followed up with telephone calls to species experts, instead of relying on written invitations. When we talked to the experts, we told them who the other experts were for their species groups and asked if they could think of others. These calls proved to be very productive for the validation of our proposed panelists and identification of additional experts.

It should be noted that some of the scientists did not feel they were "experts." However, under the guiding principles presented above the term "expert" was used collectively for resource professionals who had experience and knowledge of habitat needs and ecological process needs for a selected species or species group.

Species experts received an invitation letter and related materials (See Appendix G for invitation letter and registration form). Related materials included a registration form, an agenda, information on travel expenses and lodging, a brief overview of the proposed process, and a list of the groups of species by panel and the proposed panelists. Potential participants received this information both by email and by hard copy. Proposed panelists who were able to attend were asked to respond by completing and submitting the attached registration form.

Organize and conduct panel sessions

The Population Viability Assessment Team and CBSG facilitated the overall process. Each of the expert panels had a facilitator and scribe to aid in the process of gathering and recording information. Resource management specialists were available to answer questions, as appropriate.

Species were separated into groups according to taxonomic classification or generalized habitat type and panelists were assigned to each of the species groups (Appendix H). See Appendix I for a list of registrants/participants in panel workshops, including panelists, workshop organizers, facilitators, and scribes.

During the Plenary session, there was an overview of forest planning, species selection, and the expert panel process (See agendas in Appendix J). The working group agreement was reviewed (Appendix K).

Species experts developed responses to questions provided. The questions fell into several categories including habitat, ecological processes, population, landscape structure, and alleviation of threats. Two sets of questions were developed and used. One set related to terrestrial species (Appendix L). The other set related to aquatic species (Appendix M).

The questions tied to Outcomes A through E, with an emphasis on Outcomes A and C (Appendix N). The Outcomes are based on the associated quality, quantity, and distribution of habitat as well as the level of interactions of the selected species. For example, Outcome A is described as follows: "Habitat is distributed broadly across the taxon's historic range and is of sufficient quality to support the type and degree of intrademe and metapopulation interactions that the taxon would characteristically engage in if it were not habitat limited." For Outcome C: "Habitat across the taxon's historic range is reduced in quality or quantity. Local demes have been extirpated. Metapopulation interactions are adversely altered throughout most of the taxon's range. The geographic extent of the taxon is reduced."

The work session materials that were available to the panelists are listed in Appendix O.

Evaluate proposed focal species

Information on the proposed focal species was gathered at the panels in the same way as it was for the remaining species on the population viability assessment list.

A focal species questionnaire was distributed at the plenary session and panelists were asked to complete and submit the form. The questionnaire delineated the proposed focal species along with their associated ecosystems of concern and provided space for participants to agree or disagree with the proposals, to propose additional or alternative selections, and to provide justifications for their suggestions. See Appendix P for focal species questionnaire.

A month was allowed for species experts to respond to the questionnaire. A summary of the responses from panelists to the proposed focal species can be found in Appendix Q. Nearly all the species selected in the initial screening process described above received general approval from the experts. Panelists made recommendations regarding potential additions or deletions of proposed focal species. These recommendations will be reviewed and considered for addition to or deletion from the population viability assessment process.

Compile and deliver information to planning teams

The information obtained in the first set of expert panels is being compiled and entered into a Microsoft Access Database and will be delivered to the Forest Plan Interdisciplinary (ID) Teams for development of Draft management plan alternatives and standards and guidelines. See Appendix R for database dictionary.

A partial report is given in Appendix S. This appendix includes selected fields from the PVA database using the Connecticut warbler as an example (Note: this example does not include the aquatic fields).

After conducting the first set of expert panels, the PVA Team developed a list of operational considerations for the population viability assessment process for Region 9. These are described in Appendix T.

Incorporate information into management plan alternatives and standards and guidelines

Information provided to the Forest Plan ID Teams will allow those teams to incorporate information into plan alternatives and standards and guidelines as follows:

- Identify the types, amounts, distribution, and connectivity of habitats as well as the types and amounts of ecological processes needed to maintain the species.
- Identify conservation practices needed to ensure species viability.
- Suggest a coarse-filter approach that will provide suitably distributed habitat for the persistence of the focal species in the coarse-filter process.
- Suggest a fine-filter approach that will provide suitably distributed habitat for the persistence of species in the fine-filter process.
- Suggest landscape linkages that will provide for persistence of focal and other species selected for the population viability assessment.
- Suggest ecological processes that will maintain viable populations.
- Identify which management practices are most effective in maintaining species viability.

The following is an overview of the general process recommended for incorporating information into management plan alternatives and standards and guidelines for the Draft Environmental Impact Statement.

Coarse-filter approach

The coarse-filter approach, in conjunction with the fine-filter approach, provides favorable habitat conditions for many native species simultaneously. The coarse filter will also contribute to maintaining or restoring ecological processes that are necessary for ecosystem sustainability. These ecosystems provide protection for most species; those not conserved by the coarse-filter approach will be addressed using the fine filter.

The coarse filter is believed to be an appropriate strategy for conserving multiple species within the same area in a proactive fashion, including those that are unknown, not inventoried, or whose life-cycle requirements are not well documented.

> The Nature Conservancy calls its community strategy a coarse filter (Noss, 1987) and has estimated that 85-90% of species can be protected by conserving samples of natural communities without separate inventory and management of each species. One of the most compelling arguments for a coarse-filter or ecosystem approach is its efficiency and cost-effectiveness. A major limitation [of single-species conservation] is that most species conservation is essentially reactive. Protection and recovery may be expensive and require immediate and extreme changes in land use. Ecosystem conservation may reconcile conflicts between separate management strategies for individual species." (Noss et al. 1995)

The spatial configuration of the coarse filter is an important consideration in National Forest planning. Some species require or benefit from specific spatial arrangements; these may include large patches of contiguous habitat, linkages of habitat patches through the matrix, or juxtapositions of patches with specific composition or structure. In addition to species, some habitat features may be selected as indicators of ecosystem function. Habitat needs of focal species will be analyzed, and projections made about the size, composition, and spatial arrangement that will be needed to sustain populations of focal species. National Forests should develop a landscape design for the coarse filter that incorporates these considerations.

Ecosystems exist at multiple spatial scales, from micro sites to large landscapes. Scale is a consideration in conservation designs to maintain the diversity of native plant and animal communities and the productive capacity of ecological systems. Thus, a coarse filter could be designed to represent a dominant land cover type, but would also contain the characteristic smaller patches associated with that landscape. Within-stand structure is another consideration, as many species require certain features (e.g., large down logs, tip-up mounds and pits, a conifer component, etc.). Some of these fine scale features can be prescribed by management alternatives as well as standards and guidelines, or can be allowed to develop through the operation of natural processes in the coarse filter.

In addition to using focal species to develop the coarse-filter approach, information from historical range of variability (HRV) may be used. The HRV, "roughly equivalent to the natural range of variability concept, refers to the expected variation in physical and biological conditions caused by natural climatic fluctuations and disturbance regimes (e.g., flooding, fire, and windthrow)" (USDA 1999a, pp. 35-38).

Fine-filter approach

Species for which the coarse filter will not result in a high likelihood of maintaining viability must be addressed using the fine-filter approach. The fine filter provides specific direction for management of individual species through the development of conservation strategies that maintain fine-scale ecosystem components (e.g., fens, vernal ponds, caves, or other rare habitats and microhabitats).

Species with the following criteria are those that will most likely not be protected via the coarse filter and will require the fine-filter approach:

- Narrowly endemic species
- Species of highly specialized/unique habitats
- Wide-ranging species
- Any other species that are not predictably associated with specific habitat types or seral stages

Some species have become rare for reasons beyond the control of humans. Although humans have a role in providing protection for them, in many cases it is impossible or inappropriate to expand their local population size or increase their range. These

conditions of rarity include species that are very specialized and require unusual microhabitats, populations at the edge of the species range, and species that are relicts of former climatic regimes.

Rare species for which National Forests can actively manage habitat are primarily those whose population trends are in decline due to habitat loss or degradation. Habitat degradation takes several forms, including direct changes in the physical or biological environment (e.g. wetland drainage), biotic imbalance (e.g. impacts of herbivory), or ecological disruption (e.g. fire suppression). Appropriate habitat restoration for rare species will vary depending on the type of degradation

Landscape linkages

One aspect of maintaining population viability is to provide functional landscape linkages, or connectivity, between blocks of habitat. Landscape linkages serve to minimize the problems associated with habitat fragmentation and increase the effective size of total habitat (Harris 1984). Landscape linkages serve as pathways for genetic interchange and for range extensions. They are also important for daily, annual, and seasonal movements, permitting dispersal to breeding, foraging, and wintering grounds.

Connectivity refers both to the abundance and spatial patterning of habitat and to the ability of members of a population to move from patch to patch of similar habitat (With and Crist 1995, USDA 1996). Connectivity can be maintained by providing an intervening habitat matrix that permits effective dispersal of species and/or by providing wildlife corridors. A wildlife corridor is defined as "a narrow strip, stepping stones or a series of hospitable territory traversing inhospitable territory providing access from one area to another" (Denny 1987) that "were connected in historical time" (Hobbs 1992, USDA 1996).

As stated in Lambeck (1997):

> Dispersal-limited species are those for which there are suitable habitat patches to support small populations, but the patches are beyond the distance over which individuals can move or are separated by a matrix that is too hostile to permit movement. If individual populations are too small to be viable in their own right, the combination of stochastic and anthropogenic impacts can result in rates of local extinction that exceed rates of recolonization. Such species will require increased connectivity between habitat patches either by provision of corridors or by a reduction in the resistance of the intervening matrix (Knaapen et al. 1992).

Connectivity, specifically the need for corridors, is an issue identified in the Marble Mountain 9th Circuit Court decision. The court (Marble Mt. Audubon Soc. vs. Rice 914 F.2d 179) provides the agency with direction. In this case, five criteria serve to evaluate land as a wildlife corridor: plants can propagate, genetic interchange can occur, populations can move in response to environmental changes and natural disasters, and individuals can colonize habitats from which populations have been locally extirpated (USDA 1996).

Further direction for landscape linkages is provided in the Notice of Intent to Prepare Environmental Impact Statement for the Revision of the Land and Resource Management Plan for the Chequamegon and Nicolet National Forests (1996). The document states that "The revised Plan will specify what habitats should be linked to provide for movement of plants and animals and to increase the effective size of habitats that are now separated in space. It will also state how much area is needed to link habitats with suitable types of management in the various corridors."

Corridor dimensions and habitat requirements will be based primarily on the needs of the focal species. Specifically, Lambeck (1997) recommends the following approach to using focal species for delineating corridors:

> Species should be ranked according to the minimum width, length, and structural requirements of the connecting vegetation through which they are known to move. The species with the greatest need for wide corridors or with the least inclination to move along corridors become the focal species for defining corridor width and length, respectively. Similarly, species with the most demanding structural requirements are used to define the structural attributes of the connecting vegetation. If dispersal data are not available, presence/absence data can be used to determine the inter-patch distance beyond which seemingly suitable habitat is not occupied. For example, P. Cale (unpublished data) found, for a range of bird species, that seemingly suitable patches remained unoccupied if they were too isolated [see Fig. 2 for an example]. For each patch type in a landscape, the minimum acceptable distance between patches would be defined by the species with the shortest distance beyond which an otherwise suitable patch is not occupied.

For the habitats that should be linked to provide the movement of plants and animals, the following aspects should be considered in the identification and prioritization of landscape linkages:

1) <u>Width of corridors</u>. There are two main categories of corridors as distinguished by Noss (1983). The first category is the line corridor, for example, narrow stringers of trees. Line corridors are valuable in that they provide some security and shelter for travel by those wildlife species that will utilize them. Strip corridors are wider corridors that provide interior habitat conditions (as opposed to line corridors which are all edge). Where possible, strip corridors are preferred because they accommodate travel for a broader range of wildlife species and provide habitat for foraging and reproduction for a number of wildlife species.

2) <u>Extent and richness of high quality habitat within corridors for focal species</u>. High quality habitat within landscape linkages is defined as habitat that provides for forage, cover, or other essential needs, as appropriate during the dispersal of the given species. Quality of habitat includes consideration of structural elements. Important structural characteristics include large trees, snags, logs, etc.

3) Riparian habitats. Riparian habitats, including portions of adjacent upland habitats, should be considered in the identification and prioritization of corridors. The Committee of Scientists (USDA 1999a) suggests a strategy for the conservation and restoration of watersheds, including the following:

> Provide conditions for the viability of native riparian and aquatic species. The status of native riparian and aquatic species is typically an important indicator of watershed condition. Thus, it is important that native riparian and aquatic species be included as candidate focal species in the analysis [as discussed in Sect. 6A] to provide for the ecological conditions needed to conserve native species. In particular, threatened, endangered, and sensitive riparian and aquatic species should receive extensive consideration in the analysis. The needs of these species should represent a driving force in developing goals and standards for areas near streams and in estimating the overall ecological conditions of watersheds.

The Scientific Roundtable on Biological Diversity (USDA 1992) also recommends the delineation of riparian corridors for biological migration. The Chief of the USDA Forest Service directed the Regional Forester to establish a "committee of scientific experts" to address biological diversity issues on the Wisconsin National Forests. The Scientific Roundtable states the following:

> A 1/2-mile river corridor (1/4 mile on each side of the river) is required for Wild and Scenic Rivers. For major rivers within the Forests, this width should be considered necessary to protect ecologically sensitive attributes such as watershed protection and biological migration. A wider corridor may be necessary in some cases to adequately protect aquatic and riparian features. For small streams, buffers should be variable along stream sides, depending on the type of stream, surrounding topography, and contiguous vegetative cover to provide natural shading and filtering of lateral water movement.

4) Corridors that require limited or no restoration. There has been debate over the ability to provide replacement ecosystems through vegetative management. Due to the complexity of natural ecosystems, it is unlikely that we will have the capability to reproduce fully functional ecosystems (Society of American Foresters 1984). Therefore, we should provide existing natural ecosystems to the extent possible. However, where existing corridors are insufficient to meet ecological needs, or are lost due to catastrophic disturbances, there is no alternative but to assume we can recreate at least some of the components of a natural ecosystem (Thomas et al. 1988).

5) Corridors that are buffered by limited-intensity management activities. Corridors can be combined with buffer zones to design a landscape that provides high quality wildlife habitat intermingled with human land uses with a minimum of conflict (Harris 1984, Noss 1987). This system involves having a core area buffered by a zone of low intensity land use, which minimizes impact on the core area from surrounding higher intensity land uses.

6) Redundancy. Where appropriate and feasible, more than one linkage should be considered between blocks of habitat to improve the likelihood of persistence of linkages

in the event that corridors are impacted by disturbance such as catastrophic blow down or fire.

7) Adequate connectivity with blocks of habitat outside of the National Forest boundaries. Corridors which appropriately link blocks of habitat within national forests to blocks of habitat outside national forest boundaries can enhance population viability by increasing the effective size of total habitat and by facilitating genetic interchange, range extensions, and dispersal to breeding, foraging, and wintering grounds

Ecological assessments

Ecological assessments provide a great deal of information that is pertinent to the development of conservation strategies for the maintenance of population viability. Ecological assessments include, but are not limited to, breeding bird surveys; maps of potential habitat and habitat suitability for wolves and other species; transect survey information; harvest data; Department of Natural Resources surveys of wildlife, fisheries, and botanical resources; Natural Heritage Program inventories of threatened, endangered, and sensitive species; Forest Service surveys of plant and animal resources as well as associated habitat features.

Specifically, an ecoregional assessment is a scientific assessment of the characteristic composition, structure, and processes of ecosystems. These assessments provide an understanding of the ecological integrity of the planning area under current policies and across ownerships.

Technical elements of ecoregional assessments include historical conditions, current conditions and trends, and estimates of future conditions and trends. The Great Lakes Assessment comprises the states of Minnesota, Wisconsin, and Michigan. The terrestrial and aquatic ecosystems of the National Forests in Minnesota and Wisconsin have been mapped and described by interagency and interdisciplinary teams. Ecological unit boundaries delineate areas with different types of potential vegetation and different ecosystem processes. This information, together with data on existing land use/ land cover, provides a framework for analysis of habitats at landscape and regional scales.

Organize and conduct scientific review panel to evaluate draft forest plan alternatives

After management alternatives are developed, there will be a second set of expert panels. During the second set of expert panels, experts will review draft Forest Plan alternatives and standards and guidelines. Specifically, there will be an evaluation of the likelihood that each of the conditions described in the outcome statements would be achieved under each of several draft alternatives. The approach for conducting the second set of expert panels will be adapted from the risk assessment panels during the revision of the Tongass Land and Resource Management Plan (Shaw 1999) and the methods for assessing species and habitat outcomes in the Columbia River Basin (Quigley et al. 1997).

Expert panels will review Forest Service use of scientific theory and data in the development of management practices to provide for species viability. Experts will be asked to make professional judgments about the likely distribution of each species and its habitat.

Experts will be asked to make two distinct judgments, as follows: (1) conduct likelihood assessment based only on habitat conditions on National Forest Service lands and the natural history characteristics of the species and (2) conduct a cumulative effects assessment of the likely conditions of species' populations across all ownerships. This will take into account habitat conditions across all ownerships, natural history of the species, and all other influences on the species.

For registering expert judgments, we intend to use a process of likelihood voting with a structured outcome scale. We intend to use outcome scales similar to the Columbia River Basin outcome scales (Quigley et al. 1997). This will provide outcomes for National Forest lands and outcomes for cumulative effects analysis.

Monitoring plan recommendations

The effectiveness of this approach for maintaining viability will be monitored by measuring population trends of species or trends of habitat amount and condition (See recommendations in Committee of Scientists report, USDA 1999a, pp. 38-39, 108-110, and 152). Unpredictable ecosystem interactions, together with imperfect knowledge about the species to be managed, make the establishment of the monitoring process critically important. Monitoring programs must be designed to test the underlying assumptions that landscapes designed and managed according to the needs of what appear to be the most demanding species in the landscape do in fact protect non-focal species. Effective monitoring will require a clear identification of which characteristics are most appropriately monitored at the ecoregional, large landscape, and small landscape scales (USDA 1999a, p. 110).

At the most basic level, conditions and trends of habitats will be tracked for each focal species. Population trends of the focal species may also be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies, to the extent practicable (CFR 219.19). The monitoring methods will be implemented as stated in the Land and Resource Management Plan or associated monitoring task sheets.

There are several different ways that we may monitor population trends. First, trends can be determined using 100% population counts or can be estimated using population sampling designed to estimate actual population numbers. Second, population trends can be estimated using population indices. These indices are not estimates of actual population numbers, but are aimed at reflecting population trends or relative abundance for a species. Third, trends can be estimated using population occurrence data. These measures repeated over time may provide information on trends in distribution and relative abundance. Fourth, population trends may be inferred using species-habitat

relationships information. This approach involves inferring population trends from trends in amount and condition of habitat over time, based on known relationships between species and habitat (USDA 1999c).

Relationship of Viability Assessment to Forest Planning

The following table describes the relationship of population viability assessment to forest planning.

Viability Step	Planning Step
Assessment	Assessment (information)
Coarse Filter Fine filter (i.e., conservation strategies)	Recommendations Proposed action (to revise Forest Plan)
Coarse Filter Fine Filter (i.e., conservation strategies)	Alternatives
Test viability	Effects
	Decisions (Management Direction)
Do viability framework/monitor	Monitor

(USDA 1999b)

GLOSSARY

Coarse-filter and fine-filter approaches: "Protecting a representative array of ecosystems constitutes the coarse filter and may protect most species. However, a few species will fall through the pores of a coarse filter because of their specialized habitat requirements or because they are overexploited. These species will require individual management, the fine-filter approach." (Hunter 1996, p. 72)

Conservation assessment: An analysis and documentation of the status and distribution of a species, species group, or ecosystem. It defines what is needed to develop a plan to conserve the species or ecosystem. An assessment does not include management direction or management commitment. Assessments are often completed as administrative studies with universities, state wildlife agencies, conservation organizations, or species experts as partners.

Conservation strategy: Documentation of the management actions necessary to conserve a species, group, or ecosystem. A strategy uses the information provided in the conservation assessment to establish conservation objectives and develop management actions needed to accomplish those objectives. The strategy is not completed until it has been incorporated into Forest Service Policy through the NEPA process with appropriate line officer approval. This may require a forest plan addendum, amendment or revision and/or interim or final manual direction or an approved species plan.

Ecological engineers: "Species who, by altering the habitat to their own needs, modify the availability of energy (food, water, or sunlight) and affect the fates and opportunities of other species (e.g., the beaver)." (USDA 1999a, p. 39)

Ecological sustainability: "Conserving habitat for native species and the processes of ecological systems remains the surest path to maintaining ecological sustainability." (USDA Committee of Scientists, 1999 p. 146)

Focal species: "The key characteristic of a focal species is that its abundance, distribution, health, and activity over time and space are indicative of the functioning of the larger ecological system." (USDA 1999a, p. 147)

Historical range of variability: As defined in the Committee of Scientists report (USDA 1999a, pp. 35-36):

> The historical range of variability (HRV), roughly equivalent to the natural range of variability concept, refers to the expected variation in physical and biological conditions caused by natural climatic fluctuations and disturbance regimes (e.g., flooding, fire, and windthrow). It is derived from an ecological history of a landscape and is estimated from the rate and extent of change in selected physical and biological variables. Because HRV is derived from a historical analysis, its value is dependent on the time interval evaluated. Often, disturbance events have low predictability, but are usually bounded in space (extent) and time (recurrence interval); that is, small-scale disturbances occur more frequently, and large-scale disturbances more infrequently. As a consequence of this relationship, the longer the time interval considered, the greater the estimated HRV. Therefore, the HRV concept is only meaningful when a time interval has been specified and justified.

Indicator species: "Species selected because their status is believed to (1) be indicative of the status of a larger functional group of species, (2) be reflective of the status of a key habitat type, or (3) act as an early warning of an anticipated stressor to ecological integrity. The presence of fish in a river is an indicator of water quality." (USDA 1999a, p. 39)

Keystone species: "Species whose effects on one or more critical ecological processes or on biological diversity are much greater than would be predicted from their abundance or biomass (e.g., the red-cockaded woodpecker creates cavities in living trees that provide shelter for 23 other species)." (USDA 1999a, p. 39)

Landscape ecology: "Landscape ecology investigates patterns of habitat types on a regional scale and their influence on species distribution and ecosystem processes." (Primack 1993, p. 357)

Link species: "Species that play critical roles in the transfer of matter and energy across trophic levels or provide a critical link for energy transfer in complex food webs. For example, prairie dogs in grassland ecosystems efficiently convert primary productivity into animal biomass. Prairie dog biomass, in turn, supports a diverse predator community." (USDA 1999a, p. 39)

Species of concern: "Species that may not satisfy the requirement of providing information to the larger ecosystem but because of public interest will also be monitored and assessed for viability. Such species include some threatened and endangered species, game species, sensitive species, and those that are vulnerable because they are rare." (USDA 1999a, p. 39)

Umbrella species: "Species who, because of their large area requirements or use of multiple habitats encompass the habitat requirements of many other species (e.g., deer)." (USDA 1999a, p. 39) "Umbrella species usually have large home ranges, and thus by protecting enough habitat for their populations, adequate habitat for many other species will also be protected." (Hunter 1996, p. 54)

Viable population: "For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." (36 CFR 219.19)

Viable species: "A viable species is defined as consisting of self-sustaining populations that are well distributed throughout the species range. Self-sustaining populations are those that are sufficiently abundant and have sufficient genetic diversity to display the array of life-history strategies and forms that will provide for their persistence and adaptability in the planning area over time." (USDA 1999a, p. 38)

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Appendix A. USFS Region 9 Sensitive Species Risk Evaluation Instructions and Form.

