Research Natural Areas, Candidate Research Natural Areas, Special Management Areas, and Old Growth & Natural Feature Complexes

Introduction

In this section we discuss candidate and designated Research Natural Areas (RNAs), Special Management Areas (SMAs), and Old Growth & Natural Feature Complexes (MA 8E, 8F, and 8G, respectively) as they are allocated in Alternatives 2-9 and the Selected Alternative. We collectively refer to these management areas as *Ecological Reference Areas (ERAs)*. This reflects that although these management areas vary somewhat in terms of management and objectives, they have many areas of overlap, including the common goals of providing ecological reference or benchmark conditions for baseline monitoring and research, refugia for rare species, and some ecological conditions or functions that are not otherwise available across the landscape. In these roles, Ecological Reference Areas contribute to biological diversity, an element of ecosystem sustainability. Also included under this reference area umbrella are a smaller number of geological and archeological special management areas that provide cultural and geological reference conditions.

Additional management areas such as existing and potential Wilderness (MA 5, 5B), Semi-Primitive Non-Motorized low disturbance (MA 6A), and existing and eligible Wild and Scenic Rivers (MA 8D) all have the potential to provide old growth conditions in the future and are considered in this discussion of ecological reference areas. Because of the limited human impacts in these areas, conditions are expected to progress towards those representing old growth communities and these areas are hereafter referred to as *Developing Old Growth*.

Research Natural Areas and Candidate Research Natural Areas (RNA and CRNA)

RNAs are permanently protected and maintained in a natural condition. These areas include: (1) unique ecosystems or ecological features, (2) habitat for rare or sensitive species of plants and animals, and (3) high-quality examples of common ecosystems.

A national network of RNAs helps protect biological diversity at the genetic, species, ecosystem, and landscape levels. RNAs representing the natural condition of common ecosystems serve as baseline or reference areas. To help answer resource management questions, RNA baseline areas can be compared with similar ecosystems undergoing silvicultural or other management prescriptions. RNAs make an important contribution to ecosystem management as a monitoring tool measuring the effects of management activities in other areas.

RNAs are managed to maintain natural features and processes. Because of the emphasis on natural conditions, they are excellent areas for studying ecosystems or their component parts, and for monitoring successional and other long-term ecological changes. Non-manipulative research and monitoring activities are encouraged in RNAs and can be compared with manipulative studies conducted in other areas. In addition, RNAs serve as sites for low-impact educational and recreational activities.

The National Research Natural Area Strategy shapes the framework for the Regional RNA program. Program objectives include: (1) identifying and evaluating additional candidate RNAs to provide a regional system of protected natural areas, natural communities, and ecological units; (2) monitoring the long-term health of established RNAs through annual field checkups and field sampling of ecosystem component and

processes; (3) addressing management questions by monitoring RNAs and similar ecosystems under different management regimes; and (4) reviewing and tracking research, monitoring, and management activities to make sure they are compatible with RNA protection and maintenance values.

Special Management Areas

National Forest System lands (except Wilderness) that contain outstanding examples of plant and animal communities, geological features, scenic grandeur, or other special attributes merit special management area designation. Special Management Areas are managed to emphasize recreational and other specific related values. Other uses are permitted within the areas to the extent that they are in harmony with the purpose for which the area was designated. Special Management Areas may be designated for scenic, geological, botanical, zoological, paleontological, historical, and recreational purposes. Special management areas can be Congressionally or administratively designated.

Old Growth and Developing Old Growth

Old-growth forests provide important habitat conditions and functions by acting as source areas for certain plant and animal species. They also help maintain stable, productive soils and high quality water; provide unique opportunities for research studies; and serve as reference for monitoring the effects of forest management practices, air pollution, and other environmental change factors. Areas designated as Developing Old Growth (MA 5, 5B, 6A, 8D) are expected to provide the ecological structure, composition and function of old growth communities in the future. Native Americans, as well as many other members of the public, also attach spiritual and aesthetic values to old growth.

Current Condition

Research Natural Areas

There are currently 2,500 acres of designated Research Natural Areas on the forest.