Overview of Regional Forester Sensitive Species Designation: Criteria and Process

R9 Regional Forester Sensitive Species are designated by applying specific criteria to determine eligibility. Species automatically considered for Regional Forester Sensitive Species include U.S. Fish and Wildlife Service (USFWS) candidates for listing under the Endangered Species Act (ESA), species de-listed in the last five years under ESA, and species designated by The Nature Conservancy as G1-G3, T1-T3, and N1-N3.

Natural Heritage Program (NHP) S1, S2, State Threatened and Endangered, and species considered at risk on individual forests will be screened using the risk evaluation process outlined below. Potential sources for forests to identify "species at risk" include: USFWS Management Concern species, Partners in Flight, other NHP tracked species, State Special Concern or Watch species, Audubon State Watch lists, Tribal and New England Regional lists or other documented references. Sensitive species must be documented within National Forest proclamation boundary and be considered a valid species by taxonomic experts.

Following the application of criteria and screening of risk factors, the species proposed for Regional Forester Sensitive Species designation will be reviewed internally and by the public. After responding to the comments received, the Regional Forester will approve a final list.

The list summarizing Regional Forester Sensitive Species will be updated annually to reflect changes in status and risk. The most current list will be posted on the Internet. Species may be removed from Regional Forester Sensitive Species designation once forests provide documentation to justify that a species is no longer at risk. During rare plant and animal surveys, forests should consider potential sensitive species with habitat within the forest but documented only outside forest boundaries. Once documented within forest boundaries, species that meet the criteria and that have been evaluated for risk can be added to the Regional Forester Sensitive Species List.

Risk Evaluation Process

Risk evaluation is adaptive management in action; it is a relative, not an absolute decision process. The process is intended to qualitatively screen species by stimulating thoughtful evaluation and comparison of factors that put a species at risk. It is not a definitive formula, cookbook or rule. The most current available information should be used, however it is understood that professional judgment will be required to complete this process. It is intended that decisions not be belabored - best educated guesses, intuition, information from related species and professional judgment should be used if that is all that is readily available. The final recommendation to include or exclude a species from the Regional Forester Sensitive Species designation rests on incorporation of all published and unpublished information, taking into account the degree of uncertainty and application of professional judgment.

It is recognized that an anomaly exists in considering some species at the periphery of their range. Such species often increase or decrease because of climatic trends, habitat availability, and inherent biological adaptability. If such species are truly common elsewhere, they are likely to expand their range if conditions become appropriate. With limited resources, focusing on the viability of species that are truly threatened, endangered, or sensitive should be a priority. That is not to say that peripheral species should be ignored, but to protect those species and their habitat and allow fluctuations via natural processes.

RFSS Risk Evaluation for: _____ page ____ of _____

Rank/status and date of data: TNC_____ Fed_____ State/NHP_____

Select one box for each Risk Factor and rank certainty (1=uncertain, 2=somewhat certain, 3=certain):

Risk Factor:	A **High risk**	B **Moderate risk**	C **Low risk**
Abundance **Discuss ambiguities, population centers, search effort on NF relative to rangewide** **Certainty (1-3): _____ _____ _____**	**Rare, documented occurrence or population estimates on NF are low relative to habitat/range outside NF OR NF outside of principle range OR rare rangewide**	**Uncommon on NF**	**Common on NF**
Distribution **Discuss if range expansion or contraction is due to human or natural causes** **Certainty (1-3): _____ _____**	**Very restricted or endemic, disjunct or isolated population OR restricted to a rare habitat on NF OR majority of occurrences in state or region on NF**	**Restricted to localized population OR NF is at periphery of range**	**widespread: NF is well within the range of species**
Population Trend **Discuss source and reliability of monitoring; natural cycles vs. other causes** **Certainty (1-3): _____**	**Documented significant decline on NF (i.e., 20% decline in 10 years or 3 generations)**	**Suspected significant decline on NF**	**Appears stable, increasing or within natural population fluctuations on NF**
Habitat Integrity **Discuss protection via presence or absence of management, human impacts and specific biotic and abiotic factors that affect habitat specificity or species adaptabi lity** **Certainty (1-3): _____**	**Limited or no specific protection on NF at this time, known natural or human threats may be affecting species**	**Some protection or mitigation in place on NF; limited threats to species**	**Protection or special management on NF, generally unthreatened**
Population Vulnerability **Discuss habitat specificity, reproductive potential, potential to recover, adaptability** **Certainty (1-3): _____**	**Fragile; not resilient**	**Somewhat resilient and adaptable**	**Adaptable and resilient**

RFSS Risk Evaluation for: _____ page ____ of ____

Rationale for Sensitive Species Designation:

Supporting Narratives:

Abundance:

Distribution:

Population Trend:

Habitat Integrity:

Population Vulnerability:

References:

Individuals consulted:

Name: _____ Title: _____
National Forest: _____ Date: _____

Appendix B. Proposed planning rule, the concept of focal species and comparisons to Management Indicator Species.

A proposed rule change (October 5, 1999 36 CFR 219) to the National Forest Management Act (USDA 1982) would eliminate the use of management indicator species (MIS) on National Forests. Focal species would be used to assess ecosystem integrity, encompass habitat needs for other species, and represent the range of environments in the planning unit.

Under current planning regulations (36 CFR 219), management indicator species (MIS) are utilized to gauge the effects of management activities of forest plan implementation. Categories of species included in MIS were threatened and endangered plant and animal species, species with special habitat needs, game species, special interest non-game species, or species whose population changes are believed to indicate management effects on other species of selected major biological communities or water quality. Interdisciplinary teams assess effects of management activities on MIS habitat components and prescribe mitigation measures to offset adverse impacts. Forest Plans currently in place in Minnesota and Wisconsin rely on standards and guides (e.g., snag or den tree guides, road density guides) as mitigation measures to proposed management activities.

The current and proposed planning regulations (October 5, 1999 36 CFR 219) retain the same requirement to maintain viability of all native and desirable non-native species within the planning unit. The proposed regulations would add an ecological systems approach focusing on ecosystem integrity to complement the existing focus on species viability in assessments and management. While the proposed planning regulations would not contain the concept of MIS, they would incorporate all of the categories of MIS. In the proposed regulations, these categories are grouped into focal species, species at risk, and demand species.

Focal species population status and trends provide insight to the integrity of the larger ecological system to which it belongs. Focal species act as surrogate measures in the evaluation of ecological integrity. They can encompass habitats needed for many other species, play key roles in ecological processes, or convey information about the status and integrity of the larger ecosystem in which they occur. Collectively, the set of focal species represents the range of environments within the area being analyzed. Use of focal species is consistent with that of the Committee of Scientists Report (USDA 1999) and is addressed elsewhere in the literature by Lambeck (1997). These sources provide explanations of the characteristics of focal species, although definitions and process recommendations vary slightly among the different sources.

Species at risk include federally listed or proposed threatened and endangered species, and those species that meet the criteria for the Regional Forester's sensitive species list as well as other species for which "significant local reductions in distribution or density are concerns". This last category includes those species that have a downward population trend, but population levels are not so low that the species warrants listing on the

Regional Forester Sensitive Species (RFSS) List. These are considered indicators of ecological integrity and are defined as species for which viability is a concern. Demand species are those with a high social, cultural, or economic value. These species would be evaluated in terms of sustainable use levels consistent with ecological integrity of the planning area.

A key difference in the proposed regulations to the current regulations is the requirement to assess viability of species at risk and/or focal species that serve as surrogates for species at risk, as part of an assessment of ecosystem integrity (Proposed regulations 219.20.8i). Additional focal species would be analyzed for conditions other than viability including conditions needed to maintain or restore ecosystem integrity (Proposed regulations 219.20.8ii). Focal species for ecosystem integrity provide information about the status of the ecosystem. They respond to changes in the environment, and not solely changes due to management. The proposed regulations would be proactive in determining conditions needed for species viability, ecosystem integrity, and the historic range of variation in order to determine activities to maintain or restore ecosystems.

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Appendix C. Proposed focal species for forest plan revision.

Ecosystems of Concern	Proposed Focal Species
1. Large landscape scale-- species operates across ecosystems	American marten Canada lynx Moose Gray wolf Cougar Common loon Bald eagle Northern goshawk Bobcat Black bear
2. Pine barrens (WI)	Sharp-tailed grouse Jack pine patches Upland sandpiper Rice grass (*Oryzopsis pungens)*
3. Jack pine (MN)	Canopy jack pine
4. Northern dry forest – jack pine, oak (WI)	Pin oak
5. Red-white pine forest (Mature/older forests; native genotypes, naturally established)	White pine Pine warbler
6. Boreal upland forest (Mature/older forests; MN and a small area on the Chequamegon-Nicolet National Forests)	Northern goshawk (nesting)--Chippewa NF Broad-winged hawk Pileated woodpecker American marten Red-backed salamander On mineral soil/upland: Tamarack Black Spruce White cedar
7. Northern hardwoods (Mature/older forests; includes hemlock and white pine components in places)	Red-backed salamander Red-shouldered hawk Black-throated blue warbler Gray squirrel American marten (for Chequamegon-Nicolet NF) Pileated woodpecker (for Chippewa NF)

Ecosystems of Concern	Proposed Focal Species
	Canada yew Yellow birch Goblin fern (*Botrychium mormo*) (for Chippewa and Chequamegon-Nicolet National Forests) Downy yellow violet (*Viola pubescens*) Guild of spring ephemerals/early bloomers: Spring beauty *(Claytonia virginiana)* Hepatica (*Hepatica* species) Bloodroot (*Sanguinaria Canadensis*) Violets (V*iola* species) Dutchman's breeches (*Dicentra cucullaria)* Squirrel-corn *(Dicentra canadensis*)
8. Riparian forests (Mature/older forests)	Red-shouldered hawk Northern waterthrush Common merganser
9. **Cedar swamp** (Regeneration concern)	Cedar
10. **Hemlock** (Regeneration concern--WI)	Hemlock Blackburnian warbler
11. **Swamp conifer** (Mature/older forests; including tamarack and black spruce)	Black spruce Tamarack Yellow-bellied flycatcher Lincoln's sparrow Palm warbler Golden-crowned kinglet
14. **Sedge meadows**	Yellow rail Meadow vole
12. **Spring-fed ponds**	Central newt
13. **Vernal/woodland ponds**	Blue-spotted salamander Wood frog
14. **Areas of low road density** (Correlated with low human presence in the landscape)	Leopard frog Gray wolf Canada lynx
15. **Lakes** 16. **Rivers**	

Appendix D. Animal species selected: 1) species of current viability concern, 2) species of near-future viability concern, 3) additional species of current or near-future viability concern suggested and addressed by expert panels, and 4) proposed focal species that were addressed by panels.

E/T = Federally listed threatened and endangered; **ex** = extirpated;
R = Listed Regional Forester's sensitive species on Feb 29, 2000;
[R] = Proposed as Regional Forester's sensitive species (RFSS) by the National Forests during summer 1999, but not selected as RFSS in Feb. 2000
+ = Occurs, but not proposed or selected as a species of current viability concern for the individual National Forest

Note: The last column provides a quick reference for whether or not selected species were addressed in the panels.

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
MAMMALS					
1. Current viability concern					
Canis lupus	gray wolf	E	T	T	Y
Felis concolor	Wisconsin puma	ex	ex	ex	Y
Lynx canadensis	lynx	T	T	T	Y
Myotis septentrionalis	northern myotis		+	+	Y
Phenacomys intermedius	heather vole		R		Y
Synaptomys borealis sphagnicola	northern bog lemming			R	Y
2. Near-future viability concern					
Martes americana	American marten	+	+	+	Y
3. Additional species of viability concern addressed in panels					
Microtus chrotorrhinus	rock vole		+		Y
4. Proposed focal species					
Castor canadensis	beaver	+	+	+	Y
Clethrionomis gapperi	red-backed vole	+	+	+	Y
Lynx rufus	bobcat	+	+	+	Y
Napaeozapus insignis	woodland jumping mouse	+	+	+	Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
BIRDS					
1. Current viability concern					
Accipiter gentilis	northern goshawk	R	R	R	Y
Aegolius funereus	boreal owl		R		Y
Ammodramus leconteii	Le Conte's sparrow	R	R	R	Y
Ammodramus nelsoni	Nelson's sharp-tailed sparrow			R	Y
Buteo lineatus	red-shouldered hawk	R		R	Y
Charadrius melodus	piping plover			E	Y
Chlidonias niger	black tern	R	R	R	Y
Contopus borealis	olive-sided flycatcher	+	R	R	Y
Coturnicops noveboracensis	yellow rail	+	R	R	Y
Cygnus buccinator	trumpeter swan	R		R	Y
Dendroica caerulescens	black-throated blue warbler	+	R	R	Y
Dendroica castanea	bay-breasted warbler	+	R	R	Y
Falcipennis canadensis	spruce grouse	R	+	R	Y
Falco peregrinus	peregrine falcon		R		Y
Haliaeetus leucocephalus	bald eagle	T	T	T	Y
Oporonis agilis	Connecticut warbler	R	R	R	Y
Phalaropus tricolor	Wilson's phalarope		R	R	Y
Picoides arcticus	black-backed woodpecker	R	+	R	Y
Picoides tridactylus	three-toed woodpecker		R		Y
Poecile hudsonicus	boreal chickadee	+	[R]	+	Y
Sterna caspia	Caspian tern			R	Y
Sterna hirundo	common tern			R	Y
Strix nebulosa	great gray owl	+	R	R	Y
Tympanuchus phasianellus	sharp-tailed grouse	R	R	R	Y
2. Near-future viability concern					
Dendroica cerulea	cerulean warbler	+			Y
Hylocichla mustelina	wood thrush	+			Y
Melanerpes erythrocephalus	red-headed woodpecker		+	+	Y
Vermivora chrysoptera	golden-winged warbler	+		+	Y
4. Proposed focal species					
Ardea herodias	great blue heron	+	+	+	Y
Bartramia longicauda	upland sandpiper	+	+	+	Y
Buteo platypterus	broad-winged hawk	+	+	+	Y
Dendroica fusca	Blackburnian warbler	+	+	+	Y
Dendroica palmarum	palm warbler	+	+	+	Y
Dendroica pinus	pine warbler	+	+	+	Y
Dryocopus pileatus	pileated woodpecker	+	+	+	Y
Empidomax flaviventris	yellow-bellied flycatcher	+	+	+	Y
Gavia immer	common loon	+	+	+	Y
Lophodytes cucullatus	hooded merganser	+	+	+	Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
Melospiza lincolnii	Lincoln's sparrow	+	+	+	Y
Mergus merganser	common merganser	+	+	+	Y
Regulus satrapa	golden-crowned kinglet	+	+	+	Y
Seiurus novaboracensis	northern waterthrush	+	+	+	Y
Strix varia	barred owl	+	+	+	Y
AMPHIBIANS					
1. Current viability concern					
Hemidactylium scutatum	four-toed salamander	+		R	Y
3. Proposed focal species					
Ambystoma laterale	blue-spotted salamander	+	+	+	Y
Ambystoma maculatum	spotted salamander	+			Y
Plethodon cinereus	red-backed salamander	+	+	+	Y
Rana clamitans	green frog	+	+	+	Y
Rana pipiens	northern leopard frog	+	+	+	Y
Rana sylvatica	wood frog	+	+	+	Y
REPTILES					
1. Current viability concern					
Clemmys insculpta	wood turtle	R	R		Y
Emydoidea blandingii	Blanding's turtle	+		R	Y
3. Additional species of viability concern addressed in panels					
Diadophis punctatus	ringneck snake	+	+		Y
FISH					
1. Current viability concern					
Acipenser fulvescens	lake sturgeon	R	R		Y
Coregonus zenithicus	shortjaw cisco		R		Y
Ichthyomyzon fossor	northern brook lamprey		R	[R]	Y
Moxostoma valenciennesi	greater redhorse	R		R	Y
Notropis anogenus	pugnose shiner	R		R	Y
2. Near-future viability concern					
Etheostoma microperca	least darter	+		+	Y
3. Additional species of viability concern addressed in panels					
Lepomis megalotis	longear sunfish	+	+		Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
MOLLUSKS					
1. Current viability concern					
Lasmigona compressa	creek heelsplitter	+	R	R	Y
Lasmigona costata	fluted-shell mussel	+	[R]	R	Y
Ligumia recta	black sandshell	+	R	R	Y
INSECTS					
1. Current viability concern					
Ceraclea vertreesi	Vertree's caddisfly			R	Y
Cicindela denikei	tiger beetle sp		R		Y
Cicindela patruela	tiger beetle sp.			[R]	Y
Erebia disa mancinus	Mancinus alpine		R		no
Erebia discoidalis discoidalis	red-disked alpine		R		no
Lycaides melissa samuelis	Karner blue butterfly	R			Y
Lycaeides idas nabokovi	northern blue	R	R		no
Nicrophorus americanus	American burying beetle	E			no
Oenis jutta ascerta	jutta arctic		R		no
Ophiogomphus anomalus	extra-striped snaketail	R			Y
Ophiogomphus howei	pygmy snaketail	R			Y
Pyrgus centaureae freija	Freija's grizzled skipper		R		no

In February 2000, the following additional species were listed as Regional Forester Sensitive Species (RFSS). However, because the National Forests did not propose these as RFSS during the summer or fall of 1999, the PVA Team did not identify them as species of current viability concern. These species will also need to be considered under population viability assessment.

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
Pipistrellus subflavus	eastern pipistrelle		R		no
Incisalis henrici	Henry's elfin	R			no
Stylurus scudderi	zebra clubtail	R			no

Appendix E. Plant species selected: 1) species of current viability concern, 2) species of near-future viability concern, 3) additional species of current or near-future viability concern suggested and addressed by expert panels, and 4) proposed focal species that were addressed by panels.

E/T = Federally listed threatened and endangered; **ex** = extirpated;
R = Listed Regional Forester's sensitive species on Feb 29, 2000;
[R] = Proposed as Regional Forester's sensitive species (RFSS) by the National Forests during summer 1999, but not selected as RFSS in Feb. 2000;
+ = Occurs, but not proposed or selected as a species of current viability concern for the individual National Forest

Note: The last column provides a quick reference for whether or not selected species were addressed in the panels.

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
VASCULAR PLANTS					
1. Current viability concern					
Adoxa moschatellinna	musk-root		R		Y
Amerorchis rotundifolia	round-leaved orchis	R	+	+	Y
Arabis missouriensis v. deamii	Missouri rock-cress	R			Y
Arethusa bulbosa	dragon's-mouth	+	+	[R]	Y
Asplenium trichomanes-ramosum	green spleenwort	R			Y
Astragalus alpinus	alpine milkvetch	R	R		Y
Bidens discoidea	swamp beggar-ticks	+	R		no
Botrychium lanceolatum	triangle grape-fern	+	R	R	Y
Botrychium lunaria	common moonwort		R		Y
Botrychium michiganense (hesperium)	moonwort		R		Y
Botrychium mormo	goblin fern	R	R	R	Y
Botrychium oneidense	blunt-lobed grape-fern	R		R	Y
Botrychium pallidum	pale moonwort		R	R	Y
Botrychium rugulosum	ternate grape-fern	R	R	R	Y
Botrychium simplex	least grape-fern	+	R	R	Y
Calamagrostis lacustris	pond reed grass		R		Y
Caltha natans	floating marsh-marigold		R		Y
Calypso bulbosa	fairy slipper	R	R	R	Y
Carex crawei	Crawe sedge	R		+	Y
Carex katahdinensis	Katahdin sedge		R		Y
Carex michauxiana	Michaux's sedge	R	+		Y
Crataegus douglasii	black hawthorn		R		Y
Cypripedium arientinum	ram's-head lady's slipper	R	R	R	Y
Dryopteris expansa	spreading woodfern	R	+		Y
Dryopteris goldiana	Goldie's fern	+		R	Y
Eleocharis nitida	neat spike-rush		R		Y
Eleocharis olivacea	olivaceous spike-rush	+		R	Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
Eleocharis quinqueflora	few-flowered spike-rush	+		R	Y
Erthyronium albidum	white trout-lily	+		R	Y
Euphrasia hudsoniana	Hudson Bay eyebright		[R]		Y
Gymnocarpium robertianum	limestone oak fern			R	Y
Juglans cinerea	butternut	R			Y
Juncus stygius	bog rush	R	R		Y
Juncus subtilis	creeping rush		R		Y
Leucophysalis grandiflora	large-flowered ground-cherry	R			Y
Listera auriculata	auricled twayblade		R		Y
Listera convallarioides	broad-lipped twayblade		R		Y
Littorella uniflora	American shore-plantain	+	R		Y
Malaxis brachypoda	white adder's-mouth	R		R	Y
Moerhingia macrophylla	large-leaved sandwort	R	R		Y
Muhlenbergia uniflora	one-flowered muhly		R		Y
Najas gracillima	slender naiad		+	R	Y
Nymphaea leibergii	small white waterlily		R		Y
Orobanche uniflora	one-flowered broomrape			R	Y
Osmorhiza berteroi	Chilean sweet cicely		[R]		Y
Oxytropis campestris v. chartacea	Fassett's locoweed	E			Y
Oxytropis viscida	sticky locoweed		[R]		Y
Panax quinquefolius	American ginseng	R			Y
Platanthera clavellata	sm. green woodland orchid	+	R	R	Y
Polemonium occidentale ssp. lacustre	western Jacob's-ladder	R	R		Y
Polystichum braunii	Braun's holly fern	R	[R]		Y
Potamogeton confervoides	algae-like pondweed	R			Y
Potamogeton hillii	Hill's pondweed	R			Y
Pyrola minor	small shinleaf	R	R		Y
Ranunculus lapponicus	Lapland buttercup		[R]	[R]	Y
Rubus chamaemorus	cloudberry		[R]		Y
Salix pellita	satiny willow		R		Y
Saxifraga cernua	nodding saxifrage		R		Y
Scirpus clintonii	Clinton's bulrush		[R]		Y
Subularia aquatica	awlwort		R	R	Y
Taxus canadensis	Canada yew	+	R	R	Y
Tiarella cordifolia	heart-leaved foam-flower	R			Y
Tofieldia pusilla	small false asphodel		R		Y
Ulmus americana	American elm	R	[R]	[R]	Y
Vaccinium cespitosum	dwarf huckleberry	R	+		Y
Valeriana uliginosa	marsh valerian	R			Y
Viola lanceolata	lance-leaved violet	+	R		Y
Waldesteinia fragarioides	barren strawberry	+	R	+	Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
2. Near-future viability concern					
Cypripedium reginae	showy ladyslipper	+	+	+	Y
Betula alleghenensis (regeneration)	yellow birch		+	+	Y
Huperzia selago	clubmoss species	+			Y
Juniperus horizontalis	creeping juniper		+		Y
Pinus strobus (regeneration)	white pine	+	+	+	Y
Tsuga canadensis (regeneration)	eastern hemlock	+			Y
Thuja occidentalis (regeneration)	white cedar	+	+	+	Y
Zizania aquatica	wild rice	+	+	+	Y
3. Additional species of viability concern addressed in panels					
Botrychium ascendens	a moonwort			+	Y
Caulophyllum thalictroides	blue cohosh	+	+	+	Y
Fagus grandifolia	beech	+			Y
Streptopus amplexifolius	white mandarin	+	+		Y
Torreyochloa pallida	Torrey's manna-grass	?	+	+	Y
Medeola virginiana	Indian cucumber	+			Y
4. Proposed focal species					
Guild of spring ephemerals/ Early bloomers:					
Allium tricoccum	wild onion	+		+	Y
Claytonia virginica or caroliniana	spring beauty	+	+		Y
Dentaria diphylla	toothwort	+			Y
Dentaria laciniata	toothwort	+			Y
Dicentra canadensis	squirrel-corn	+			Y
Dicentra cucullaria	Dutchman's breeches	+	+		Y
Sanguinaria canadensis	bloodroot	+	+	+	Y
Caulophyllum thalictroides	blue cohosh	+	+	+	Y
Quercus ellipsoidalis	northern pin oak	+	+	+	Y
LICHENS					
1. Current viability concern					
Caloplaca parvula			R		Y
Cetraria aurescens			R		Y
Cetraria oakesiana			R		Y
Cladonia wainoi (=pseudorangiformis)			R		Y
Lobaria quercizans			R		Y
Menegazzia terebrata			R		Y
Peltigera venosa			R		Y
Pseudocyphellaria crocata			R		Y
Sticta fuliginosa			R		Y
Usnea longissima			R		Y

Species	Common name	Cheni	Sup	Chip	Addressed in Expert Panels?
2. Near-future viability concern					
Lobaria pulmonaria		+			Y

In February 2000, the following additional species were listed as Regional Forester Sensitive Species (RFSS). However, because the National Forests did not propose these as RFSS during the summer or fall of 1999, the PVA Team did not identify them as species of current viability concern. These species will also need to be considered under population viability assessment.