During 10 years of Forest Plan implementation, the following six RNA candidates were designated on the Chequamegon: Chequamegon Hardwoods (1988), Twin Lake Bog (1989), McCarthy Lakes and Cedars (1989), Spider Lake Ash Swamp (1989), Memorial Grove Hemlocks (1989), and Tucker Lake Hemlocks (1991). Four other candidate RNAs identified in the 1986 plan were evaluated and recommended for SMA designation. One Research Natural Area was designated by Congress (Fairy Land Research Natural Area) as part of the Forest Lodge acquisition. There are eight designated RNAs on the Chequamegon. The Nicolet has three RNA candidates designated as research natural areas: Grandma Lake Wetlands (1991), Bose Lake Hardwoods (1992), and McCaslin Mountain (1992). South Branch Grove and Waupee Lake have been evaluated and are pending designation upon completion of establishment records. Two CRNAs, Kentuck Lake Swale and Atkins Lake, are being evaluated. The following eight Candidate RNAs were evaluated and designated as SMAs: Bastile Lake, Pine-Oak Grove, Brule River Cliffs, Wisconsin Slough, Barney Creek, Glocke Lake, Hagar Mountain, and Snow Falls Creek. Three Candidate RNAs have yet to be evaluated.

All designated RNAs are also co-designated as State Natural Areas by the Wisconsin Department of Natural Resources.

Special Management Areas

There are 13,000 acres of designated Special Management Areas (SMAs).

The 1986 Nicolet Plan uses the term special areas, instead of special management areas. Thirteen special areas had boundaries formally designated with a project-level decision: Cathedral Pine/Archibald Tract, Jack Pine Camp Road, Indian Springs, Roberts Lake Cedars, Shoe Lake, Upper Island Lake, Logger Lake, Thunder Mountain, Camp 5 Lake/Oconto River, North Fork Upland, LaFave Swamp, Kohloff Lake, and Lake Laura Wetlands.

The Chequamegon Plan indicates 900 acres of St. Peter's Dome area, including the Dome area, Morgan Falls, and Morgan Creek would receive "special management" as per Congressional Intent. No candidate SMAs (Chequamegon Plan term: "special interest areas") were designated in a project-level decision on the Chequamegon. Three SMAs (Mary Livingston Griggs Historical SMA, Mary Griggs Burke Scenic SMA, Mary Griggs Burke Botanical SMA) were designated Congressionally as part of the Forest Lodge acquisition.

Many designated SMAs are also co-designated by the Wisconsin DNR as State Natural Areas.

Old Growth

At present, only small portions of the Forests are considered existing old growth (Table 3-22).

Table 3-22. Current Acres and Percent of the Forests in the Older Age Classes.

Age	Acres	% of Forest
150+	12,127	0.8
120+	43,361	2.9
100+	110,675	7.4

Combined, the current plans allocate 67,600 acres for old growth. The Chequamegon did not designate any acres of old growth. The Nicolet National Forest chose to formally designate a number of these areas as old growth through project-level decisions. Approximately 20,300 acres of the Nicolet were designated as old growth in project-level decisions (USDA FS 1998).

Current Management Direction

The Chequamegon Plan lists 10 Candidate RNAs and 8 candidate "special interest areas": Chippewa Pines, Spring Brook Meadows, Spillerberg Lake, Lake Ree, Pigeon Lake Shore, Goblin Woods, Ghost Lake Cedars, and Hay Lake. The Nicolet Plan lists 18 CRNAs and 71 candidate "special areas" that were predominantly rare plant locations or unique communities.

The Chequamegon National Forest Land and Resource Management Plan does not list management goals and objectives for old growth; rather, it describes old-growth composition objectives by management area (Chequamegon LRMP, Chapter IV) and supports these through Forestwide Standards and Guidelines. The Chequamegon Plan Forestwide Standards and Guidelines direct managers to "provide old growth and

permanent openings in prescribed quantities for diversity in each management area" (Chequamegon LRMP, IV-78).

The Nicolet Plan does not list management goals for old growth. However, it establishes an objective of 13,600 acres of managed old growth (Nicolet LRMP, p 24). Objectives for the specific amount of old growth per forest type are included in Forest Service Manual 2600: Nicolet Supplement 15, referenced in the plan. The supplement calls for managing old growth on 3% of commercial forest lands growing short-rotation species and 5% of lands growing long-rotation tree species.

The Nicolet Plan Forestwide Standards and Guidelines specify, "5% of all managed upland timber stands, except for uneven aged hardwood, will be managed as old growth. Old-growth designated stands are not thinned or harvested until well beyond normal rotation age. Designated stands are distributed throughout the Forest, and all timber types are represented, but emphasis is on long-rotation species. Old growth short-rotation species will not be located in retention areas." Selection criteria and management schemes are contained in Nicolet Supplement 15 (Nicolet LRMP, p 66). The plan also lists the age at which each forest type becomes classified as old growth (Nicolet LRMP, pp 46-47).