Species	Common name		Sup	Chip	Addresed in Expert Panels?
Cynoglossum virginianum (=boreale) var. boreale	no. wild compfrey	R	R		no
Juncus vaseyi	Vasey's rush		R		no
Sparganium glomeraturm	Clustered bur-reed		R	R	no
Tomenthypnum falcifolium	moss		R		no

Appendix F. Species literature review forms.

General Instructions For Completing Species Data Forms

1. Purpose: The Forest Service is collecting data for species known to occur on the National Forests in Minnesota (Chippewa and Superior National Forests) and Wisconsin (Chequamegon and Nicolet National Forests). The information is to be used for upcoming Forest Plan revisions. Specifically, the information is to be used in the assessment of species population viability, and the development of alternatives and management standards and guidelines for the draft environmental impact statement for revision of the Forest Plans.

2. Species lists: The current group of species the Forest Service is collecting information on is the Regional Forester Sensitive Species draft list. These species have been identified because there is a concern for maintaining viable populations or continued existence on the Minnesota or Wisconsin National Forests. There may be other species identified as the Forest Service completes a coarse and fine filter analysis of the National Forests.

3. Professional judgment: Species evaluation is a relative, not an absolute process. The process is intended to qualitatively screen species by stimulating thoughtful evaluation and comparison of factors that put a species at risk. It is not a definitive formula, cookbook or rule. The most current and available information is expected to be used, however it is understood that professional judgment will be required to complete this process. It is intended that uncertainty not be belabored - best educated guesses, intuition, information from related species and professional judgment should be used if that is all that is readily available. Final conservation practices for ecosystem sustainability and species viability rests on incorporation of all published and unpublished information, taking into account the degree of uncertainty and application of professional judgment.

4. Scope of literature search: Preparer is expected to conduct an exhaustive search of the literature that pertains to the northern forested portions of Wisconsin and Minnesota, as well as a less exhaustive search of literature needed to complete portions of the data form that refer to rangewide conditions. It is not intended that the search go to extraordinary lengths, such as translating articles from another language. Source locations may include libraries, the Internet, The Nature Conservancy and/or Natural Heritage Inventory species abstracts, and informal consultation with experts.

5. Location of search: Preparers should maintain specific records of where they searched. If using the Internet, note the web addresses. If using a library index, note the name of the index and keywords used. The intent is to be able to show where the search was conducted.

6. Citation: Each piece of information in the data form must be accompanied by its source in the form of a citation. Include personal communications. Use *Journal of Wildlife Management* style for references and citations. In the case of authors citing other authors, use (Smith 1990 in Jones 1992).
Make photocopies of literature that is cited. When the literature comes from books or lengthy monographs, photocopy only the pertinent pages, and the cover page (including the title, author(s), editor(s) if any, date, and publisher). When the literature is from a relatively short journal article, copy the entire article.

7. Species information:

- Geographic source of information: Some information will have been gathered at one location within the species range, and there will not be evidence as to whether conditions may be different elsewhere. For example, "We set up remote cameras in one site in the Boundary Waters and found that fishers were eating the eggs of ground-nesting birds." In this case, include the information with a note that it was collected at only one location within the species' range.

- Duplicative information: Information for one category of data will sometimes be the same for another. In these cases, simply reference the previous information as "see 1.B.2 above."

- Anecdotal information: Some information will be of an anecdotal nature, as in "We saw an eagle feeding on a roadkilled deer." In these cases, include the information but note that it is anecdotal.

- Category not applicable: Not all categories will apply to every species. In this case, note "not applicable" or "n/a."

- Lack of information: **Some** categories will lack data, and the search of published literature will not provide any information. In these cases, note "no information found." Alternatively, if the author expresses professional judgment as the source of data please note as "professional judgment."

8. **Landscape scales and maps:** The form requests species information at different landscape scales. Attached to this form is a map of Laurentian Mixed Forest Province 212 that serves as the general "Regional" scale. Also attached is a map of the Chippewa, Superior, and Chequamegon-Nicolet National Forests whose proclamation boundaries each represent a "Planning Area."

Species Data Collection Form

Species name:
Authority:
Common name:
Status:
Fed _____ State
TNC: Global____ Ntl ____ State
Tribal _____FS R9

Date:
Preparer:
Address:
Phone:
E-mail:

1. HABITAT
1A. Rangewide

1. Area of the historic range (approximately 1600-1800):
   Geographic location (provide distribution map if available or narrative)
   Size
2. Factors that limited the historic range
   climate
   competition
   (others that may important)
3. Area of the current range:
   Geographic location (provide distribution map if available or narrative)
   Size
4. Area currently occupied within the range: proportion of the area in #3 above.
5. Current distribution (continuous or metapopulation):

Habitat requirements (repeat as needed for seasons of the year, describe seasonal habitat briefly if outside ecoregion Province 212):

6. Minimum size of habitat patches:
7. Minimum distance between habitat patches:
8. Composition of habitat
   Breeding:
   Feeding:
   Resting:
9. Habitat patch structure in the landscape, habitat associations (adjacent or in vicinity):

1B. Planning Area - (The planning areas are the National Forest proclamation boundary (see attached map)

1. Area occupied by the species within the planning area (provide map, if available):
2. Area occupied historically (approximately 1600-1800):

Habitat requirements:
3. Minimum size of habitat patches if different from rangewide:
4. Minimum distance between habitat patches if different from rangewide:
5. Composition of habitat
Breeding:
Feeding:
Resting:
6. Habitat patch structure in the landscape and proportion, habitat associations (adjacent or in vicinity) that may be needed for different parts of daily activity or life cycle:
7. Habitats or features that are actively avoided (e.g. humans, highways, wetlands...)
8. Habitat conditions that may not be required but contribute to greater productivity:

1C. Site, stand, or project level

Habitat requirements
1. Composition of the overstory;
2. Composition of the shrub/understory:
3. Composition of ground flora:
4. Vertical structure of the vegetation:
5. Age class(es) of forest vegetation:
6. Required or preferred microhabitat features, if any (e.g. vernal pools, large woody debris, exposed sandy banks, nest trees, rock outcrops....) and their use (e.g. perching, sunning, nesting, denning, etc.):

2. POPULATION:
2A. Rangewide

1. Historic (approximately 1600-1800):
a. Numbers of individuals:
b. Breeding/reproducing individuals:
c. Numbers of populations:
d. Relationship/distance among populations:
e. Reasons for fluctuations in population size:

2. Current
a. Numbers of individuals:
b. Breeding/reproducing individuals:

c. Numbers of populations:
d. Relationship/distance among populations:

2B. Planning Area (see attached map)

1. Historic (approximately 1600-1800):
    a. Numbers of individuals:
    b. Breeding/reproducing individuals:
    c. Numbers of populations:
    d. Relationship/distance among populations:
    e. Reasons for fluctuations in population size:

2. Current
    a. Numbers of individuals:
    b. Breeding/reproducing individuals:
    c. Numbers of populations:
    d. Relationship/distance among populations:

3. LIFE HISTORY: (Describe life history by geographic area within the range where variations occur)

3A. Reproductive method (seeds, sprouts, stolons, rhizomes, spores, eggs, live birth, etc.):

3B. Dispersal of progeny or propagules:
1. Methods
2. Distance
3. Habitat requirement for dispersal
4. Barriers

3C. Reproductive Age:
1. Minimum:
2. Maximum:

3D. Fecundity:
1. Cycles per year:
2. Years per cycle:
3. Seeds per mature plant per cycle:
4. Progeny per mature female per cycle:
5. Total progeny per life time:

3E. Survival- what proportion of progeny survive to reproductive age?

3F. Sex ratio of populations?

3F. Lifespan - average and longest known:

3G. Migration

1. Where does the species go when it migrates:
2. What time of year does the species leave and return to ecoregion Province 212?

3H. Obligate associations (e.g. plants, insects, mammals, microbes) and which part of the life cycle is obligate:

3I. Miscellaneous:

Monoecious vs. dioecious:
Sexual vs. asexual:
Monogamous vs. polygamous:
Herds:
Packs:
Other:

4. TRENDS - Percent increase or decrease if known; approximate time when population began increasing or decreasing.

4A. Rangewide

Habitat: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

Population: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

4B. Regional - Province 212 (see attached map) (Boundaries dependent on species)

Habitat: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

Population: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

4. Adaptation to human pressures (any evidence that the species' or population's behavior is changing to adapt in a way that would cause populations to increase?):

C. Planning Area (see attached map)

1. Habitat: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

2. Food: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

3. Population: Increasing____ Decreasing____ Stable_____ Do not know_____

Cause?

4. Adaptation to human pressures (any evidence that the species' or population's behavior is changing to adapt in a way that would cause populations to increase?):

5. THREATS TO POPULATION VIABILITY

See next page

5. THREATS TO POPULATION VIABILITY

Instructions:

Note: Provide a source citation for each piece of species information.

5.1: Part 1: Identify potential threats to species population viability.

Evaluate those threats that impact, or could potentially impact, populations in northern forested areas of Wisconsin and Minnesota.

Table 1. Threats to population viability. Identify threats to viability that apply to this species. High, Medium, and Low categories refer to the likelihood of the threat occurring during the time period specified (short term: 10 years and long term: approximately 100 years).

Species:

Threat	Yes: Potential threat to pop. viability exists: further eval of threat in Part 5.2			No: Generally "not applicable"	Remarks
	High	**Med**	**Low**		
Loss of habitat 10yr					
100yr					
Decline in habitat quality 10yr					
100yr					
Habitat fragmentation (inclu loss of connectivity) 10yr					
100yr					
Changes in vegetation composition 10yr					
100yr					
Changes in vegetation structure 10yr					
100yr					
Competition from non-native species 10yr					
100yr					
Competition from native species whose range *or* pop. trend has changed 10yr					
100yr					
Predation 10yr					
100yr					
Disease 10yr					
100yr					
Climate change 10yr					
100yr					
Loss of obligate associate 10yr					
100yr					
Natural catastrophes 10yr					

Threat	Yes: Potential threat to pop. viability exists: further eval of threat in Part 5.2			No: Generally "not applicable"	Remarks
100yr					
Threats during migration 10yr					
100yr					
Genetic drift 10yr					
100yr					
Genetic homogeneity 10yr					
100yr					
Hunting/Trapping 10yr					
100yr					
Collection 10yr					
100yr					
Poisoning 10yr					
100yr					
Criminal Acts 10yr					
100yr					
Pollution/toxics 10yr					
100yr					
Interactions among threats 10yr					
100yr					
Other:					

5.2 Part 2: Evaluate and document potential threats to species population viability (from Table 1).
Include source citation for all information.

Species _____ Preparer(s)_____ Date:

5.2A. Description of threat: (discuss both short term: next 10 years and long term: approximately next 100 years), including how it affects the species (e.g. the threat is grazing and the effect is removal of seeds with fewer resulting progeny; or, the threat is grazing and the effect is exposure of bare soil which allows non-native weeds to establish and compete).

5.2B. Consequence to species persistence, rated as High, Medium, or Low. High consequence would result in Outcome 5 (diagram and descriptions attached), Medium would result in Outcomes 3 or 4, and Low would result in Outcome 2. (short term: 10 yrs and long term: 100yrs)

5.2C. Threshold levels of the threat that could cause a sudden decline in populations (short term: 10 yrs and long term: 100yrs)

5.2D. Describe any interactions among threats and summarize any other key points:

_____

Outcome 1.
Habitat is distributed broadly across the taxa's historic range and is of sufficient quality to support the type and degree of intrademe and metapopulation interactions that the taxa would characteristically engage in if it were not habitat limited.

Outcome 2.
Habitat across the taxa's historic range is reduced in quality or quantity. Local demes may be extirpated. Metapopulation interactions are adversely altered, but the taxa generally retains the geographic extent typical of the historic distribution.

Outcome 3. Habitat across the taxa's historic range is reduced in quality or quantity. Local demes have been extirpated. Metapopulation interactions are adversely altered throughout most of the taxa's range. The geographic extent of the taxa is reduced.

Outcome 4.
Habitat across the taxa's historic range is much reduced in quality or quantity. A majority of the historic populations have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxa is significantly reduced.

Outcome 5.
Habitat across the taxa's historic range is much reduced in quality or quantity. A majority of the historic populations have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxa is reduced to the point that the taxa would benefit from the protection of the Endangered Species Act.

Appendix G. Invitation letter and registration form.

United States Department of Agriculture | **Forest Service** | **Eastern Region** | **310 Wisconsin Ave Suite 500 Milwaukee, WI 53203**

File Code: 2670

Date: December 14, 1999

Dear Valued Colleague:

It is our pleasure to invite you to participate as a member of a Species Expert Panel at the first US Forest Service Population Viability Assessment Work Session January 11-13, 2000 (plant experts), and January 19-21, 2000 (animal experts), at the Duluth Entertainment and Convention Center, Duluth, MN.

Your experience and knowledge is needed to complete an important project affecting conservation of biological diversity and sustainable ecosystems of Wisconsin and Minnesota. We are calling on you because your peers recognize you for your work in species biology and/or community ecology. The Forest Service will provide your travel, lodging, and meal allowance.

The January work sessions are being conducted in cooperation with Conservation Breeding Specialist Group and the Chequamegon-Nicolet, Superior, and Chippewa National Forests of Wisconsin and Minnesota. Our goal is for experts and organizations to work together to better understand the habitat and ecological processes needed to maintain species viability, overall biological diversity, and sustainable ecosystems in northern Minnesota and Wisconsin.

The Conservation Breeding Specialist Group has observed that perhaps 80% of the useful information for species viability is in the head of the experts, and is not likely to be available in printed form. The Chequamegon-Nicolet, Superior, and Chippewa National Forests are currently revising land management plans and incorporating new scientific information for species viability. Your contributions will be used in the design of draft Forest Plan alternatives that will result in Forest Plan goals, objectives, standards and guidelines for the next decade and beyond. A more complete description of the population viability assessment and analysis process is attached.

Please fill out and return the attached registration form. If you have further questions please contact Stephen R. Mighton, Eastern Region Threatened & Endangered Species Program Manager, at (414) 297-3612, or smighton/r9@fs.fed.us. Thank you for your interest and participation in this process. We look forward to working with you in Duluth.

Sincerely,

/s/Don L. Meyer (for)

ROBERT T. JACOBS
Regional Forester, Eastern Region

Enclosures (5)

cc:
Forest Supervisors, Cheni, Superior, Chippewa
Mike Miller, Forest Plan ID Team Leader, WI
Duane Lula, Forest Plan ID Team Leader, MN

Population Viability Assessment Workshop
US Forest Service and Conservation Breeding Specialist Group

Duluth Entertainment and Convention Center
January 11 to 13, 2000 – Plants
January 19 to 21, 2000 – Animals

Registration Form:

Yes – I plan to attend the Work Session on Plants, January 11-13, 2000 _____

Yes – I plan to attend the Work Session on Animals, January 19-21, 2000 _____

1. Name (for name tags): _____
2. Organization: _____
3. E-mail address: _____
4. Mailing address: _____

   (verify we have it correct) _____
   _____
5. Phone Number: _____
6. FAX Number: _____
7. Social Security Number: _____

   (needed for travel authorization and reimbursement of travel expenses on site)

Based on your experience and knowledge we are asking for:

1. Your specific area of expertise:_____
2. Which species group your knowledge applies to (see enclosed sp group list):_____
   _____

Please respond by 1/2/2000 or at your earliest convenience to:
Stephen Mighton – Fax 414-297-3808 or e-mail to smighton/r9@fs.fed.us

Appendix H. Plant and animal panels and the panelists assigned to each group.

PLANT PANELS

Group -1 Aquatic/Beach/Fluctuating Shores

Caltha natans
floating marsh-marigold
Littorella uniflora
American shore-plantain
Najas gracillima
slender naiad
Nymphaea leibergii
small white waterlily
Potamogeton confervoides
algae-like pondweed
Potamogeton hillii
Hill's pondweed
Subularia aquatica
awlwort
Zizania aquatica
wild rice

Plants Group 1 - Panelists

Tim Gerber *U. of Wisconsin-La Crosse*
Deb Pomroy-Petry *Olga Lakela Herbarium*
Carol Reschke *Minnesota Dept. of Natural Resources*
Jan Schultz *Hiawatha National Forest*

Additional panelists joining panels to address wild rice:
Karen Danielsen *Great Lakes Indian Fish and Wild. Comm.*
Rick Gitar – *Fond du Lac Indian Resrvation*
Jim Meeker – *Northland College*

Forest Service
Facilitator: Mike Miller
Scribe: Ralph Wells
Resource specialist: Steve Mighton

Group 2 - Nonforest Wetland/fluctuating shore

Arethusa bulbosa
dragon's-mouth

Astragalus alpinus
alpine milkvetch

Calamagrostis lacustris
pond reed grass

Carex crawei
Crawe sedge bulrush

Carex katahdinensis
Katahdin sedge

Carex michauxiana
Michaux's sedge

Crataegus douglasii
black hawthorn

Eleocharis nitida
neat spike-rush

Eleocharis olivacea
olivaceous spike-rush

Eleocharis quinqueflora
few-flowered spike-rush

Juncus stygius
bog rush

Muhlenbergia uniflora
one flowered muhly

Salix pellita
satiny willow

Scirpus clintonii
Clinton's rush

Valeriana uliginosa
marsh valerian

Viola lanceolata
lance-leaved violet

Plants Group 2 - Panelists

Lissa Grover *Superior National Forest*
Cal Harth *Natural Resources Research Institute*
Andrew Hipp *University of Wisconsin – La Crosse*
Welby Smith *Minnesota Dept. of Natural Resources*

Other panelists joining panel to address individual species:
Paula Armstrong – *Arethusa bulbosa*
Dave Schmoller – *Valeriana uliginosa*
Gary Walton – several species

Forest Service
Facilitator: Phil Freeman
Scribe: Beth Boddiger
Resource specialist: Mary Shedd

Group 3 - Forested Wetland

Amerorchis rotundifolia
round-leaved orchis

Bidens discoidea
swamp beggar-ticks

Calypso bulbosa
fairy slipper

Cypripedium arietinum
ram's-head ladyslipper

Cypripedium reginae
showy lady's-slipper

Listera auriculata
auricled twayblade

Listera convallarioides
broad-lipped twayblade

Malaxis brachypoda
white adder's-mouth

Platanthera clavellata
small green woodland orchid

Polemonium occidentale ssp. lacustre
western Jacob's-ladder

Pyrola minor
small shinleaf

Ranunculus lapponicus
Lapland buttercup

Rubus chamaemorus
cloudberry

Thuja occidentalis
white cedar

PROPOSED FOCAL SPECIES

Larix laricina
tamarack

Picea mariana
black spruce

Plants Group 3 - Panelists

Chel Anderson *Minnesota Dept. of Natural Resources*
Steve Chadde *Contract Botanist*
Richard Gitar *Fond du Lac Reservation*
Myra Mason *Contract Botanist*
Linda Parker *Chequamegon/Nicolet National Forests*
David Rogers *Universtiy of Wisconsin – Madison*

Forest Service
Facilitator: Stacy Lemieux
Scribe: Mary Nordeen
Resource specialist: Terry Doyle

Group 4 - Disturbance/cliffs/open lands, barrens

Arabis missouriensis v. deamii
Missouri rock-cress

Euphrasia hudsoniana
Hudson Bay eyebright

Juncus subtilis
creeping rush

Juniperis horizontalis
creeping juniper

Leucophysalis grandiflora
large-flowered ground-cherry

Moerhingia macrophylla
large-leaved sandwort

Oxytropis viscida
sticky locoweed

Oxytropis campestris v. chartacea
Fassett's locoweed

Saxifraga cernua
nodding saxifrage

Tofieldia pusilla
small false asphodel

Vaccinium cespitosum
dwarf huckleberry

OTHER SPECIES ADDRESSED

Oryzopsis pungens
rice grass

Plants Group 4 - Panelists

Lynden Gerdes *Minnesota Dept. of Natural Resources*
Mark Leach – *University of WI-Madison*
David Schmoller *Contract Botanist*
Quita Sheehan *Chequamegon/Nicolet National Forest*
Ian Shackleford *Chippewa National Forest*

Forest Service
Facilitator: Sherry Phillips
Scribe: Andrew Langford
Resource specialist: Jim Gallagher

Group 5 - Upland Forested - Ferns

Asplenium trichomanes-ramosum
green spleenwort
Dryopteris expansa
spreading woodfern
Botrychium lanceolatum
triangle grape fern
Botrychium lunaria
common moonwort
Botrychium mormo
goblin fern
Botrychium oneidense
blunt-lobe grape-fern
Botrychium pallidum
pale moonwort
Botrychium rugulosum
ternate grape-fern
Botrychium simplex
dwarf grape fern
Drypteris goldiana
Goldie's fern
Gymnocarpium robertianum
limestone oak fern
Huperzia selago
clubmoss species
Polystichum braunii
Braun's holly fern
OTHER SPECIES ADDRESSED
Botrychium ascendens

Plants Group 5 – Panelists

Paula Armstrong *Contract botanist*
Don Farrar *Iowa State University*
Gary Fewless *U. of Wisconsin - Green Bay*
Candy Fitzloff-Westfield (2 days) *Chippewa National Forest*
Colleen Matula *Ottawa National Forest*
Carol Mortensen *Leech Lake Reservation*
Gary Walton *Olga Lakela Herbarium, Univ of MN-Duluth*

Other panelists joining panel to address individual species
Elizabeth Nauertz - *Huperzia selago*

Forest Service:
Facilitator: Steve Ludwig
Scribe: Chris Brunner
Resource specialist: Dick Meier

Group 6 - Upland Forested

Adoxa moschatellinna
musk-root

Erthyronium albidum
white trout-lily

Orobanche uniflora
one-flowered broomrape

Osmorhiza berteroi
Chilean sweet cicely

Panax quinquefolius
American ginseng

Tiarella cordifolia
heart-leaved foam-flower

Waldsteinia fragarioides
barren strawberry

Juglans cinerea
butternut

Taxus canadensis
Canada yew

Tsuga canadensis
eastern hemlock

Betula alleghaniensis
yellow birch

Pinus strobus--white pine

PROPOSED FOCAL SPECIES

Guild of spring ephemerals/early bloomers (*Claytonia virginica or caroliniana* - spring beauty; *Sanguinaria canadensis* – bloodroot; *Dicentra cucullaria* - Dutchman's breeches; *Dicentra canadensis* – squirrel-corn; *Dentaria diphylla* – toothwort; *Dentaria laciniata* – toothwort; *Allium tricoccum* – wild onion)

Quercus ellipsoidalis - northern pin oak

Caulophyllum thalictroides
blue cohosh

OTHER SPECIES ADDRESSED

Plants Group 6 – Panelists

Janet Boe *Minnesota Dept. of Natural Resources*
Dave Cleland *Ecologist, USDA No Central Reasearch Static*
Emmet Judziewicz *Wisconsin Dept. of Natural Resources*
Jim Meeker *Northland College*
Elizabeth Nauertz *Forest Service - No. Central Research Station*
Tom Rooney *U. of Wisconsin-Madison*
David A. Shadis *Chippewa National Forest*
Sue Trull *Ottawa National Forest*

Other panelists joining panel to address individual species
Paula Armstrong – ginseng
Gary Walton – *Adoxa moschatellin*
Karen Danielson – some tree species
Carol Reschke

Forest Service
Facilitator: Tracy Beck
Scribe: Bob Berrisford
Resource specialist: Eunice Padley

Fagus grandifolia
beech
Medeola virginiana
Indian cucumber
Streptopus amplexifolius
white mandarin

Group 7 – Lichens

Caloplaca parvula
Cetraria aurescens
Cetraria oakesiana
Cladonia wainoi
Lobaria pulmonaria
Lobaria quercizans.
Menegazzia terebrata
Peltigera venosa
Pseudocyphellaria crocata
Sticta fuliginosa
Usnea longissima

Plants Group 7 – Panelists

Jim Bennett *University of Wisconsin-Madison*
Alan Fryday *Michigan State University*
John Thompson *University of Wisconsin-Madison*
Cliff Wetmore *University of Minnesota-St. Paul*
Susan Will-Wolf *University of Wisconsin-Madison*

Forest Service
Facilitator: Eunice Padley
Scribe: Ian Shackleford
Resource specialist: Dick Meier

ANIMAL PANELS

Group -1 BIRDS: Aquatic
(beaver also addressed by this group)

piping plover
black tern
trumpeter swan
Wilson's phalarope
Caspian tern
common tern
PROPOSED FOCAL SPECIES
common loon
common merganser
northern waterthrush
hooded merganser
great blue heron
beaver

Group 1 – Panelists

Tom Doolittle *Bad River Indian Reservation*
Madeline Linck *Hennepin County Parks*
Steve Maxson *Minnesota Dept. of Natural Resources*
Steve Mortensen *Leech Lake Reservation*

Forest Service
Facilitator: Robin Vora
Scribe: Steve Olson
Resource Specialist: Dick Meier

Group -2 BIRDS: Forest

black-throated blue warbler
bay-breasted warbler
spruce grouse
olive-sided flycatcher
Connecticut warbler
boreal chickadee
black-backed woodpecker
three-toed woodpecker
golden-winged warbler
cerulean warbler
wood thrush
PROPOSED FOCAL SPECIES
Blackburnian warbler
pileated woodpecker
pine warbler
golden-crowned kinglet

Group 2 – Panelists

Joan Elias *Ecological Consultant*
Jan Green *Minnesota Ornithologists Union*
Maya Hamady *Minnesota Dept. of Natural Resources*
JoAnn Hanowski *Natural Resources Research Institute*
Bob Howe *University of Wisconsin-Green Bay*
Ron McCormick *USDA North Central Research Station*

Forest Service
Facilitator: Stacy Lemeiux
Scribe: Mary Nordeen
Resource specialist: Terry Doyle

Group -3 BIRDS: Non-forest

Le Conte's sparrow

Nelson's sharp-tailed sparrow

yellow rail

sharp-tailed grouse

red-headed woodpecker

PROPOSED FOCAL SPECIES
upland sandpiper
palm warbler

Lincoln's sparrow

yellow-bellied flycatcher
ADDITIONAL SPECIES
sedge wren

Group 3 – Panelists
Laura Erickson *University of Minnesota –Duluth*
Wayne Russ *Superior National Forest*
Steve Stucker *Minnesota Dept. of Natural Resources*

Other panelists joining panel to address individual species
Joan Elias – palm warbler
JoAnn Hanowski – several species

Forest Service
Facilitator: Marc Whistler

Scribe: Dave Maercklein
Resource specialist: Terry Doyle/Dick Meier

Group –4 LARGE/MED MAMMALS

American marten

Wisconsin puma

gray wolf

lynx

PROPOSED FOCAL SPECIES
bobcat
(beaver: addressed by Group 1)

Group 4 – Panelists
Jon Gilbert *Great Lakes Indian Fish and Wildlife Comm.*
Mike Nelson *U.S. Geological Survey*
Bill Route *Natural Resources Research Institute*
John Wright *USDA North Central Research Station*
Adrian Wydeven *Wisconsin Dept. of Natural Resources*

Other panelists joining panel to address individual species:
Steve Kessler

Forest Service
Facilitator: Tracy Beck
Scribe: Melissa Rickers
Resource specialist: Eunice Padley

Group -5 SMALL MAMMALS

northern myotis

heather vole

northern bog lemming

PROPOSED FOCAL SPECIES
red-backed vole
water shrew

woodland jumping mouse

OTHER SPECIES ADDRESSED
rock vole

Group 5 – Panelists
Cal Harth *Natural Resources Research Institute*
Rick Jannett *University of Minnesota – Twin Cities*
Elizabeth Spencer *Wisconsin Dept. of Natural Resources*

Other panelists joining panel to address individual species:
Dick Buech

Forest Service
Facilitator: Phil Freeman/Ralph Wells
Scribe: Pat Hale
Resource specialist: Steve Mighton

Group -6 HERPS

four-toed salamander

wood turtle

Blanding's turtle

PROPOSED FOCAL SPECIES
red-backed salamander
northern leopard frog

blue-spotted salamander

wood frog

spotted salamander

green frog

OTHER SPECIES ADDRESSED

ringneck snake

Group 6 – Panelists
Dick Buech – *North Central Forest Experiment Station*
Gary Casper *Milwaukee Public Museum*
Jim Gerholdt *The Remarkable Reptiles*
Jeff Hines *Minnesota Dept. of Natural Resources*
Madeline Linck *Hennepin County Parks*

Forest Service
Facilitator: Sybill Amelon
Scribe: Chris Brunner

Group -7 INSECTS

Vertree's caddisfly
Ceraclea vertreesi
extra-striped snaketail –
Ophiogomphus anomalus
pygmy snaketail
Ophiogomphus howei
tiger beetle sp
Cicindela denikei
tiger beetle sp
Cicindela patruela
Karner blue butterfly
Lycaides Melissa samuelis

Group 7 – Panelists
David C. Houghton *University of Minnesota*
Bill Smith *Wisconsin Dept. of Natural Resources*
Janet Rith *Rivers Council of Minnesota*
Wayne Steffens *Contractor*

Forest Service
Facilitator: Mike Miller
Scribe: Andrew Langford
Resource specialist: Dick Meier

Group -8 BIRDS: Raptors

northern goshawk

boreal owl

red-shouldered hawk

peregrine falcon

bald eagle

great gray owl

PROPOSED FOCAL SPECIES
broad-winged hawk
barred owl

Group 8 – Panelists
Dave Andersen *USGS Minnesota Coop. Wildlife Unit*
Lisa Belmonte *University of Minnesota-Duluth*
Tom Erdman *Richter Museum of Natural History*
Jim Gallagher *Chippewa National Forest*
Karin Kozie *Superior National Forest*
Sergei Postupalsky *Contract Ornithologist*
Steve Wilson *Minnesota Dept. of Natural Resources*

Additional consultants for individual species
Bill Smith – goshawk
Tom Dolittle – goshawk
Steve Mortenson – goshawk
Jeff Hines -- goshawk
Forest Service
Facilitator: Duane Lula;
Phil Miller/Onnie Beyers (goshawk)
Scribe: Bob Berrisford
Mike Miller (goshawk)

Group -9 FISH

lake sturgeon
Acipenser fulvescens
shortjaw cisco
Coregonus zenithicus
least darter
Etheostoma microperca
no. brook lamprey
Icthyomyzon fossor
greater redhorse
Moxostoma valenciennesi
pugnose shiner
Notropis anogenus
OTHER SPECIES ADDRESSED
longear sunfish
Lepomis megalotis

Group 9 – Panelists
Luther Aadland *Minnesota Dept. of Natural Resources*
Nancy Auer *Michigan Tech University*
Don Fago *Wisconsin Dept. of Natural Resources*
Ted Halpern *Minnesota Dept. of Natural Resources*
Neal Mundahl - *Winona State University*
Konrad Schmidt *Native Fish Conservancy*
Frank Stone *U.S. Fish and Wildlife Service*
Scott Yess *U.S. Fish and Wildlife Service*

Forest Service
Facilitator: Jim Gallagher
Scribe: Chantel Cook
Resource specialists: Sue Reinecke, Scott Snelson, Mary Shedd

Group -10 MOLLUSKS

creek heelsplitter
Lasmigona compressa
fluted-shell mussel
Lasmigona costata
black sandshell
Ligumia recta

Group 10 – Panelists
Mark Hove *University of Minnesota*
Lindsay Anderson *Natural Resources Research Institute*
Glen Miller *Great Lakes Indian Fish and Wildlife Commission*
Rick Hart ` *Minnesota Dept. of Natural Resources*

Forest Service
Facilitator: Jim Gallagher
Scribe: Chantel Cook
Resource specialist: Mary Shedd

Appendix I. List of participants in panel workshops, including panelists, workshop organizers, facilitators, and scribes.

Work Session for plants--January 11-13, 2000.

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Work Session for animals--January 19-21, 2000.

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Work Session for mollusks--February 8-9, 2000.

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Appendix J. Agendas for plant and animal panel sessions.

Population Viability Assessment Work Session
US Forest Service and Conservation Breeding Specialist Group

Time: January 11 to 13, 2000 – **PLANTS**

Place: Duluth Entertainment and Convention Center
350 Harbor Drive, Duluth, MN 55802, (800) 628-8385, Fax (218) 722-4247

Workshop Objective: To gather experience and information not available in published form, synthesize with existing information to identify those habitat and ecosystem process needs to maintain species viability.

Panel Purpose Statement:
Species Expert Panel Purpose Statement:
The Species Expert Panels are to:

1. Focus on and address a single species or species group.
2. Verify species habitat needs and/or ecological process needs.
3. Identify habitat conditions and/or ecological process conditions limiting or threatening the species or species group.
4. Describe those habitat conditions and/or ecological process conditions that will maintain a low likelihood and high likelihood of species population viability.
5. Identify critical information needs.

AGENDA:

Tuesday, January 11
1pm to 5pm

- Plenary Session: All panelists
  - 1:00-1:30 - Introductions – US Forest Service
  - 1:30-1:45 - Overview of Work Session Process – Conservation Breeding Specialist Group
  - 1:45-2:00 - Review objective, expert panel expectations and outcome – US Forest Service
  - 2:00-2:30 - Forest Planning Process – US Forest Service, Duane Lula
  - 2:30-2:45 - Break
  - 2:45-3:15 - Population Viability Assessment Overview – US Forest Service, Stephen Mighton
  - 3:15-3:30 - Focal Species Overview – US Forest Service, Eunice Padley
  - 3:30-3:45- Guidelines for species expert panels – Conservation Breeding Specialist Group

- 3:45-4:30 - Panel questions overview, adjustments, agree on panel structure and operation – US Forest Service
- 4:30-5:00 – Meet in panel groups to prepare for following day

- Expert Panels
  - Introductions – panelists, facilitator, scribe
  - Identify and agree on species specific questions
  - For each species being addressed:
    1. Focus on and address a single species or species group.
    2. Verify species habitat needs and/or ecological process needs.
    3. Identify habitat conditions and/or ecological process conditions limiting or threatening the species or species group.
    4. Describe those habitat conditions and/or ecological process conditions that will maintain a low likelihood and high likelihood of population viability.
    5. Identify critical information needs.

Wednesday, January 12
8am to 5pm

- Plenary Session – (If needed) Review progress, address process concerns or panel question issues
- Expert Panels – Continue
- Box Lunch – Unfortunately, participants will have to pay for these
- Expert Panels – Continue
- Plenary Session - Review progress, address process concerns or panel question issues

Thursday, January 13
8am to 12noon

- Expert Panels – Continue
- Plenary Session – Closing overview, discussion on experience, critique

Population Viability Assessment Work Session
US Forest Service and Conservation Breeding Specialist Group

Time: January 19 to 21, 2000 – **ANIMALS**

Place: Duluth Entertainment and Convention Center
350 Harbor Drive, Duluth, MN 55802, (800) 628-8385, Fax (218) 722-4247

Workshop Objective: To gather experience and information not available in published form, synthesize with existing information to identify those habitat and ecosystem process needs to maintain species viability.

Panel Purpose Statement:
Species Expert Panel Purpose Statement:
The Species Expert Panels are to:

1. Focus on and address a single species or species group.
2. Verify species habitat needs and/or ecological process needs.
3. Identify habitat conditions and/or ecological process conditions limiting or threatening the species or species group.
4. Describe those habitat conditions and/or ecological process conditions that will maintain a low likelihood and high likelihood of species population viability.
5. Identify critical information needs.

AGENDA:

Wednesday, January 19
1pm to 5pm

- Plenary Session: All panelists
  - 1:00-1:30 - Introductions – US Forest Service
  - 1:30-1:45 - Overview of Work Session Process – Conservation Breeding Specialist Group
  - 1:45-2:00 - Review objective, expert panel expectations and outcome – US Forest Service
  - 2:00-2:30 - Forest Planning Process – US Forest Service, Duane Lula
  - 2:30-2:45 - Break
  - 2:45-3:15 - Population Viability Assessment Overview – US Forest Service, Stephen Mighton
  - 3:15-3:30 - Focal Species Overview – US Forest Service, Eunice Padley
  - 3:30-3:45- Guidelines for species expert panels – Conservation Breeding Specialist Group
  - 3:45-4:30 - Panel questions overview, adjustments, agree on panel structure and operation – US Forest Service
  - 4:30-5:00 – Meet in panel groups to prepare for following day

- Expert Panels
    - Introductions – panelists, facilitator, scribe
    - Identify and agree on species specific questions
    - For each species being addressed:
        1. Focus on and address a single species or species group.
        2. Verify species habitat needs and/or ecological process needs.
        3. Identify habitat conditions and/or ecological process conditions limiting or threatening the species or species group.
        4. Describe those habitat conditions and/or ecological process conditions that will maintain a low likelihood and high likelihood of population viability.
        5. Identify critical information needs.

Thursday, January 20

8am to 5pm

- Plenary Session – (If needed) Review progress, address process concerns or panel question issues
- Expert Panels – Continue
- Box Lunch – Unfortunately, participants will have to pay for these
- Expert Panels – Continue
- Plenary Session - Review progress, address process concerns or panel question issues

Friday, January 21
8am to 12noon

- Expert Panels – Continue
- Plenary Session – Closing overview, discussion on experience, critique

Appendix K. Working agreement for expert panel session.

FACILITATOR

- Sets time and tasks
- Keeps purpose front and center
- Facilitates discussions
- Can call *time out*

GROUND RULES

- All ideas are valid
- Everything is recorded on flip charts
- Everyone participates; no one dominates
- Listen to each other
- Treat each other with respect
- Seek common ground
- Differences and problems are acknowledged - not *worked*
- Observe time frames

EACH WORKING GROUP WILL HAVE:

- A facilitator.
- A person to take notes on a flip chart. These notes will serve as the group memory for your discussions.
- A person to enter notes into a computer. These notes will form the basis of the report that will come out of the meeting.

Appendix L. Questions directed to expert panels regarding terrestrial species.

Habitat:

1. What Outcome does the current condition of habitat indicate for species viability?

2. What are the vegetation types required within habitat patches that would lead to Outcome A? Outcome C?
   In terms of:
   - ✓ Canopy cover
   - ✓ Super canopy
   - ✓ Midstory vegetation
   - ✓ Ground cover, etc.

3. What age classes within habitat patches would lead to Outcome A? Outcome C?

4. What features within the habitat patches would lead to Outcome A? Outcome C?
   For example:
   - ✓ Down logs (size, quantity, distribution)
   - ✓ Snags – Standing live or dead (size, quantity, distribution)
   - ✓ Canopy closure and/or canopy openings
   - ✓ Water features, including vernal pools, spring-fed ponds, streams, etc. (size, quantity, distribution, juxtaposition with microhabitats and/or other features, other conditions)
   - ✓ Vertical layers
   - ✓ Soil conditions – Compaction, infiltration, chemistry, etc.
   - ✓ Slope, aspect, elevation
   - ✓ Other features

Landscape Structure

5. What patch size(s) would lead to Outcome A? Outcome C?

6. How many patches per unit area are needed to lead to Outcome A? Outcome C?

7. What is an appropriate distribution of patches (in terms of proximity, etc.) within the landscape to lead to Outcome A? Outcome C?

8. What landscape linkages are needed between the habitat patches for Outcome A? Outcome C?
   In terms of:
   - ✓ Habitat quality
   - ✓ Width
   - ✓ Redundancy
   - ✓ Length

9. Are there compensating factors of habitat conditions and/or landscape structures, that is, do more than one set of habitat conditions and/or landscape structures lead to the same outcome for the population? If so, describe the compensating factors that would lead to Outcome A? Outcome C?

Ecological Processes

10. If the species is dependent on a natural disturbance process, then what are the conditions needed to lead to Outcome A? Outcome C?
    For example:
    - ✓ Fire (extent, intensity, frequency)
    - ✓ Blowdown (extent, intensity, frequency)
    - ✓ Flooding (extent, intensity, frequency)

11. Is there a process such as nutrient cycling, water infiltration, etc. whose function could significantly impact population viability? If so, describe conditions leading to Outcome A? Outcome C?

Alleviation of Threats

12. If population viability of the species is likely to be significantly impacted by global climate change in the foreseeable future, describe the conditions that you expect would minimize this threat and lead to Outcome A? Outcome C?

13. Are there any other limiting factors and/or threats that are (or will be) significantly impacting population viability (in addition to habitat, climate conditions, and ecological processes)?
    For example:
    - ✓ Predation/herbivory
    - ✓ Disease
    - ✓ Loss of prey base
    - ✓ Loss of symbiotic relationships
    - ✓ Competition – interspecific, intraspecific
    - ✓ Genetics
    - ✓ Lifecycle characteristics
    - ✓ Legal harvesting
    - ✓ Illegal harvesting
    - ✓ Collecting
    - ✓ Road mortality
    - ✓ Pollution and/or toxins

    If so, describe the combination of conditions and/or interaction of factors that would lead to Outcome A? Outcome C?
    Rank according the impact.

Critical Information Needs

14. **What are the critical information gaps and/or needs? For example: studies, research, inventory, monitoring, evaluation, etc.**

Population

15. What outcome does the current condition of the population indicate for species viability?

16. Is there a viable population, or the potential for a viable population, on National Forest System lands alone?

17. How many individuals, breeding pairs, packs, etc. make up a viable population?

The Species Information Form/Literature Review:

18. Is there additional information about the species that should be included?

Appendix M. Questions directed to expert panels regarding aquatic species.

Habitat:

1. What are the channel units or lake habitats required within stream reaches or lake zones that would lead to Outcome A? Outcome C? In terms of:
   - ✓ Pools
   - ✓ Riffles
   - ✓ Seeps/springs
   - ✓ Runs
   - ✓ Bays
   - ✓ Rocky shoals

2. What is the minimum habitat patch size that would lead to Outcome A? Outcome C? (e.g. What species or size patch of aquatic vegetation, or optimal sequencing of habitat are required or desired by this species.)

3. What features within the habitat units/patches would lead to Outcome A? Outcome C?
   For example:
   - ✓ Woody debris/Down logs (size, quantity, distribution)
   - ✓ Water quality, chemistry
   - ✓ Aquatic vegetation
   - ✓ Substrate type and size
   - ✓ Water quantity
   - ✓ Water velocity
   - ✓ Water depth
   - ✓ Riparian condition
   - ✓ Other water features, including vernal pools, spring-fed ponds, streams, etc. (size, quantity, distribution, juxtaposition with microhabitats and/or other features, other conditions)

Landscape / Watershed / Basin Structure

4. What size(s) or collections of stream reaches or basins would lead to Outcome A? Outcome C?

5. How many stream reaches or basins per unit area are needed to lead to Outcome A? Outcome C?

6. What is an appropriate distribution of stream reaches or basins (in terms of proximity, etc.) within the landscape to lead to Outcome A? Outcome C?

7. What linkages are needed between the stream reaches, basins, and/or terrestrial/riparian habitats for Outcome A? Outcome C?

In terms of:

- ✓ Physical connectivity
- ✓ Width
- ✓ Length
- ✓ Redundancy
- ✓ Habitat quality
- ✓ Water chemistry
- ✓ Water quality
- ✓ Water quantity or flows
- ✓ Riparian condition

8. Are there compensating factors of habitat conditions and/or landscape structures, that is, do more than one set of habitat conditions and/or landscape structures lead to the same outcome for the population? If so, describe the compensating factors that would lead to Outcome A? Outcome C?

Ecological Processes

9. If the species is dependent on a natural disturbance process, then what are the conditions needed to lead to Outcome A? Outcome C?

For example:

- ✓ Fire (extent, intensity, frequency) for recruitment of large woody debris
- ✓ Blow down (extent, intensity, frequency) for recruitment of large woody debris
- ✓ Water fluctuations (e.g. flooding, spring spates, periodic low water)
- ✓ Beaver

10. Is there a process such as nutrient cycling, water infiltration, etc. whose function could significantly impact population viability? If so, describe conditions leading to Outcome A? Outcome C?

Alleviation of Threats

11. If population viability of the species is likely to be significantly impacted by global climate change in the foreseeable future, describe the conditions that you expect would minimize this threat and lead to Outcome A? Outcome C?

12. Are there any other limiting factors and/or threats that are (or will be) significantly impacting population viability (in addition to habitat, climate conditions, and ecological processes)?

For example:

- ✓ Predation
- ✓ Disease
- ✓ Loss of prey base
- ✓ Loss of symbiotic relationships
- ✓ Competition – interspecific, intraspecific
- ✓ Change in terrestrial habitat
- ✓ Genetics
- ✓ Lifecycle characteristics
- ✓ Legal/illegal harvesting
- ✓ Road building
- ✓ Pollution and/or toxins
- ✓ Changes in hydrological regime
- ✓ % Watershed in open condition
- ✓ Barriers / loss of barriers
- ✓ Non-native species
- ✓ Erosion, sedimentation
- ✓ Forest harvest
- ✓ Collecting

If so, describe the combination of conditions and/or interaction of factors that would lead to Outcome A? Outcome C? Rank according the impact.

Critical Information Needs

13. What are the critical information gaps and/or needs? For example: basic life history, studies, research, inventory, monitoring, evaluation, etc.

Population

14. Is there a viable population, or the potential for a viable population, in waterways or basins on National Forest System lands alone?

15. How many individuals make up a viable population?

16. What outcome does the current condition of the population indicate for species viability?

17. What outcome does the current condition of habitat indicate for species viability?

18. Is there additional information about the species that should be included?

Appendix N. Species viability outcomes statements and caveat.

Species Viability Outcomes Statements:
Draft EIS Alternatives will be rated against these 5 possible outcomes as a result of implementation. (Adapted from Interior Columbia Basin Ecosystem Management Project)

REVISED OUTCOMES STATEMENTS – 1/19/00

NOTE: **Outcomes Caveat**
The concept of habitat, habitat distribution, and habitat quality must be based on knowledge of the species' distributional range and life history.

Outcome A.
Habitat is distributed broadly across the taxon's historic range and is of sufficient quality to support the type and degree of intrademe and metapopulation interactions that the taxon would characteristically engage in if it were not habitat limited.

Outcome B.
Habitat across the taxon's historic range is reduced in quality or quantity. Local demes may be extirpated. Metapopulation interactions are adversely altered, but the taxon generally retains the geographic extent typical of the historic distribution.

Outcome C.
Habitat across the taxon's historic range is reduced in quality or quantity. Local demes have been extirpated. Metapopulation interactions are adversely altered throughout most of the taxon's range. The geographic extent of the taxon is reduced.

↑ Maintaining Viability ↑ **
↓ Declining Viability ↓

Outcome D.
Habitat across the taxon's historic range is much reduced in quality or quantity. A majority of the historic populations have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxon is significantly reduced.

Outcome E.
Habitat across the taxon's historic range is much reduced in quantity and quality. A majority of the historic populaitons have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxon is reduced to the point that the taxon would benefit from the protections of the Endangered Species Act.

(** Upon further review of the outcome statements with the Forest Service Washington Office, the threshold line for "maintaining viability", may be inappropriate. These statements do not provide a quantified measure of viability. Their intended use in this portion of the assessment was to provide preliminary infomation on the range of environmental conditions that might provide for viability of species. After alternatives are developed, there will be a further evaluation of the likelihood that each of the conditions described in the outcome statements would be achieved under each of the alternatives.)

Appendix O. Work Session materials available to panelists.

WORK MATERIALS
Species literature review
Species review cited literature
Meeting workbook: 1. Agenda 2. Panel purpose statement 3. Facilitator and workgroup room assignments 4. PVA Team process 5. Species groupings and expert panelists assignments
CBSG Background—who they are & how they will interact w/ FS. Speech only or a paragraph too
MAP: State maps: MN and WI—including Ntl. Forests, state forests, tribal lands
MAP: National Forest maps
MAP: Ntl Forest current vegetation by cover type or community (with acreages). Maps of old-growth forest
MAP: Province 212 for MN, WI, and MI. Include province description. MAP: Sections within Province 212. Include section descriptions.
MAP: Vegetation cover map –current (e.g., Landsat TM coverages for current vegetation)
Current species information relevant to the planning area. Such as current species occurrences, counts, and distribution
MAP: pre-European settlement condition (e.g., GLA map)
"REFERENCE LIBRARY"
Current printouts of forest cover types by age class distribution in 10 year increments for each forest.
Proposed draft NFMA regs from the Federal Register
Field guides
Reference books and other materials
Forest planning docs
WI Biodiversity report
MN GEIS Biodiversity Tech Paper
Northern State Forest assessment
Scientific Roundtable report
Wild Forests Wildlife, Forests, and Forestry Saving Nature's Legacy
Mladenoff's comparison of Border Lakes and Sylvania
Lorimer, Frelich on wind disturbance regimes
Heinselman on fire regimes
Waller, Alverson, Solheim's work, e.g. Forests Too Deer
Frelich's old growth paper

Endangered Ecosystems
Copies of any classification systems used in our preparation – TNC alliance and community descriptions.
Cover type descriptions.
Almendinger's releve' summaries
FIA forest type data for the States and the National Forests
NHP/NHI data bases –TES locations
MN's set of 14 maps – key maps for reference may be: - Land ownership on NFs - Forest Plan map (with Mas) - LTA maps - Watershed map - Current veg by age - Current veg by community - Maps of pot old growth - Potential candidate RNAs - Roads system map - Current veg Landsat
Map of blowdown damaged forest on SNF
MN's tabular info on key characteristics of Province, Section, Subsection, and LTA
MAP: LTA maps and descriptions for the Forests.

Appendix P. Focal species questionnaire distributed to panelists.

For each ecosystem group, please indicate whether you agree or disagree with the proposed focal species. If you think that other species would be better surrogates for ecosystem integrity, please list them and provide rationale.

1) Large landscape scale - species operates across ecosystems

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
American marten		
Lynx		
Moose		
Gray wolf		
Cougar		
Loon		
Eagle		
Goshawk		
Bobcat		
Black bear		
Other species suggestions and rationale:		

2) Pine barrens (WI)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Sharp tailed grouse		
Jack pine patches		
Upland sandpiper		
Rice grass (*Oryzopsis pungens*)		
Other species suggestions and rationale:		

3) Northern dry forest – jack pine, oak (WI)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Pin oak		
Other species suggestions and rationale:		

4) Hemlock (regeneration concern - WI)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Hemlock		
Blackburnian warbler		
Other species suggestions and rationale:		

5) Northern hardwoods (includes hemlock and white pine components in places)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Canada yew (*Taxus canadensis*)		
Guild of spring ephemerals/early bloomers (*Claytonia virginiana* - spring beauty, *Hepatica* species, *Sanguinaria canadensis* - bloodroot, *Viola* species, *Dicentra cucullaria* -Dutchman's breeches, *Dicentra canadensis* – squirrel-corn)		

5, continued) Northern hardwoods

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Red backed salamander		
Red-shouldered hawk		
Black-throated blue warbler		
Gray squirrel (for Chippewa National Forest)		
Yellow birch		
Botrychium mormo (for Chippewa and Chequamegon-Nicolet National Forests)		
Viola pubescens (downy yellow violet)		
American marten (for Chequamegon-Nicolet National Forests)		
Pileated woodpecker		
Other species suggestions and rationale:		

6) Red-white pine forest (native genotypes, naturally established)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
White pine		
Pine warbler		
Other species suggestions and rationale:		

7) Cedar swamp

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
White cedar		
Other species suggestions and rationale:		

8) Riparian forests

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Red-shouldered hawk		
Northern water thrush		
Common merganser		
Other species suggestions and rationale:		

9) Swamp conifer (including tamarack and black spruce)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Black spruce		
Tamarack		
Yellow bellied flycatcher		
Lincoln's sparrow		
Palm warbler		
Golden-crowned kinglet		
Other species suggestions and rationale:		

10) Areas of low road density (correlated with low human presence in the landscape)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Leopard frog		
Gray wolf		
Lynx		
Other species suggestions and rationale:		

11) Sedge meadows

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Yellow rail		
Meadow vole		
Other species suggestions and rationale:		

12) Spring-fed ponds

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Central newt		
Other species suggestions and rationale:		

13) Boreal upland forest (MN and a small area on the Chequamegon-Nicolet National Forests)

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Goshawk (nesting) – Chippewa National Forest		
Broad-winged hawk		
Pileated woodpecker		
American marten		
Red-backed salamander		
White spruce (understory)		
Tamarack		
Black spruce		
Cedar (mineral soils)		
Other species suggestions and rationale:		

14) Jack pine - MN

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Jack pine patches		
Other species suggestions and rationale:		

15) Vernal ponds

Proposed focal species	**Agree with proposal**	**Disagree with using this species, and reason**
Blue-spotted salamander		
Wood frog		
Other species suggestions and rationale:		

16) Lakes

Focal species suggestions and rationale:

17) Streams

Focal species suggestions and rationale:

General comments:

Appendix Q. Summary of responses from panelists to proposed focal species.

1) Large landscape scale - species operates across ecosystems

Proposed focal species	Agree with proposal		Disagree with using this species, and reasons
	# yes	#no	
American marten	9	3	Accommodated by site-level mitigation. Human harvest, recolonizing part of area, rare on part of Chip. Wouldn't provide good basis for type/age/patch size.
Lynx	6	10	Low probability of any breeding population. Too elusive. Very rare. Habitat is not well-known in region. Likely eruption species in much of area. It most likely does not occur in planning area. No response to monitor. Population too small and marginal. Too incidental – no viable population.
Moose	11	3	Unknowns; spotty distribution. Habitat is probably not limiting. OK for Superior, not for Chip. Profit from early succession forests.
Gray wolf	11	3	Too broad a generalist; public education may reduce concern over road density. Recolonizing species, habitat generalist. No good way to define needs. Prey base profits from early succession.
Cougar	2	12	Not common enough. Low probability of any existing population. Too elusive. Very rare. Uses too wide a range of habitat. Rare if found here at all. It most likely does not occur in planning area. Numbers too small to be monitored/ evaluated with confidence. No good way to define needs or to monitor. Population too small and marginal. Too incidental – no viable population.
Loon	9	3 ? Habitat requirements pretty specific – are these included here because they may fly a distance to feed? Still require relatively undisturbed lakes, low mercury levels.	OK for large lakes with suitable habitat. Better used for aquatic habitats – not here. Not able to effectively manage fish or human intrusion. It's more specific to lake water quality.
Eagle	8	2	OK, but question what it would be an indicator of. Well suited with humans; can be managed at smaller scales. Only option that really matters is maintaining white pine; very long term option.
Goshawk	11		We don't know what it is an indicator of. Won't work on SNF.
Bobcat	9	2	Habitat & prey generalist. How would needs be defined? Rare to use on SNF.
Black bear	8	6	Very common – everywhere. Indicator of young disturbed forest. Not very selective of ecosystems across which it moves (use of disturbed areas). No good way to define needs. What other species with hunting season is included?

Other species suggestions and rationale:

Species	# of Recs	Rationale
Beaver	2	Change water quality; have huge and long-term impact on sites. Provide habitat for a variety of species.
Redback vole	1	The dominant small mammal upon which many interaction depend.
Snowshoe hare	1	Critical prey for many species; cyclic abundance related to abundance of lynx, fox, coyote, raptors, owls, etc.

Guild of small mammals (microtines)	1	Same as above.
River otter	1	Indicator of aquatic ecosystem integrity, especially toxics.
Fisher	1	
Barred owl	1	Easy to monitor, habitat needs are mature…? (can't read comment) with tree cavities.
Boreal owl	1	May use a specific juxtaposition of habitats distributed well enough to permit dispersal and pair bonding (Superior NF only).
Caribou	1	Might be reintroduced?
Spruce grouse or ruffed grouse	1	Use a juxtaposition of varied habitats.
Sharp-tailed grouse	1	Requires a landscape-level approach to maintain viable populations.
No. leopard frog	1	Because of long distance (1 mile) movements between winter, breeding, and summer habitats, N. leopard frogs could fit here rather than simply under road density.
Old growth conifer and hardwoods	1	Large browsers and their prey may do well in a landscape dominated by aspen rotations. Other of the above species require large wilderness tracts but are independent of forest type. Survival of many of the state listed species requires old growth and other special habitats. These species could suffer in a landscape highly supportive of the above species.

2) Pine barrens (WI)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Sharp tailed grouse	11	1	Doesn't this species also occur in large, heavily managed jack pine clearcuts? Is there a species that is better at discriminating between highly disturbed (clearcut sites) and naturally occurring pine barrens?
Jack pine patches	12		Note: the patches should be surrounded by thinly vegetated barrens, i.e. not patches of jack pine within forests of other types.
Upland sandpiper	8	2	Not present in many important sites. More in wet grasslands.
Rice grass (*Oryzopsis pungens*)	7		
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Waldsteinia fragaroides (barren strawberry)		1	Common associate of barrens
Pinus strobes, Pinus resinosa		1	Historic occurrence
Vaccinium spp., *Vaccinium angustifolium*		2	Wildlife feeding, esp. bears. An umbrella species dependent on disturbance; utilized by a large number of species (bear, birds, etc.).
Arctostaphylos uva-ursi (bearberry)		1	Wildlife feeding, esp. bears
Pteridium aquilinum (bracken fern)		1	Common associate
Badger		1	Occupy open lands w/ sandy soils and are dependent on a diverse community of small mammals.
Northern pocket gopher		1	Only occurs in NW WI in pine barrens habitat.
Clay-colored sparrow		1	
Pine warblers		1	
Some other openland sparrows		1	
Fireweed (*Epilobium angustifolium*)		1	Indicative of fire in system.

Sparrow species, e.g. savannah	1	Might be more likely to respond and are easy to monitor.
No. pin oak (*Quercus ellipsoidalis*)	3	Northern dry forest and pine barrens can be different seral stages on the same piece of ground. Or will occur adjacent to one another. I think they should be discussed together and have the same species.
Northern blue butterfly	1	Occurs in the best (least disturbed) barrens in eastern Wisconsin.
Ceanothus ovatus	2	Widespread, but not common, in Moquah barrens.
Chimaphella umbellata	2	Associate of the pine barrens community.
Oryzopsis canadensis	2	Quite rare; occurs in the barrens.
Microbiotic soil crusts	1	A component of pine barrens habitat. It would have been more common before human use.

3) Northern dry forest – jack pine, oak (WI)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Northern pin oak	8		
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Quercus sp.		1	Common associate of barrens
Whitetail deer		1	Browsing impacts
Squirrel sp.		1	Mast needs
Gray squirrel		1	Needs reliable mast trees to persist, most other northern forest types do not support it.
Jack pine		2	Describes the habitat.
Connecticut warbler		1	On Cheq NF – species of concern, alternate habitat with muskeg.

4) Hemlock (regeneration concern - WI)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Hemlock	12		Hemlock regenerating better than white cedar generally. Regenerating in some areas (higher snow depths, hidden among other conifers) but is not regenerating over large parts of its range.
Blackburnian warbler	9		
Other species suggestions and rationale:			
Species		**# of Recs**	Rationale
Lycopodium sp.		1	
Dryopteris spinulosa (wood fern)		1	Dominant understory in ATD habitat type
Athyrium filix-femina (lady fern)		1	Dominant understory in ATD habitat type
Impatiens capensis (spotted touch-me-not)		1	Indicator of surface drainage

Oxalis montana	1	Indicator of surface drainage
Coptis groenlandica (bunchberry)	1	Indicator of surface drainage
Porcupine	1	Hemlock in mature stages are optimum habitat, porcupine needs mature conifers and large snags.
Northern flying squirrel	1	Needs large den trees; is associated with mature mixed conifer/hardwood habitat.
Red-shouldered hawk	1	Most mating territories in WI have hemlock component.

5) Northern hardwoods (includes hemlock and white pine components in places)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Canada yew (*Taxus canadensis*)	8	4	Very rare on Chip & not found in this habitat. More outside of northern hardwoods on SNF. Not specific to northern hardwood; occurs widely in mixed upland conifers, boreal hardwood forest although drastically reduced by deer. Taxus is being browsed out by deer overpopulation – its absence from a given site is not necessarily because of inappropriate habitat.
Guild of spring ephemerals: (*Claytonia virginiana, Claytonia carolina, Sanguinaria canadensis* (MN only), *Viola canadensis, Dicentra cucullaria, Dentaria diphylla, Dentaria lacinerata, Allium tricoccum)*	9	2 ? ?	Common in Toimi – Murphy City area of Superior NF regardless of disturbance/logging. *Claytonia* rare or absent on Chip; *Hepatica* common in many habitats including regen aspen on Chip; *Dicentra cucullaria* OK for rich NH on Chip but not regular NH; *D. canadensis* not found on Chip. *Hepatica americana* is widely distributed across upland forested ecosystems; *Viola canadensis* possibly, probably not other *Viola* spp.; *Dicentra canadensis* not in CNF, SNF. Not exclusive to No. Hardwoods on SNF. Yes- could indicate appropriate habitat from which hardwoods have been removed.
Red backed salamander	8	1	Not exclusive to N.H. and small area need.
Red-shouldered hawk	6	3	Not in N.H.; is a wetland associate. Not on SNF. Does not occur on Superior NF. Better in riparian forests.
Black-throated blue warbler	5	3 ?	More associated with mature conifer component. Rare and likely hard to monitor on Chip. Too rare to tie to this type. Not exclusively in N.H.
Gray squirrel (for Chippewa National Forest)	5	3 ? ? ?	Is this a range issue? Too widely distributed; and they're "town squirrels". Why is it included? Better in oak; NH used only w/ oak component. OK but could be influenced by human settlement (feeding). More important to oak; not good for N.H.
Yellow birch	10	2	Appears to <u>not</u> be as susceptible to failed regeneration due to deer.
Botrychium mormo (for Chippewa and Chequamegon-Nicolet National Forests)	8		Hard to find. Better for rich N.H. sites.
Viola pubescens (downy yellow violet)	2	5	More appropriate to use as an associate sp of *Osmorhiza berteroi*. Ecological amplitude too broad. Found in many habitats on Chip (aspen). Too widely distributed across upland forest ecosystems. Summer greens perhaps a better focal species group.
American marten (for Cheq-Nic NF)	6	1	Poor choice – in MN lives in boreal forest; does not need NH type.

Pileated woodpecker	10	1 ?	Needs big trees – not N.H. Yes; good indicator of wood decomposers and associates. Not exclusive to NH.
Other species suggestions and rationale:			
Species		**# of Recs**	Rationale
Whitetail deer		1	Browsing impact
Caulophyllum thalictroides (blue cohosh)		2	Forest health indicator for mesic and rich mesic forests.
Goshawk		1	Main nesting habitat in WI and MI.
Blue spotted salamander		2	Main habitat.
Spotted salamander		1	Main habitat.
Barred owl (*Strix varia*)		2	1) Needs mature hardwood and mixed deciduous/coniferous forests for breeding, same as red-shouldered hawk and northern goshawk; 2) needs adequate size cavities in trees and snags. Altrhough these owls will nest in open (hawk, squirrel) nests, their productivity in such nest sites is very low (see Postupalsky et al. 1997. Gen Tech Rept NC-190, pp. 325-337); 3) barred owls are subject to predation by raccoons, martens, fisher, and to competition for cavities; 4) barred owls may be sensitive to forest fragmentation.
Old growth yellow birch or white pine component		1	
Lobaria quercizans		2	Associated with old-growth sugar maple/yellow birch forests.
Lobaria pulmonaria		1	Associated with old-growth sugar maple/yellow birch forests.
Leptogium saturninum and *Leptogium bernetiae*		1	Associated with old-growth hemlock hardwood and NH forests in WI; old ash bogs in MN.
Red oak component (for Superior NF)		1	
Large-flowered trillium (*Trillium grandiflorum*)		1	
Yellow-bellied sapsucker		2	"Eco-engineer"
Adiantum pedatum		1	
Sugar maple		2	*Acer saccharum* old growth (>100 yr) – this is the key indicator of appropriate habitat for many listed species and the above species may not be in all suitable habitat (*B. mormo* occurs in less than half of suitable hardwood sites – see comments at end.)
Great crested flycatcher		1	Though not on SNF.
Black-throated green warbler		1	Always present in NH while black-throated blue is very spotty in MN.
Lycopodium obscurum, L. dendroides, etc.		1	Umbrella species; can be impacted by changes in hydrology and light (timber harvest, etc.); loss of plant in a habitat may impact the hydrology of a site thereby impacting associated species. A non-timber forest product that may be over harvested.

Bark beetles (maple borer?)	1	
Napaeogopus hudsonias?? (woodland jumping mouse)	1	
West Virginia white	1	
Brown creeper	1	
Summer greens (*Smilacina racemosa*, Trilliums, Blue cohosh, etc.)	1	Perhaps more important than spring ephemerals as focal species are the summer greens that are more susceptible to deer browse. However, both groups are susceptible to exotic invasion.
Beech (*Fagus grandifolia*)	1	Declining in Nicolet, where forestry practices select against it (favoring other spp such as sugar maple). Nicolet has largest pops of beech on any WI public lands.
Medeola virginiana – Indian cucumber root	1	Special concern in WI. Estimated 90% of individuals in WI occur in Nicolet NF and Menominee reservation. May be declining elsewhere in WI because of deer browse.
Strepotopus amplexifolius – white mandarin	1	Special concern in WI. Except on the deer-free Apostle Islands, this species has severely declined in WI because of deer browse.
Streptopus roseus	panel	Proposed as a representative of summer greens that are heavily browsed in the middle of the growing season.
Carex spp., including *C. plantaganea, C. grayeii, C. lupulina, C. lupiliformis*	2	Sensitive to canopy opening, may be declining.
Anzia colpodes (a lichen species)	1	Found in old-growth forests; is likely in WI. May be of viability concern.
Peltigera spp, lichens	1	Focal for old-growth forests, where they are more abundant.

6) Red-white pine forest (native genotypes, naturally established)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
White pine	12	2	Heavily affected by exotic (blister rust); don't use species that have problems due to exotics!! Red pine (naturally regenerated) better choice. Yes, for regenerating white pine.
Pine warbler	12		

Other species suggestions and rationale:

Species	**# of Recs**	Rationale
Red pine	5	Grows faster, less threat to success, will outcompete white pine. Use natural stands >70 yrs, > 100 acres, that have not been thinned. Red pine instead of white pine; a main threat to naturally established pine forests is lack of fire. Red pine is more sensitive to this threat, as white pine more readily regenerates without fire. Red pine regeneration – we have natural red/white pine stands but with very little regen – long term maintenance. There seems to be variation in choice of tree species among forest types. In most cases you list dominant tree species, whereas here you omit red pine.

Vaccinium sp.	1	Shrub component, regeneration success, fire need evaluation.
Aspen sp	1	Abundance – want to keep at low frequency to lessen competition.
Lady's slipper	1	
Monotropa uniflora (Indian pipe)	1	
Porcupine?	1	
Natural red and white pine with a score >22 (MN, and equivalent score in WI)	1	
Red-breasted nuthatch	1	Characteristic species that is less restricted to pines than pine warbler.

7) Cedar swamp

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
White cedar	14		Supporting comment: This tree species, perhaps as no other, is not regenerating over much of the Forest Service land in Wisconsin. In addition to regen problems, it has been extirpated from the transitional habitats, where aspen is being managed today.
Other species suggestions and rationale:			
Species	**# of Recs**		Rationale
Whitetailed deer	1		Browsing impact.
Tamarack	1		To evaluate ratio of conifer to hardwood.
Yellow lady's slipper (*Cypripedium calceolus*)	3		Indicative of browsing pressure in summer. A surrogate for other orchid species such as *C. reginae* because of deer browse. Has wider ecological amplitude than most other orchids.
Cedar swamps with abundant regeneration > 2 ft	1		
Cedar forests > 120 yrs	1		
Upland cedar forests	1		
Menegazzia terebrata	1		Lichen in old growth cedar.
Old cedar/yellow birch/black ash forest	1		
Calypso bulbosa	3		
Young white cedar	1		
Winter wren	1		Not specific, but is abundant here when "tip-ups" are common.

Parmotrema crinitum	1	A somewhat more common lichen that could indicate the possible presence of rare lichens in older cedar swamps.
Pseudovaria consocnins	1	A somewhat more common lichen that could indicate the possible presence of rare lichens in older cedar swamps.
Usnea longissima	1	A rare lichen found in older cedar swamps.

8) Riparian forests

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Red-shouldered hawk	8		Limited areas/not all forests.
Northern water thrush	7	1 2-?	Rare on Chip – can it be monitored? Limited areas/ not all forests. Also common in other lowland forest types, not necessarily riparian. Riparian forests cover ecotones adjacent to rivers, lakes, & wetlands along aquatic units of different scales. I can imagine riparian forests along small streams for example where water thrush/mergansers would not be present.
Common merganser	6	2 ?	On Chip is associated with large lakes. Riparian forests cover ecotones adjacent to rivers, lakes, & wetlands along aquatic units of different scales. I can imagine riparian forests along small streams for example where water thrush/mergansers would not be present.

Other species suggestions and rationale:

Species	**# of Recs**	**Rationale**
Veg spp: grasses, sedges, shrubs	1	Typical plants as health indicator, veg needed to prevent erosion.
Water shrew	1	Sensitive to water quality.
Otter	1	Indicator of toxics.
Leopard frog	2	Indicator of toxics. Indicator of aquatic integrity and pollutants.
Mink	1	Indicator of toxics.
Wood frog	1	Indicator of aquatic integrity and pollutants.
Saw-whet owl	1	Nesting and foraging habitat.
Hooded merganser	2	WI
Wood duck	3	WI. May be more widespread than common merganser.
Wood turtle	2	Indicator of riparian quality. Species of concern, requires forested areas along streams.
Barred owl	1	See comments under Northern Hardwoods.
Beaver	1	
American elm	1	
Silver maple (*Acer saccharinum*)	1	Truly a riparian species.
Common goldeneye	1	Another hole nesting species.
Cerulean warbler	1	Habitat specific, declining populations.

Napaea dioica	1	The only endemic genus in Midwest with only species. Populations are small; don't know if it's increasing or decreasing.
Green dragon (*Ariesamea dracontium*)	1	Plant resembling a large jack-in-the pulpit. Associated with floodplain forests; don't know if it's increasing or declining.
Canada warbler	1	Lowland, riparian hardwoods.
Water shrew?	1	

9) Swamp conifer (including tamarack and black spruce)
Comment from Don Farrar: Wetlands supporting black spruce & tamarack are more appropriately referred to as Bogs. Bogs have a very different hydrology than swamps and consequently different vegetation.

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Black spruce	11	1 ?	Common species. On Chip, black spruce and tamarack indicate different swamp types. Lowland sp must be separated from upland.
Tamarack	11	1 ?	Further define. On Chip, black spruce and tamarack indicate different swamp types.
Yellow bellied flycatcher	8	1 ?	More associated with mixed habitat on Chip. Yes for closed canopy muskeg. Often found more frequently in other lowland forest types.
Lincoln's sparrow	6	1	Also some other types. Young, regenerating forest only. Yes for open muskeg. Yes for open swamps only.
Palm warbler	6	?	Limited. Yes for open muskeg. Yes for open swamps only.
Golden-crowned kinglet	7		Yes for closed canopy muskeg.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Ground layer vegetation		1	Distinguish between conifer bog and swamp types.
Moss spp.		1	Health indicator.
Oxycoccus microcarpus (small bog cranberry)		1	Health indicator.
Ledum groenlandicum (Labrador tea)		1	Health indicator.
Kalmia spp (bog laurel)		1	Health indicator.
Chamaedaphne calyculata (leatherleaf)		1	Health indicator.
Star-nosed mole		1	Needs moist soils usually in conifers or mix.
Olive-sided flycatcher		1	Good indicator species for this habitat.
Mytle (yellow-rumped) warbler		1	

Spruce grouse	1	
Dragon's mouth orchid	1	
Buck bean	1	
Carex trisperma, C. gynocrates, or *C. chordorhiza*	1	
Creeping strawberry (*Gaultheria hispidula*?)	1	
Northern comandra	1	Not common but in swamp conifer.
Connecticut warbler	1	Similar to palm warbler, Lincoln's sparrow – they are a habitat guild.
Golden-winged warbler	1	Probably found almost exclusively in this habitat historically – before clearcuts.
Northern parula	1	A characteristic resident of more closed forests.
Jutta arctic, red-disked alpine and other lepidoptera	1	
Swamp orchids, e.g. *Cypripedium acaule*	1	Susceptible to deer browse.

10) Areas of low road density (correlated with low human presence in the landscape)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Leopard frog	5	5 ?	Doubts that it's tied to low road density. Not the case in WI. More associated with large wetlands or lakes; high numbers can be found near human disturbance. No correlation. Presence of leopard frog is more a function of presence of waters without predatory fish and bullfrogs which eat tadpoles and young froglets. Where did this come from? Can live in small areas between roads.
Gray wolf	10	? ? 1	Question road density and wolf numbers. We've always thought so – but now? Maybe not. Some of highest wolf density in MN is in areas of high rd density.
Lynx	5	7	Too rare for meaningful measurements. Eruption species, rare. Will wind up being like wolf road density, based on roadless principle and guessed road density. Too marginal a population. I think lynx are dependent on immigration from Canada and so would be poor focal species to choose.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Weeds		1	Number/abundance should be low compared with areas of high road density.
Spruce grouse		2	Susceptible to roadside hunting.
Bobcat		2	Sensitive to road densities but not as much as wolf, and broadly distributed. (See Matt LaVollette paper.)

11) Sedge meadows

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Yellow rail	8	1	Limited areas. Not present in most of planning area. Need a particular substrate under sedges.
Meadow vole	4	2 ?	Found in all habitats. Widespread in roadsides, old fields, etc. Not in flooded sedge – occur in many other open areas and probably not in wet meadows.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Sedges		1	Indicators of hydric conditions.
Franklin's squirrel		1	Found in grasslands, sedge edges.
Marsh wren		1	Very good indicator.
Swamp sparrows		1	
Southern bog lemming		1	Typical mammal, better than microten P. (can't read this last part)
Bob-o-link		1	
Carex oligosperma, C. lasiocarpa		1	
Calamogrostis canadensis		1	
Northern harrier		1	For larger meadows.
LeConte's sparrow		2	Limited areas. Need other species like sedge wren and LeConte's sparrow that have wider tolerances of sedge fen conditions than yellow rail.
Sedge wren		4	For SNF – yellow rail too rare there. Need other species like sedge wren and LeConte's sparrow that have wider tolerances of sedge fen conditions than yellow rail. Depend almost exclusively on this habitat type, recent downward trends of population.
Sedge-inhabiting butterflies (skippers) should be included		1	
Chorus frogs		1	Chorus frogs would be a good herp choice for a focal species here.
Non-native cattails (*Typha angustifolia*)		2	
Native cattails *(Typha latifolia)*		1	These were formerly abundant – when habitat is disturbed the narrow leaved cattails come in. *T. latifolia* occupies the wetter gradient of sedge meadows.
Calamogrostis Canadensis, Carex stricta		1	Typical of sedge meadows and quite common.

12) Spring-fed ponds

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Central newt	3	3	Such ponds typically have fish which consume…? and central newts? (can't read the comment). Not a resident.

			Yes as long as isolated from lakes/large streams. Newts require permanent wetlands and not restricted to spring-fed ponds.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Veg spp		1	Oligotrophic spp could be compared to eutrophic.
Pond lilies		1	
Duck weed		1	
Mollusks?		1	
Moss spp.		1	
Blue spotted salamander		1	
Fairy shrimp?		1	
Water shrew		1	
Pickerel frog		1	Suggest add pickerel frog instead [of central newt].

13) Boreal upland forest (MN and a small area on the Chequamegon-Nicolet National Forests)

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Goshawk (nesting) – Chippewa National Forest	4	2	Found more in mixed forest to old-growth aspen.
Broad-winged hawk	6	2	Habitat generalist on Chip; more in hardwoods. Boreal hardwood on SNF.
Pileated woodpecker	6	1 ?	Large tree, not forest type. Boreal hardwood on SNF.
American marten	8	1 ?	Recolonizing; human harvest. Mixed forest, won't give a good handle on age or patch size.
Red-backed salamander	4	3 ?	Too acidic to maintain large populations. This I think would be better in N.H. Not exclusive to this type. Red-backs are more appropriate to N.H.
White spruce (understory)	7		To follow as a type.
Tamarack	4	3 2-?	Swamp species. Uncommon in uplands. Very little upland occurrence.
Black spruce	8	2	Swamp species. Yes, to follow as a type. Yes, for understory.
Cedar (mineral soils)	8	1,?	Yes, to follow as a type.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Ground layer veg & shrub component: *Vaccinium* spp, lingonberry, *Arctostaphylos uva-ursi*, *Gaultheria*, *Sailx* sp, mosses, lichens.		1	Forest health indicators.
Barred owl		1	See comments under Northern Hardwoods.
Old white spruce > 70 yrs.		1	
Northern saw-whet owl		1	

Black-backed woodpecker.	2	
Bay-breasted warbler	1	
Birch?	1	
Aspen?	1	
Yellow rumped warbler	1	
Olive sided flycatcher	1	
Blackburnian warbler	1	
Sharp-shinned hawk	1	For SNF, where goshawk does not seem to occur – because forest too dense?
No. red backed vole and other small mammals	1	
Red squirrels	1	Prey base for other species.
Blue spotted salamander	1	Perhaps replace red-backed salamander with blue spotted.
Balsam fir (*Abies balsamea)*	1	More characteristic of typic upland boreal forests in WI and MI, including Isle Royale.
Rubus parviflorus - thimbleberry	1	More characteristic of typic upland boreal forests in WI and MI, including Isle Royale. Seems to be declining; disease impacting it in the UP.

14) Jack pine - MN

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Jack pine patches	9		Word "patch" is misleading. Use JP dominated forest. What scale patches? Can be a big component of boreal forest type on Canadian Shield.
Other species suggestions and rationale:			
Species		**# of Recs**	**Rationale**
Spruce grouse		4	I'm probably wrong but I think there's a relationship with JP in certain condition and juxtaposition to low areas. One of two kinds of preferred habitat; highest populations in JP.
Stemless lady's-slipper		1	
Blueberry		1	
Black-backed woodpecker		1	

15) Vernal ponds

Proposed focal species	**Agree with proposal**		**Disagree with using this species, and reason**
	# yes	# no	
Blue-spotted salamander	9	?	Agree if within hardwoods. For MN, these are the dominant species.
Wood frog	9	? ?	Found in many habitats (spring breeding OK). Very successful in so many breeding habitats. For MN, these are the dominant species.
Other species suggestions and rationale:			

Species	# of Recs	Rationale
Hydric veg component	1	
Spotted salamander	2	Roadkill issues. Better indicator, takes 2 yrs of pond usage to mature.
Central newt	1	
Gray tree frog	1	
Broad-winged hawk	1	Good indicator, nests close to these in WI and MI.
Fairy shrimp	1	Fairy shrimp are very important, I think.
Leopard frog	1	

16) Lakes

Focal species suggestions and rationale:		
Species	**# of Recs**	**Rationale**
Bullfrog	1	As a negative indicator; voracious predator in aquatic systems.

17) Streams

Focal species suggestions and rationale:		
Species	**# of Recs**	**Rationale**
River otter	1	Indicator of toxics, tie to riparian forests.
black sandshells		Occupy larger rivers.
Lasmigona compressa		Occupy smaller headwater systems. Good indicator of water quality. For MN NF's.
fish, dragonfly, amphibian		
Elktoe		For Cheq-Nic.
Ellipse		For Cheq-Nic.
Extra-striped snaketail (dragonfly)		For Cheq-Nic.
Pygmy snaketail (dragonfly)		For Cheq-Nic.
Ski-tailed emerald (dragonfly)		For Cheq-Nic.
Purple wartyback		For Cheq?

Suggested additional category of ecosystem: Rock Cliffs. Cool moist (often north-facing cliffs host a number of listed species, especially pteridophytes and bryophytes. Their hydrology and surrounding forests need to be maintained. Focal "species" – Rock cliffs.

General comments:

1) Importance of monitoring baseline prey species like snowshoe hare, because changes in abundance of other species, such as raptors, can't be assessed without knowing whether major changes have occurred in prey.

2) Northern hardwoods – needs to be more specific to be an ecosystem of concern.
I am not certain focal wildlife species are the best way to address/ evaluate ecosystems of concern. Mary suggested species cover old forest as well as mid-successional forests. Why not directly evaluate ecosystems of concern if they have been identified. Perhaps I just don't understand this concept.
Other possible ecosystems of concern (Examples, could be expanded):
Cliff communities
Lake beach
Undisturbed 2nd or 3rd order watersheds
Undeveloped large or deep lakes outside Border Lakes Subsection.

3) You have no focal species for exposed sand beach areas and lakes/wetlands.
Spotted sandpiper.
Take a look at J. Almendinger et al. Key to Natural Communities for good plant indicators on Chip.

4) Sedge meadows – does this category include rich fens and wet meadows?
By concentrating too much on species, we may concentrate too little on ecosystems. Although I recognize the practicality of using one or a few 'focal' species, it may be better in the end to use GIS technology and field work to monitor ecosystems across the landscape and measures like species diversity to provide information about ecosystem status and integrity.

5) Sedge meadows – assume wet? Standing water? Suggest opening this to low meadow to include a few more species, e.g. meadow vole and harrier.

6) For some of the species, I'd like to know the rationale for including them. What are the combination of factors that led to a species becoming focal.

7) Criteria for "focal species" are clear and ought to stimulate identification of good lists. This process requires a more systematic analysis, however. In other words, we should take more time to eventually develop a more comprehensive list.

8) I wish there was some natural grassland ecosystem (bobolink habitat) covered.

9) The first part of the description of focal species, i.e. "those which play key roles in maintaining community structure or processes" seems to have been neglected in favor of high profile listed species which often occupy only a portion of the broader community that supports them. The "ecosystems of concern" are described primarily by their vegetation. In many cases the correlation with the suggested animal focal species is only secondary at best. Even when the correlation is strong, I do not see the rationale for tracking the dependent species when the hosting plant community or some of its key structural species are much more easily observed and tracked.

We must realize also that plant and animal populations are dynamic. Just as an individual organism has a life span, so do individual populations. Species seldom occupy all of their potential suitable habitat. It is important to long term survival that species have these unoccupied habitats in which to start new populations in areas free of the pathogens, pests, competition, etc responsible for the decline of populations. Because of

this metapopulation dynamic, management guided by existing populations of dependent species (many of the suggested focal species) rather than by the distribution of appropriate habitat risks loss of sufficient habitat to maintain the species.

10) Notes from mussel panel:

Reasons for using aquatic species, including mussels, as focal species.

- Mussels do not move around easily, are easy to monitor,
- Mussels are long-lived.
- very sensitive to changes (i.e. habitat alterations/ pollution) - "canary in a coal mine",
- good indicator of water quality,
- shells & body have been used to track inputs of heavy metals into aquatic species,
- body glycogen levels can indicate short-term stress (stress = zebra mussels, water quality, etc.) – work done by Teresa Newton,
- one of the few animals that has not been shown to get cancer,
- Integrally tied in to aquatic ecosystem, because they require aquatic (fish & amphibians) host & good water quality

Possible species selection includes:

Chippewa	Superior	Cheq-Nic
Lasmigona compressa	*Lasmigona. compressa*	Elktoe
		Ellipse
		Extra-striped snaketail (dragonfly)
		Pygmy snaketail (dragonfly)
		Ski-tailed emerald (dragonfly)

L.compressa—good indicator of water quality
Purple wartyback—if found on Chequamegon, would be good indicator?

Ecosystems of Concern: riverine. No threats to lacustrine populations in northern MN or WI.

- On CNF & SNF- small low-gradient streams susceptible to siltation. Larger, higher gradient systems able to flush out sediments.
- Need to consider more than 1 species / system in order to capture a broader array of systems & needs. May be unique ecosystems where you'd find different suites of mussel species (i.e. black sandshells & others occupy larger rivers while *L. compressa* & others occupy smaller headwater systems.
- River runs w/stable, coarse substrates

- Low gradient sites w/in high gradient reach important for mussels on Ottertail (re:RH)

Recommend that aquatic species also include fish, possibly dragonfly, amphibian, in addition to mussel species

Appendix R. Database dictionary.

This document contains a description of each field in the PVA database, and gives allowable values for the fields.

General codes that can appear anywhere
(User-developed classes and codes.)

NG	Not given – the experts did not say whether the info exists or not.
NA	Not applicable.
UNK	The experts specifically said that a piece of information is unknown to science.
COM	See comments for this field.
OTH	Other

Instructions for comment fields
Comment fields contain text summaries of experts' statements, or excerpts from literature, or comments based on personal knowledge of the person preparing the data entry. The note, "[LIT]" should be included at the beginning of the phrase if the information came from the literature review. The name or initials of the preparer should be included if the information is based on personal knowledge. The default reference is the material from expert panels, in which case no note about reference should be included.

Instructions for each field

1) Field name: GNAME (Field name matches TNC code used in the R9 Regional Forester's Sensitive Species database.)
Field description: Scientific name
Values: Scientific names of species, matching those in the R9 Regional Forester's Sensitive Species database.

2) Field name: GNCOMNAME (Field name matches TNC code used in the R9 Regional Forester's Sensitive Species database.)
Field description: Common name
Values: Common names of species, matching those in the R9 Regional Forester's Sensitive Species database.

3) Field name: SU
Field description: Species is listed as RFSS, or is present on, the Superior National Forest
Values: See Listing codes table

Listing codes table	
R	RFSS listed
+	Occurs on the forest indicated, but is not RFSS there.
T	Federally threatened
E	Federally endangered

4) Field name: CP
Field description: Species is listed as RFSS, or is present on, the Chippewa National Forest
Values: See Listing codes table in 3, above.

5) Field name: CN
Field description: Species is listed as RFSS, or is present on, the Chequamegon-Nicolet National Forests
Values: See Listing codes table in 3, above.

6) Field name: Date
Field description: Date that the species record was prepared.
Values: Year/month/day, as 00/03/20.

7) Field name: Preparer_name
Field description: Name of the person preparing the species record (reviewing species information, assigning standard values, and selecting information to be entered in comment fields).
Values: First and last names of the person preparing the information.

8) Field name: Amount_info
Field description: The amount of existing information about the species, relative to the amount that exists for some species. This field is interpreted by the preparer and subject to errors of judgement.
Values: See "Amount of information" table.

Amount of information	(user developed classes and codes)
MUCH	Relatively greater amount of info available for this species than most others.
MED	Medium amount of info available.
LITTL	Little information available.
ANONE	Almost no information available.

9) Field name: Lifeform
Field description: Life form of the species
Values: See "Animal lifeform codes" table, and "Plant lifeform codes" table.

Animal lifeform codes	(Classes taken from Biosource)
AMPH	Amphibians
BIRD	Birds
FFSH	Freshwater fish
MAMM	Mammals
REPT	Reptiles
ARAC	Arachnids
BIVA	Bivalves
CEPH	Cephalopods
CNID	Cnidarians
CRUST	Crustaceans
DIPL	Diplopods
GAST	Gastropods
INSE	Insects
OLIG	Oligochaeta
PORI	Porifera
SCAP	Scaphopoda
TURB	Turbellaria

Plant lifeform codes	(most classes and codes taken from TERRA)
AQVP	Aquatic vascular plant (new code)
BR	Bryophyte
FA	Fern allies
FE	Ferns
FU	Fungus
GR	Herbaceous graminoid
LC	Lichen
OR	(new code)
SERU	Sedges, rushes (new code)
VPNT	Vascular plant (new code). USE THIS AS DEFAULT, IF PLANT DOESN'T FIT IN ANY OTHER CODE.
SH	Woody shrub
TR	Woody tree
VI	Herbaceous vine

10) Field name: Range
Field description: Range of the species.
Values: See "Range codes' table.

Range codes	**(User-developed classes and codes)**
SARC	Subarctic
BORE	Boreal
SBOR	Sub-boreal
CBOR	Circumboreal
ENAM	Eastern N. America
NENAM	Northeastern N. America
WNAM	Western N. America
NWNAM	Northwestern N. America
ZONE	Zone including northern Lake States and sub-boreal portions of Canada, stretching east and west through N. America.
RMTN	Rocky Mountains
LKST	Lake States
NLKST	Northern Lake States
GLSH	Great Lakes lakeshore/lake effect zone
PRAR	Prairie biome
LEND	Local endemic
NAM	Throughout North America
EUS	Eastern United States
WUS	Western United States
NEUS	Northeastern United States

11) Field name: Forest
Field description: Whether this data record applies to the Superior, Chippewa, Chequamegon-Nicolet, or multiple National Forests.
Values: See "Forest codes" table.

Forest codes	
SU	Superior
CP	Chippewa
CN	Chequamegon-Nicolet

12) Field name: Part_range
Field description: The part of the species range in which the National Forest described in this record is located.
Values: See "Part of range" table.

Part of Range	(User-developed classes and codes.)
DISJCN	Disjunct on C-N NF's
DISJCP	Disunct on Chippewa NF
DISJSU	Disjunct on Superior NF
EEDGCN	Eastern edge on C-N NF's
EEDGCP	Eastern edge on Chippewa NF
EEDGSU	Eastern edge on Superior NF
MIDCN	Mid range on C-N NF's
MIDCP	Mid range on Chippewa NF
MIDSU	Mid range on Superior NF
NEDGCN	Northern edge on C-N NF's
NEDGCP	Northern edge on Chippewa NF.
NEDGSU	Northern edge on Superior NF
NGCN	Not Given for C-N NF's
NGCP	Not Given for Chippewa NF
NGSU	Not Given for Superior NF
OTHCN	Other for C-N NF's
OTHCP	Other for Chippewa NF
OTHSU	Other for Superior NF
SEDGCN	Southern edge on C-N NF's
SEDGCP	Southern edge on Chippewa NF
SEDGSU	Southern edge on Superior NF
UNKCN	Unknown for C-N NF's
UNKCP	Unknown for Chippewa NF
UNKSU	Unknown for Superior NF
WEDGCN	Western edge on C-N NF's
WEDGCP	Western edge on Chippewa NF
WEDGSU	Western edge on Superior NF

13) Field name: Abundance
Field description: Abundance of populations within the range.
Values: See "Abundance" table.

Abundance	(User-developed classes and codes.)
CPCE	Common on planning unit and elsewhere
CPRAR	Common on planning unit, rare elsewhere
CPUNC	Common on planning unit; less common in most of the range
NA	Not applicable
NG	Not given
ONE	One occurrence on planning unit
OTH	Other
RABU	Rare rangewide; thought to have been more abundant historically
RPABU	Rare on planning unit; abundant or common elsewhere
RRAR	Rare rangewide; thought likely to have been rare historically
RUNK	Rare rangewide; historical condition unknown
UNCABU	Uncommon rangewide; thought to have been more abundant historically
UNCPABU	Uncommon on planning unit; abundant or common elsewhere
UNCUNC	Uncommon rangewide; thought to have been uncommon historically
UNCUNK	Uncommon rangewide; historical condition unknown
UNK	Unknown
VR	Very rare on the planning unit

14) Field name: PVA_status
Field description: Indicates whether the species is included in PVA because of current viability concern, near-future viability concern, and/or is considered a focal species.
Values: "See PVA status codes table".

PVA status codes table	(User-developed classes and codes.)
CURR	Species is of current viability concern.
FOCAL	Included in PVA as a focal species.
ADDTL	Species is thought to be of near-future viability concern.
OTH	Other

15) Field name: Land_allocation
Field description: Preparer's recommendation on whether this species should be provided for primarily via landscape goals & objectives.
Values: Yes-No.

16) Field name: Standard_Guideline
Field description: Preparer's recommendation on whether this species should be provided for primarily via Standards and Guidelines.
Values: Yes-No.

16b) Field name: Management_Concerns
Field description: Preparer's recommendation about management concerns that negatively impact species or habitat, that may warrant landscape objectives and/or standards and guidelines.
Values: See "Management Concerns" table.

Management Concerns	**(User-developed classes and codes)**
YOUNG	Young forest habitat lacking
OLD	Old forest habitat lacking
SUCC	Vegetative succession or lack thereof is impacting habitat
CONV	Conversion
SIMP	Simplification
SPEC	Another needed species is lacking
PATCH	Patch size is incorrect for species
STRUC	Vertical structure in stand is incorrect for species
AQSTR	Aquatic structure (biological and physical) is incorrect for species
DENS	Density is incorrect for species
CANOP	Canopy cover is incorrect for species
CWD	Coarse woody debris (terrestrial/aquatic) is lacking
WLFTR	Wildlife trees are lacking
BUFFR	Buffer zone is lacking or disturbed
CONN	Landscape connectivity, linkages, corridors are lacking
PROTC	Site lacks protection
GROUN	Duff layer lacking, or compaction, or sedimentation
AQUA	Other aquatic feature incorrect for species
RIP	Other riparian feature incorrect for species
TERR	Other terrestrial feature incorrect for species
SEAS	Seasonal impacts from humans
LASD	Lake shore development/management
LALD	Lake landing development
DEER	High deer density
REC	Recreation use
FRAG	Habitat fragmentation at landscape level
ETHN	Even-aged thinning
NA	Not applicable
NG	Not given
OTH	Other
ROAD	Road construction
ROCR	Road crossing on aquatic system
RODE	Road density
SELEC	Selection harvest (by species or individually marked)
SHEL	Shelterwood forest harvest
TRAIL	Trail construction
TRUSE	Trail use
UTHN	Uneven-aged thinning
XCUT	Clearcuts impact species

17) Field name: Comments_Standard_Guideline
Field description: Experts descriptions of habitat needs, that the PVA team interpreted as a possible S&G.
Values: See instructions for comment fields.

17b) Field name: Additional_Comments_Standard_Guideline
Field description: Additional expert descriptions of habitat needs, that the PVA team interpreted as a possible S&G.
Values:

18) Field name: Subsection
Field description: Experts said that the species was found in an area that PVA team interpreted as equating to an ecological unit at the Subsection level of the National Hierarchy. This field is used when the experts specifically said that the species only occurred in a part of the National Forest; the field is left blank when the species occurs across the area.
Values: See "Subsection codes table".

Subsection codes table	(Classes and codes standard with Forest Service and States.)
212Ja	Lake Superior clay plain
212Jb	Gogebic/Penokee Iron Range
212Jc	Winegar Moraines
212Je	Central/Northwest Wisconsin Loess Plains
212Jf	Perkinstown End Moraine
212Jj	Bay Lobe Stagnation Moraine
212Jk	Spread Eagle-Dunbar Barrens
212Jl	Brule and Paint Rivers Drumlin Ground Moraine
212Jm	Northern Highlands Pitted Outwash
212Js	Lincoln Formation Till Plain
212Ka	Bayfield Sand Plains
212Kb	Mille Lacs Uplands
212La	Border Lakes
212Lb	North Shore Highlands
212Lc	Laurentian Highlands
212Ld	Toimi Uplands
212Ma	Littlefork/Vermillion Uplands
212Mb	Agassiz Lowlands
212Na	Chippewa Plains
212Nb	St. Louis Moraines
212Nc	Pine Moraine and Outwash Plains
212Nd	Tamarack Lowlands

19) Field name: LTA
Field description: Experts said that the species was found in an area that PVA team interpreted as equating to an ecological unit at the Landtype Association level of the National Hierarchy. This field is used when the experts specifically said that the species only occurred in a part of the National Forest; the field is left blank when the species occurs across the area.

Values: See "Wisconsin Landtype Association codes table", "Chippewa National Forest Landtype Association codes table", or "Superior National Forest Landtype Association codes table"

Wisconsin Landtype Association codes table	(Classes and codes standard with Forest Service and State.)
Ja03	Ashland Lake-Modified Till Plain
Jb01	Penokee/Gogebic Iron Range
Jc01	Glidden Drumlins
Jc04	Chequamegon Washed Till and Outwash
Jc05	Valhalla/Marenisco (McDonald) Moraines
Jc06	Cable Rolling Outwash
Jc07	Telemark Washed End Moraine
Jc13	Smokey Hill Basalt Ridge
Je02	Flambeau silt capped Drumlins
Je05	Jump River Ground Moraine
Jf05	Perkinstown Moraines
Jj01	Lakewood Plains and Moraines, Loamy
Jj02	Mountain Moraines, Loamy
Jk03	Butler Plains, Sandy Wind-blown and Lake Sediments
Jk04	Waupee Knolls, Sandy Outwash
Jl01	Iron River/Argonne Drumlins, Silty or Loamy
Jl02	Argonne Outwash Plains, Loamy Inter-drumlin Outwash
Jl04	Nicolet Hills, Hummocky Outwash
Jl05	Popple River Knolls, Loamy Outwash
Jl06	Wabeno Drumlins, Silty
Jl07	Wabeno Plains, Loamy Inter-drumlin Outwash
Jl08	Fern Moraines, Silty and Loamy
Jm01	Northern Highlands Outwash Plains
Jm03	Vilas-Oneida Outwash Plains, Sandy Outwash
Js03	Merrill Outwash Plain
Ka04	Bayfield Rolling Outwash Barrens
Ka07	Bayfield Rolling Outwash and Washed Till

Chippewa National Forest Landtype Associations codes table	(Classes and codes standard with Forest Service and State.)
Ma18	Aggassiz Lake Plain
Na07	Bemidji Sand Plain
Na08	Bena Dunes and Peatlands
Na18	Blackduck Stagnation Moraine
Na16	Blackduck Till Plain
Na10	Deer River Peatlands
Na03	Guthrie Till Plain
Nb12	Hill City Till Plain
Nc16	Itasca Moraine
Nc30	Itasca Moraine (Hummocky)
Nb07	Marcell Moraine
Na09	Rosey Lake Plain
Nb03	Sugar Hills Moraine

Superior National Forest Landtype Associations codes table	(Classes and codes standard with Forest Service and State.)
La07	Johnson Lake Shallow Moraine
La08	Lac LaCroix Shallow Moraine
La13	Gabbro Lake Shallow Moraine
La14	Rove Slate Shallow Moraine
La15	Trout Lake/Indian Sioux Ground Moraine
La16	Myrtle Lake
La17	Ash Lake
La21	Saganaga Lake
La22	Poplar Lake
La23	Ely-Knife Lake
La24	White Iron Lake
La35	Northern Light Lake
La36	Two Island Lake
La37	Vegetable Lakes
Lb02	North Shore
Lb03	Highland Moraine
Lb05	Cabin Lake
Lb08	Honeymoon Mountain
Lb10	Sawtooth-Eagle Heights
Lb11	Tettegouche
Lc05	Sandy River Outwash
Lc07	Big Rice Moraine
Lc10	Mesabi Iron Range
Lc20	Nashwauk
Ld01	Toimi Drumlins
Le02	Kelly Landing
Le03	Timber Frear
Le04	Temperence/Poplar River
Le08	Seven Beaver Peatland
Le09	Phantom Lake Peatland
Le10	Greenwood
Le11	Big Lake/Bird Lake End Moraines
Ma19	Agassiz
Nd05	Marhkam/Palo

20) Field name: Preferred_forest_type_A
Field description: Species preferentially uses these forest types (CDS codes) for Outcome A.
Values: See "Forest type codes table".

Forest Type code	(Forest Type names from CDS)
01	Jack pine
02	Red pine
03	White pine
04	White pine/hemlock
05	Hemlock
11	Balsam fir/aspen/paper birch
12	Black spruce
14	Northern white cedar
15	Tamarack
16	White spruce/balsam fir/Norway spruce
17	Upland black spruce
18	Mixed swamp conifer
19	Cedar/aspen/paper birch
41	White pine/northern red oak/white ash
48	Jack pine/oak
54	White oak
55	Northern red oak
59	Mixed oaks
71	Black ash/American elm/red maple
76	Red maple (wet)
77	Green ash
79	Mixed lowland hardwoods
80s	Upland northern hardwoods
81	Sugar maple/beech/yellow birch
82	Sugar maple/basswood
84	Red maple (dry site)
85	Sugar maple
86	Beech
89	Mixed hardwoods
91	quaking aspen
92	paper birch
93	bigtooth aspen
94	balsam poplar
95	aspen-white spruce-balsam fir
NA	Not applicable
NG	Not given
UNK	Unknown

21) Field name: Utilized_forest_type_A
Field description: Species utilizes these forest types (CDS codes) for Outcome A.
Values: See "Forest type codes table", in Item 20, above.

22) Field name: Other_forest_types_A
Field description: Other forest types (CDS codes) that the species may use for Outcome A (e.g. for foraging habitat, hiding cover)
Values: See "Forest type codes table", in Item 20, above.

23) Field name: Comments_forest_type_A
Field description: Comments about forest types needed for Outcome A.
Values: See instructions for comment fields.

24) Field name: Preferred_forest_type_C
Field description: Species preferentially uses these forest types (CDS codes) for Outcome C.
Values: See "Forest type codes table", in Item 20, above.

25) Field name: Utilized_forest_type_C
Field description: Species utilizes these forest types (CDS codes) for Outcome A.
Values: See "Forest type codes table", in Item 20, above.

26) Field name: Other_forest_types_C
Field description: Other forest types (CDS codes) that the species may use for Outcome A (e.g. for foraging habitat, hiding cover).
Values: See "Forest type codes table", in Item 20, above.

27) Field name: Comments_forest_type_C
Field description: Comments about forest types needed for Outcome C.
Values: See instructions for comment fields.

28) Field name: Veg_type
Field description: Vegetation type in CDS
Values: See "Vegetation type code table".

Vegetation type code table	(Standard Forest Service classes and codes.)
50	Upland opening undifferentiated
51	Upland opening grass
52	Upland opening forb
53	Upland opening shrub
54	Savannah
60	Wetland undifferentiated
62	Wetland sedge meadow
63	Wetland shallow marsh
64	Wetland deep marsh
65	Wetlands open less than 10 acres
66	Wetland shrub swamp
68	Wetland bog
70	Water lake > 10 acres
80	Water – stream, river undifferentiated
90	Non vegetated, rock, sand

29) Field name: Comments_veg_type
Field description: Comments to describe vegetation types not adequately covered in CDS descriptions. Comments about species habitat needs for riparian areas should be included here as well as in the aquatic section.
Values: See instructions for comment fields.

30) Field name: Tree_code
Field description: Tree code - used in CDS, TWIGS.
Values: See "Tree codes table".

Tree codes table	(Standard Forest Service classes and codes.)
12	Balsam fir
71	Tamarack
94	White spruce
95	Black spruce
105	Jack pine
125	Red pine
129	Eastern white pine
241	Northern white cedar
261	Hemlock
315	Striped maple
316	Red maple
318	Sugar maple
371	Yellow birch
375	Paper birch
531	Beech
541	White ash
543	Black ash
544	Green ash
701	Ironwood
741	Balsam poplar
743	Bigtooth aspen
746	Quaking aspen
762	Black cherry
802	White oak
809	Northern pin oak
830	Pin oak
833	Northern red oak
837	Black oak
951	American basswood

30b) Field name: Comments_Tree_Code
Field description: Comments that explain what the experts said about tree species, and show how the PVA team translated their remarks into a tree code.
Values: See instructions for comment fields.

31) Field name: Impt_shrubs
Field description: Y-N, Shrubs are deemed important as habitat for the species.
Values: Yes-No. Yes refers the user to the comment field for more information.

32) Field name: Comments_shrubs
Field description: Codes for names of shrubs that are important habitat, or other expert statements about shrub characteristics.
Values: Text field. Codes for shrub names are the agency standard NRCS's PLANTS database codes, on line at http://plants.usda.gov/plants/.
Other See instructions for comment fields.

33) Field name: Impt_ground_flora
Field description: Y-N, Ground flora are deemed important as habitat for the species.
Values: Yes-No.

34) Field name: Comments_ground_flora
Field description: Names of ground flora species that are important habitat, or other expert statements about ground flora characteristics.
Values: Text field. Codes for plant names are the agency standard NRCS's PLANTS database codes, on line at http://plants.usda.gov/plants/.
Other See instructions for comment fields.

35) Field name: Critical_age_class
Field description: Forest type age classes that are needed as essential habitat for the species.
Values: See "Age class codes table".

Age class codes table	(MN planning team developed codes.)
YOUN	Young
IMMA	Immature
MATU	Mature
OLD	Old
OLDER	Older
ALL	All age classes of forest vegetation.
NA	Not applicable – used when the species does not seem to require or preferentially utilize any particular age class, and when the habitat is not generally assigned an age (e.g. sedge meadows).

The following table is included for reference only (it does not contain codes to be entered in the PVA database). Age class codes refer to specific age ranges for different forest types. This table was taken from Minnesota Planning Team documents.

Forest type codes	Cover Type	Young	Immature	Mature	Old	Older
01	Jack pine	0-19	20-39	40-59	60-79	80+
02*	Red pine	0-19	20-59	60-119	120-149	150+
03*	White pine	0-19	20-59	60-119	120-149	150+
12,15,18*	Lowland conifers	0-19	20-59	60-119	120-149	150+
16,17*	Spruce/fir	0-19	20-39	40-89	90-149	150+
80's*	Upland northern hardwoods	0-19	20-59	60-119	120-149	150+
70's*	Lowland northern hardwoods	0-19	20-59	60-119	120-149	150+
91-95, 11	Boreal hardwoods	0-9	10-39	40-59	60-80	80+

	and mixed hardwoods/conifer					
50's*	Oak	0-19	20-59	60-119	120-149	150+
14,19*	Cedar	0-19	20-49	50-119	120-149	150+

* indicates that the forest type(s) are considered "old growth" when they reach the age indicated in the column labeled "Old"

36) Field name: Age_class_occupied
Field description: Forest type age classes that the species occupies at some time(s) of the year or life cycle, e.g. a species relies on lowland conifers as habitat; it occasionally forages in upland open areas, but upland open is not thought to be critical habitat.
Values: See "Age class codes table", in Item 36, above.

37) Field name: Comments_age_class
Field description: Comments about the forest type age classes, especially as to which age classes are required or utilized at different parts of the life cycle or season.
Values: See instructions for comment fields.

38) Field name: Density
Field description: Density of forest vegetation, expressed as CDS stand size density (stocking) class. This field is interpreted by the PVA team from experts remarks about stand density, and considerable judgment is involved in the interpretation.
Values: See "Stand size density codes table".

Stand size density codes	(Standard Forest Service classes and codes.)
0	Nonstocked (less than 16% stocked)
1	Seedling-sapling (16%-39% stocked)
2	Seedling-sapling (40%-69% stocked)
3	Seedling-sapling (over 70% stocked)
4	Poletimber stand (16%-39% stocked)
5	Poletimber stand (40%-69% stocked)
6	Poletimber stand (over 70% stocked)
7	Sawtimber stand (16%-39% stocked)
8	Sawtimber stand (40%-69% stocked)
9	Sawtimber stand (over 70% stocked)

39) Field name: Canopy_closure
Field description: Forest canopy closure, in generalized classes.
Values: See "Canopy cover codes" table.

Canopy cover codes	(from Chippewa NF's Species Canopy Cover set. Source: D. Shadis.)
CONT	Continuous canopy, >75% canopy cover.
INTER	Interrupted canopy, 50-75% canopy cover.
PARK	Parklike, 25-50% canopy cover.
RARE	Few trees, 5-25% canopy cover.
OPEN	Barely present, 0-5% canopy cover.

40) Field name: Comments_canopy_closure
Field description: Expert statements about species needs for forest canopy characteristics.
Values: See instructions for comment fields.

41) Field name: Aquatic_habitat_required
Field description: Species requires this aquatic habitat (stream, lake, or pond).
Values: See "Aquatic habitat codes" table.

Aquatic habitat codes	(User-developed classes and codes.)
STRM	Stream
LAKE	Lake
POND	Pond
TEMP	Temporary pond
OTH	Other

42) Field name: Aquatic_habitat_utilized
Field description: Species utilizes this aquatic habitat (stream, lake, or pond).
Values: See "Aquatic habitat codes table", in Item 41, above.

43) Field name: Aquatic_features
Field description: Features required within aquatic habitat.
Values: See "Aquatic features codes table". Entries in this field refer the user to a comment field that contains descriptions of the feature.

Aquatic features	(User-developed classes and codes.)
AREA	Area
BAY	Bays
CHEM	Chemistry
COM	See comments
DEPTH	Depth
FLOW	Flow Rate
LKZON	Lake Zone
NA	Not applicable
NG	Not given
OTH	Other
OTHER	Other
POOL	Pool
RIFF	Riffles
RSHOL	Rocky Shoals
RUN	Runs
SEEP	Seeps/springs
STRUC	Structure
SUBST	Substrate
UNK	Unknown
VEG	Vegetation

Aquatic features	(User-developed classes and codes.)
WIDTH	Width

44) Field name: Watershed
Field description: Experts said that the species was found in an area that the PVA team interpreted as equating to a 5th level watershed. This field is used when the experts specifically said that the species only occurred in a part of the National Forest; the field is left blank when the species occurs across the area.
Values: See "Wisconsin National Forests watershed codes" table, "Chippewa National Forest watershed codes table", and "Superior National Forest watershed codes table".

Wisconsin National Forests 5th level watershed codes		(Classes and codes developed by C-N NF in cooperation with WI DNR.)
NationalForest	WS Code	Watershed Name
Chequamegon	LS06	Bayfield Peninsula NW
	LS07	Bayfield Penninsula SE
	LS05	Iron River
	LS08	Fish Creek
	LS10	White River
	LS12	Marengo River
	LS14	Upper Bad River
	SC18	Upper St. Croix and Eau Claire Rivers
	SC20	Totagatic River
	SC22	Upper Namekagon River
	UC22	Lake Chippewa
	UC23	WF Chippewa River
	UC21	EF Chippewa River
	UC19	Weirgor Creek and Brunet River
	UC18	Thornapple River
	UC11	Lower NF Flambeau River
	UC14	Flambeau Flowage
	UC10	Upper SF Flambeau River
	UC09	Elk River
	UW37	Middle Tomahawk River
	UW35	Somo River
	UC04	Upper SF Jump River
	UC03	Middle Jump River
	LC20	Upper Yellow River
	BR12	Trappers and Pine Creeks
Nicolet	UW45	Tamarack Pioneer River
	UW46	Deerskin River
	UW44	Eagle River
	UW40	Pelican River
	WR20	Upper Wolf River and Post Lake

	GB18	Brule River
	GB16	Pine River
	GB17	Popple River
	GB14	Pike River
	GB11	Upper Peshtigo River
	GB12	Otter Creek and Rat River
	GB10	Middle Peshtigo and Thunder Rivers
	GB06	SB Oconto River
	GB05	NB Oconto River

Chippewa National Forest 5th level watersheds codes table	(Watershed codes provided by the Chippewa National Forest.)
1	Red River
2	Upper Bowstring River
3	Bowstring River
4	Popple River
5	Big Fork River
6	Rice River
7	Turtle River
8	Cass Lake
9	Third River
10	Lake Winnibogoshish
11	Boy River
12	Leech Lake
13	Leech Lake River
14	Deer River
15	Mississippi River
16	Prairie River
17	Willow River
18	Big Fork River North
19	Crow Wing Chain

Superior National Forest 5th level watersheds codes table	(Watershed codes provided by the Superior National Forest.)
1	Pigeon Point
2	Pigeon River
3	Brule River
4	North Superior
5	Central Superior
6	South Superior
7	Cloquet River
8	Whiteface Reservoir
9	North St. Louis River
10	South St. Louis River
11	Saganaga Lake
12	North Kawishiwi River
13	Isabella River

14	Stony River
15	South Kawishiwi River
16	Shagawa Lake
17	Basswood Falls
18	Lac LaCroix/Loon
20	Pike River
21	Vermilion Lake
22	Crane Lake
23	Rainy Lake
24	Rice River
25	Sturgeon River
26	Little Fork River

45) Field name: Comments_aquatic_habitat
Field description: Comments about the aquatic habitat, including clarification of information contained in the previous four fields, and any other information that cannot be standardized.
Values: See instructions for comment fields.

46) Field name: Ground_cover
Field description: Describes what is on the surface of the ground.
Values: See "Ground cover codes table".

Ground Cover	(Some classes and codes are taken from TERRA, some are user-developed)
BAFO	Basal forb
BAGR	Basal graminoid
BARE	Bare soil
BEDR	Bedrock
BOUL	Boulders
COBB	Cobbles
COGR	Coarse gravel
DUFF	Duff
FIGR	Fine gravel
GRAV	Gravel (2-75 mm)
LICH	Lichen, fungi, algae
LITT	Litter and duff
LOAM	Loam
LOGS	Logs > 3" dbh
MOLI	Moss/lichen-includes fungi and club mosses
MOSS	Moss
MUD	Mud
NA	Not applicable
NG	Not given
OTH	Other
PEAT	Peat

Ground Cover	(Some classes and codes are taken from TERRA, some are user-developed)
ROAD	Road
ROCK	Rock
RUWA	Running water
SAND	Sand
SEEP	Seep/spring
SNOW	Snow
STWA	Standing water
UNK	Unknown
VELI	Veg plus litter
WATE	Water
WOOD	Wood

47) Field name: Down_logs
Field description: Codes in this field note that the experts made a comment about a characteristic of down logs; user should refer to the comment field for specifics.
Values: See "Down logs codes" table.

Down logs codes	**(User-developed classes and codes.)**
SIZE	**Size**
DENS	Density
DCLAS	Decay class
SPEC	Species
OTH	Other

48) Field name: Snags
Field description: Codes in this field note that the experts made a comment about a characteristic of snags; user should refer to the comment field for specifics.
Values: See "Snag codes" table.

Snag codes	(User-developed classes and codes.)
SIZE	Size
HEIT	Height
DENS	Density
DBH	d.b.h.
DCLAS	decay class
OTH	Other

49) Field name: Wildlife_trees
Field description: Codes in this field note that the experts made a comment about a characteristic of wildlife trees; user should refer to the comment field for specifics. Wildlife trees are living trees that are partially decadent or have an unusual growth form ("cull" trees).
Values: See "Wildlife trees codes" table.

Wildlife trees codes	(User-developed classes and codes.)
SIZE	Size
CAVI	Cavities
DEAD	% dead
CRNST	crown structure
OTH	Other

50) Field name: Other_habitat_features
Field description: Codes in this field note that the experts made a comment about a characteristic of some terrestrial or aquatic feature; user should refer to the comment field for specifics, if any.
Values: See "Other habitat features table".

Other habitat features	
ASPE	Aspect
CLIF	Cliff (TERRA)
COM	See comments
DRUM	Drumlin (TERRA)
ELEV	Elevation
MORA	Moraine (TERRA)
NA	Not applicable
NG	Not given
OTH	Other
OTRM	Old tree-tip mounds
OUPL	Outwash plain (TERRA)
RAVIN	Ravine
SCHEM	Soil chemistry
SLOP	Slope
SMOIS	Soil moisture
SPROD	Soil productivity
STEX	Soil texture
TALU	Talus
TIPL	Till plain (TERRA)
TRTM	Tree-tip mounds (TERRA)
UNK	Unknown

51) Field name: Comments_habitat_features
Field description: Comments for the four previous fields, including aquatic and terrestrial habitats.
Values: See instructions for comment fields.

52) Field name: Patch_size_A_min
Field description: Minimum size of the habitat patch needed for outcome A, in acres.
Values: Numeric, in acres.

53) Field name: Patch_size_A_max
Field description: Maximum size of the habitat patch needed for outcome A, in acres.
Values: Numeric, in acres.

54) Field name: Comments_patch_A
Field description: Comments about characteristics of patches needed for Outcome A.
Values: See instructions for comment fields.

55) Field name: Patch_size_C_min
Field description: : Minimum size of the habitat patch needed for outcome C, in acres.
Values: Numeric, in acres.

56) Field name: Patch_size_C_max
Field description: Maximum size of the habitat patch needed for outcome C, in acres.
Values: Numeric, in acres.

57) Field name: Comments_patch_C
Field description: Comments about characteristics of patches needed for Outcome C.
Values: See instructions for comment fields.

58) Field name: Patch_distance
Field description: Distance between habitat patches in miles.
Values: Numeric, in miles.

59) Field name: Number_patches
Field description: Number of habitat patches required for Outcome A or C. To be used in conjunction with the following field, which shows the unit area.
Values: Numeric, giving the number of patches that the experts said were needed. If numbers were given for both Outcomes A and C, both numbers will be entered, with a comma between them.

60) Field name: Unit_area_for_patches
Field description: Area that the previous field refers to.
Values: Numeric, in acres.

61) Field name: Corridor_length
Field description: Length for terrestrial or riparian corridors.
Values: Length in miles.

62) Field name: Comments_corridor-length
Field description: Comments for the previous field, including whether the recommendation is for optimum or minimum viability.
Values: See instructions for comment fields.

63) Field name: Corridor_width
Field description: Width for terrestrial or riparian corridors.
Values: Total width in feet.

64) Field name: Comments_corridor-width
Field description: Comments for the previous field, including whether the recommendation is for optimum or minimum viability.
Values: See instructions for comment fields.

65) Field name: Corridor_forest_cover_type
Field description: CDS code for forest cover type within the corridor.
Values: See "Forest type codes table" in Item 20, above.

66) Field name: Corridor_redundancy
Field description: Number of corridors required by species between pairs of suitable habitat patches.
Values: Numeric.

67) Field name: Comments_linkages
Field description: Comments about landscape linkages not captured in other corridor comment fields.
Values: See instructions for comment fields.

68) Field name: Patch_structure
Field description: Y-N depending on whether experts gave information on patch juxtaposition, clumping, or anything else about landscape structure.
Values: Yes – No.

69a) Field name: Comments_patch_structure
Field description: Comments for the previous field.
Values: See instructions for comment fields.

69b) Field name: General_comments_patches
Field description: Any additional comments about patch size, structure, arrangement, or management that did not seem to belong in other comment fields for patches.
Values: See instructions for comment fields.

70) Field name: Compensating_factors
Field description: Y-N depending on whether experts gave information on compensating factors of landscape structure
Values: Yes – No.

71) Field name: Comments_compensating_factors
Field description: Comments for the previous field.
Values: See instructions for comment fields.

72) Field name: Essential_processes
Field description: Ecological processes required by the species.
Values: See "Essential processes" table.

Essential Processes	(User-developed classes and codes.)
AGING	Aging, forest succession
ANIM	Animal dispersal of propagules

Essential Processes	(User-developed classes and codes.)
COM	See comments
CONN	Connectivity (barrier-free stream/river flow,
FCAT	Fire, catastrophic stand-replacing
FIRE	Fire, light ground fire
FLOOD	Flooding
INSEC	Insects
NA	Not applicable
NG	Not given
NUTCY	Nutrient cycling
OTH	Other
POLL	Pollination
UNK	Unknown
WCAT	Widnthrow, catatrophic
WFLOW	Water flow (flowing water required, as for mussels
WGAP	Windthrow, gap-phase

73) Field name: Comments_processes
Field description: Comments for the previous field.
Values: See instructions for comment fields.

74) Field name: First_threat
Field description: Threat to species viability ranked #1 by the experts.
Values: See "Threats" table.

Threat	(User-developed classes and codes.)
ACID	Acid deposition
BARR	Barrier to water migration
CLIMA	Climatic change
COLL	Collecting
COM	See comments
COMP	Competition - interspecific, intraspecific
CONV	Stand conversion
DEVL	Development
DISE	Disease
FIRE	Fire
FLOOD	Flooding
FRAG	Fragmentation
GENE	Genetics
HERBV	Herbivory
HLOS	Habitat loss
HYDRO	Altered hydrology

Threat	(User-developed classes and codes.)
IHARV	Illegal harvesting
INSEC	Insect outbreak
INVAS	Invasive fauna (non-native)
LHARV	Legal harvesting
LIFE	Lifecycle charactristics
LIGHT	Too much light, & drying; associated with canopy o
NA	Not applicable
NG	Not given
OTH	Other
PARA	Parasitism, including cowbird nest parasitism
PEST	Pesticides
POLLU	Pollution and/or toxins
PRED	Predation
PREY	Loss of prey base
ROAD	Road mortality
SEDI	Sedimentation
SOIL	Soil damage - compaction, rutting, displacement
SYMB	Loss of symbiotic relationships
TOWER	Collisions with towers
UNK	Unknown
WEED	Non-native invasive plant
WINTR	Threats on wintering grounds

75) Field name: Comments_first_threat
Field description: Comments for the previous field.
Values: See instructions for comment fields.

76) Field name: Second_threat
Field description: Threat to species viability ranked #2 by the experts.
Values: See "Threats codes table", in Item 74, above.

77) Field name: Comments_second_threat
Field description: Comments for the previous field.
Values: See instructions for comment fields.

78) Field name: Additional_threats
Field description: Additional threats mentioned by the experts.
Values: See "Threats codes table" in Item 74, above.

79) Field name: Comments_additional_threats
Field description: Comments for the previous field, including how to alleviate the additional threats.
Values: See instructions for comment fields.

NOTE: Fields 80-83 are not currently being used. They were replaced by fields 84-95.

To be deleted: 80) Field name: Viable_pop_on_NF
Field description: Y-N depending on whether the experts thought a viable population exists on NF lands alone.
Values: Yes – No.

To be deleted: 81) Field name: Potential_viable_pop
Field description: Y-N depending on whether the experts thought a viable population could exist on NF lands alone.
Values: Yes – No.

To be deleted: 82) Field name: Current_outcome_habitat
Field description: Expert's ranking of current outcome based on habitat conditions.
Values: See "Outcomes codes table".

Outcomes codes table	(Outcome descriptions adapted from PVA conducted by Interior Columbia River Basin Assessment.)
A	Habitat is distributed broadly across the taxon's historic range and is of sufficient quality to support the type and degree of intrademe and metapopulation interactions that the taxon would characteristically engage in if it were not habitat limited.
B	Habitat across the taxon's historic range is reduced in quality or quantity. Local demes may be extirpated. Metapopulation interactions are adversely altered, but the taxon generally retains the geographic extent typical of the historic distribution.
C	Habitat across the taxon's historic range is reduced in quality or quantity. Local demes have been extirpated. Metapopulation interactions are adversely altered throughout most of the taxon's range. The geographic extent of the taxon is reduced.
D	Habitat across the taxon's historic range is much reduced in quality or quantity. A majority of the historic populations have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxon is significantly reduced.
E	Habitat across the taxon's historic range is much reduced in quantity and quality. A majority of the historic populations have been extirpated. Metapopulation interactions are essentially precluded. The geographic extent of the taxon is reduced to the point that the taxon would benefit from the protections of the Endangered Species Act.

To be deleted: 83) Field name: Current_outcome_population
Field description: Expert's ranking of current outcome based on population conditions.
Values: See "Outcomes codes table", in Item 82, above.

84) Field name: Viable_pop_CN
Field description: Y-N depending on whether the experts thought a viable population exists on C-N NF's lands alone.
Values: Yes-No.

85) Field name: Viable_pop_CP
Field description: Y-N depending on whether the experts thought a viable population exists on Chippewa NF lands alone.
Values: Yes-No.

86) Field name: Viable_pop_SU
Field description: Y-N depending on whether the experts thought a viable population exists on Superior NF lands alone.
Values: Yes-No.

87) Field name: Potential_viable_pop_CN
Field description: Y-N depending on whether the experts thought a viable population could exist on C-N NF lands alone.
Values: Yes-No.

88) Field name: Potential_viable_pop_CP
Field description: Y-N depending on whether the experts thought a viable population could exist on Chippewa NF lands alone.
Values: Yes-No.

89) Field name: Potential_viable_pop_SU
Field description: Y-N depending on whether the experts thought a viable population could exist on Superior NF lands alone.
Values: Yes-No.

90) Field name: Current_outcome_hab_CN
Field description: Expert's ranking of current outcome based on habitat conditions for C-N NF's.
Values: Yes-No.

91) Field name: Current_outcome_hab_CP
Field description: Expert's ranking of current outcome based on habitat conditions for Chippewa NF.
Values: See “Outcomes codes table”, in Item 82, above.

92) Field name: Current_outcome_hab_SU
Field description: Expert's ranking of current outcome based on habitat conditions for Superior NF.
Values: See “Outcomes codes table”, in Item 82, above.

93) Field name: Current_outcome_pop_CN
Field description: Expert's ranking of current outcome based on population conditions for C-N NF's.
Values: See “Outcomes codes table”, in Item 82, above.

94) Field name: Current_outcome_pop_CP
Field description: Expert's ranking of current outcome based on population conditions for Chippewa NF.

Values: See "Outcomes codes table", in Item 82, above.

95) Field name: Current_outcome_pop_SU
Field description: Expert's ranking of current outcome based on population conditions for Superior NF.
Values: See "Outcomes codes table", in Item 82, above.

96) Field name: Additional_comments_any_topic
Field description: Expert's comments that did not seem to belong in any of the other comment fields.
Values: See instructions for comment fields.

Appendix S. Selected fields from database using Connecticut warbler as example.

Record number	GNAME	GNCOMNAME	SU	CP	CN	Date
161	Oporornis agilis	Connecticut Warbler	R	R	R	00/03/22

Preparer name	Amount info	Lifeform	Range	Forest	Part Range	Abundance
Eunice Padley	LITTL	BIRD	ZONE	SU, CP	SEDG	RRAR

PVA status	Land allocation	Standard Guideline	Management Concerns
CURR			FRAG,STRUC

Comments Standard Guideline

Needs mature forest with parklike structure and a shrub layer.

Additional Comments Standard Guides

NG

Subsection	LTA	Preferred forest type A	Utilized forest type A
NG	NG	01,12,15,16,17,18	NG

Other forest types for A outcome

91

Comments forest type for A outcome

Type 91- utilized in NW MN only

Preferred forest type for C outcome	Utilized forest type C	Other forest types C
01,12,15,16,17,18	NA	91

Comments forest type for C outcome

Type 91- utilized in NW MN only

Vegetation types

NA

Comments vegetation type

NG

Tree code

NA

Comments Tree Code

NG

Important shrubs

YES

Comments shrubs

Mature trees with shrub structure. Ericaceous shrubs especially.
VACCI,RUID,ARUV,LEGR,COSE16,ALINR,ALRU3,ANDRO,KAPO,CHCA2

Important ground flora

Yes

Comments ground flora

SPAGH2. Nests made of fine dry grasses, sedges, fine plant fibers (lit review).

Record number	GNAME	GNCOMNAME	Critical age class	Age class occupied
161	Oporornis agilis	Connecticut Warbler	IMMA, MATU	IMMA, MATU

Comments age class

Mature trees with shrub structure.

Density	Canopy closure	Comments canopy closure
4,7	PARK	Chip: lowland conifer, open, mature, including tamarack/sphagnum, also JP. Parklike, savannah-like. Sup: boreal bog and JP.

Ground cover	Down logs	Snags	Wildlife trees
MOLI, BAGR	OTH	NA	OTH

Other features	Comments about features
NA	[LIT] OTH-feeds on fallen logs. [LIT] OTH2-sings from branches.

Patch size A min	Patch size A max
100	UNK

Comments patch A

Found in bogs 100-1000 acres in size. Not less than 100.

Patch size C min	Patch size C max
100	UNK

Comments patch C

Found in bogs 100-1000 acres in size. Not less than 100.

Patch distance	Number patches	Unit area for patches	Corridor length
UNK	UNK	UNK	UNK

Corridor length

UNK

Corridor width

UNK

Comments corridor width

NG

Corridor forest cover type	Corridor redundancy
UNK	UNK

Comments linkages

UNK

Comments patch structure

There must be a certain threshold abundance of appropriate habitat in the local area.

General comments patches

Experts had no basis for guessing patch size or distribution except for historic landscape.

Compensating factors	Comments compensating factors
NO	NA

Essential processes

FIRE

Comments processes

Higher density post fire than post logging (scribe). [LIT] Was most abundant 28 yrs after fire.

Appendix T. Operational considerations: Region 9 population viability assessment process.

Population Viability Assessment (PVA)

1. The PVA should ideally be completed as part of the Assessment of the Management Situation before the Notice of Intent to revise the Forest Plan.
2. The Forest Interdisciplinary (ID) Team should allow 1 to 1.5 years to complete the PVA process. Time line is dependent on the number of units involved and number of species included.
3. Allow time for developing or modifying the process. One month would allow review, dialogue, debate, modification, training, and communication with the unit.
4. If future Forests follow the process developed by the Regional Office, the time frame will likely be shortened.
5. There needs to be a clear understanding of the PVA process. A road map, if you will, that leadership and unit resources managers understand. The road map needs to have a clear beginning, check points, and end point.
6. Forest leadership needs to be familiar with the process to understand the time commitment and complexity, and allow resource staff the time and tools to conduct the analysis.
7. PVA should be conducted for more than one Forest at a time. There are economies of scale. It will also reduce the demands the Forest Service may place on species experts and their time involvement.
8. A weak point on the analysis process will be the lack of population data for the many species being analyzed. Be prepared to explain this and how it was addressed in the analysis.

Team

9. The Forest Biologist and Ecologist will likely be full time on the PVA process due to complexity and logistics of conducting the analysis.
10. Team members need to free of other tasks to focus on PVA. The assessment is time consuming, complex, and needs focus to make sure it is done correctly and documented for the record.
11. It is not reasonable to request the team to provide a "legally defensible" product or to burden the team with that expectation. It is the team's responsibility to use the best available science and seek out coordination with other units and peer review.
12. An aquatic ecologist should be part of the Forest PVA Team.
13. The PVA Team needs to be prepared for resulting challenges, e.g. species selection, use of population data, collection of species data, selection of experts, use of experts, communication of process, review of process by others, and critique.

Communications

14. The PVA Team needs to allow time for communication with the planning unit.
15. ID Team Leaders need to be involved in every step of the process in a strategic role.

16. It cannot be emphasized enough that the PVA Team must have purposeful communication with ID Teams, Forest Leadership Team (FLT), Forest Staff, concerned publics, Regional Office and Regional Leadership Team (RLT). Population Viability Assessment is a difficult subject, conducting one is a complex process, and our agency does not have a "road map" to follow. People seem to have trouble understanding it.
17. The PVA Team must explain clearly the limitations of the results and not let them be over applied.

Time Estimates

18. Slow it down enough to be involved with the process and people at the panels, rather than just coordinating logistics.
19. Be realistic on timelines.
20. Time lines depend partly on number of planning units involved and number of species. For one planning unit, three people, most of the time, for a year and a half would probably work.

Budgets

21. The PVA is expensive. Phase I (which includes conducting the first set of expert panels) seems to be in the neighborhood of $250,000 including salary, species information collection and processing, contacting species experts, conducting expert panel workshops, database development, information processing, and preparation of findings.

Species Experts

22. Maintain a single contact and mailing list with all vital information.
23. Contact potential panelists 2-3 months in advance of panel workshop.
24. Organizations such as the Department of Natural Resources (DNR) with a chain of command take longer – allow 3 to 4 months.
25. Species experts should be contacted through official correspondence and then with a personal phone call to gain their support and involvement.

Species Information

26. A systems analyst should be consulted early to facilitate design of species information to be collected, questions to be asked of expert panels, and design of the database.
27. To facilitate flow of information, the species accounts, panel questions, and database entries should all focus on a single set of specific data. In other words, species data should be thoroughly thought out before any data is collected.
28. Species screening and selection may take as long as 2 months.
29. It may be more economical and efficient to use a single contract to collect the species account information. This could be contracted through Forest Service (FS) Research.
30. Ideally, focal species selection should involve a panel (held several months ahead of the species expert panels) to allow time for literature reviews and adjustments to species selections. Otherwise, time should be allowed for contacting experts

about focal species selections via mailings or phone, again with enough lead time to get literature reviews before the panels.

31. Focal species identification needs lead-time and may want to have a broader group involved in the discussion. Forest Service should provide some guidance based on experience. Ideally, a panel would be held in advance of the species panels, including landscape ecologists as well as experts with a broad knowledge of many species to work out the details of the focal species process and identify appropriate species.
32. May want to contract out analyses of existing databases to universities, etc., to have a scientific foundation for the selection of species, where possible.
33. Getting Element Occurrence Records from the Heritage programs requires legal agreements and may take two months, or longer depending on the requirements of the particular Heritage program in any given state.
34. Allow enough time for literature searches and reviews. Using the 30 plus 30-day emergency hires was not ideal for getting good quality literature reviews – need to allow advance time to prepare a RFP and go through contracting processes (up to 6 months lead time needed to complete the paperwork for contracting).
35. Species accounts and panel questions need to be complimentary. Design panel questions and then species accounts information so one follows the other.
36. Include a summary of the element occurrence records in the species account information.
37. Include a disclaimer paragraph in the species accounts that explains the purpose of the information, how it was collected, special considerations, and if it had peer review.
38. Allow at least 2 months for summarizing species after conducting the expert panels.

Meeting Materials

39. Get meeting materials out 4 weeks before conducting the work sessions with expert panels. Cover letter, agenda, materials, workbook, panel questions, and species accounts should all be in the panelist's hands before they arrive at the work session.
40. In pre-meeting materials, provide definitions of terms.
41. Species accounts and panel questions need to be complimentary. Design panel questions and then species accounts information so one follows the other.

Modeling species habitat/ecosystem relations

42. The Regional PVA team suggests that species modeling (as part of the PVA process) be tested for use on high priority species.

Panel Workshop Operations

43. Balance the number of species and panelists. Approximately 10 species per panel, 5 to 8 panelists for a two-day work session. If more species are assigned to a panel expand the work session.

44. Be considerate of the volume of information needed to discuss a species habitat and ecological process needs. Also, consider the complexity of the species being reviewed.
45. Conduct a trial run of panel operations before the work session. This will identify any situations that were not previously considered and familiarize the team to panel operations and considerations.
46. Running multiple panels is a logistical challenge. It may be better to train a small group to run one or two panels at a time and have them repeat the process to cover all species groups.
47. If conducting multiple panels be sure the have a full time clerical assistant to assist in copying, panelist's needs and unplanned events.
48. The PVA Team should assign a workshop coordinator from the planning unit or contract this task. There are too many logistics for the team to keep track of and at the same time address the complex scientific questions and challenges involved with species information and viability assessment process.
49. The PVA Team needs to be free to provide quality control during the panel process.
50. Facilitators and scribes need to be fully briefed and understand the process enough to operate independently.
51. Use trained facilitators to operate the panels. Panel facilitators who had subject matter background performed best and were able to ask the appropriate follow-up questions to provide depth to panelist's comments.
52. Provide specific guidelines, procedures, and briefings for facilitators and scribes.
53. PVA Team member should review facilitator performance and scribe notes after 2 hours of panel work to ensure quality and correct any deficiencies.
54. Review PVA process and panelist questions in the plenary session. However, the plenary sessions need to be short to keep panelist interest and focus.
55. It may difficult to get all panelists to express themselves during the process. Facilitators will need to be aware of this and purposefully seek their engagement.
56. Scribes need to capture more than what is written on the flip charts. Their role is to capture the dialogue that accompanies the major points of agreement.
57. Distinguish between speculative information and citations from the literature.
58. Provide an opportunity for panelists to submit a written critique. Many panelists want an opportunity to express their experience at a workshop other than an open forum.

Database

59. To facilitate flow of information, the species accounts, panel questions, and database entries should all focus on a single set of specific data. In other words, species data should be thoroughly thought out before any data is collected.
60. The panel of experts should write into the database as the questions are asked during the workshops. The database can be displayed and discussed to reach consensus.
61. Provide a table of accepted values that panelists respond to. If the values are not satisfactory, comments can be made for a particular database entry.