Proposed Changes and Range of Changes

One of the major changes brought about by plan revision is a new emphasis on retaining the ecological integrity (ecological composition, structure and function) of an ecological reference area. Ecological integrity is based in part on the size and shape of the ecological reference area, as well as the management of adjacent lands. Existing Chequamegon and Nicolet RNAs are relatively small, averaging 205 and 366 acres, respectively. These reserve areas are not integrated into any systematic network of reserves where the proximity, continuity, and presence of connecting corridors are coordinated. Many RNA objectives, such as maintaining biological diversity, serving as reference areas, monitoring the effects of resource management, and protecting against serious environmental disruptions (FSM 4063.02), cannot be fulfilled with such small, isolated areas (Alverson and others 1994; Noss 1990). If RNAs are to serve as baseline, reference, and monitoring areas, the total RNA land area and average size must increase from current levels.

Another change is an emphasis on representation of ecosystems within an ecological reference area network. The framework that guided the 1986 Plans in locating, evaluating, and establishing RNAs has several serious limitations and deficiencies. The "Regional Guide for the Eastern Region" (USDA FS 1983) includes RNA direction and uses forest cover types classified by the Society of American Foresters as the framework for targets. This framework limits types to forested areas and does not reflect the currently accepted National Hierarchy of Ecological Units for natural resource management.

The CNNF used the Eastern Region draft framework for establishing a network of representative ecological reference areas (including RNAs and other protected natural areas). The 1986 Forest Plans identified unique or distinctive features as RNAs. While these types of RNAs may play a role in protecting biodiversity, unique areas have limited capabilities to fulfill other vital roles such as serving as ecosystem management reference areas or helping to determine whether or not management activities are causing impairment of land productivity (as directed by FSM 4063).

The Eastern Region's draft framework (Tyrrell et al. 1998b) establishes a network of RNAs and areas equivalent to RNAs on other ownerships. The framework is based on the subsection level of the National Hierarchy of Ecological Units, in combination with natural communities found within the region. For northern Wisconsin, a modification of the National Vegetation Classification (alliance level) will be used as the community classification system for terrestrial and palustrine communities. A modification of the Wisconsin aquatic classification system is used for aquatic communities.

Given their small number and size, it is not surprising that the majority of the Chequamegon-Nicolet ecosystems are not presently represented within designated or candidate RNAs and SMAs. Using the National Vegetation Classification (alliances level), the Nicolet RNA and SMAs represent 25% of the 51 alliances found on the Forests while the Chequamegon has 26% of the alliances represented within an RNA or CRNA (33%, if Wilderness and special areas are included).

The total acreage of MA 8E, 8F, and 8G (combined) varies from 83,100 (Alternative 1) to 192,000 (Alternatives 4, 7, and 9). Specifically, acres of RNAs (MA 8E) vary from 2,500 in Alternative 1 to 35,000 in Alternatives 2-9 and the Selected Alternative. Special Management Areas (MA 8F) vary from 13,000 acres in Alternative 1 to 64,000 acres in Alternatives 2-9 and the Selected Alternative. Old Growth & Natural Feature Complexes (8G) vary from 67,600 acres in Alternative 1 to 92,600 acres (Alternatives 4, 7, and 9). Under the Selected Alternative, 85,500 acres are designated as 8G. Areas designated as developing old growth (MA 5, 5B, 6A, 8D) range from 88,100 acres in Alternative 2 to 188,900 acres in Alternative 4 (see Table 3-26).

Because the establishment of an ecological reference area network is considered a minimum management requirement, the combined acreage of RNAs, Candidate RNAs, and SMAs (MA 8E and 8F) does not vary among Alternatives 2-9 and the Selected Alternative. There are 99,000 acres of MA 8E and 8F in Alternatives 2-9 and the Selected Alternative.

Many new goals, objectives, standards and guidelines regarding ecological reference areas have been developed for Alternatives 2-9 and the Selected Alternative (see Chapters 1 and 2, Forest Plan).

Based on the recommendations of the *Analysis of the Management Situation: Old Growth Forests* (USDA FS 2000d), old growth allocations on the Chequamegon-Nicolet National Forest should not exceed 68%, the average percentage of land in old growth conditions in the Lake States during the 3000-year stable historic period prior to EuroAmerican settlement (Frelich & Lorimer 1991). Frelich & Lorimer (1991) estimated that, on average, at least 40% of the forested land in the Lake States during the 3000-year period remained undisturbed for 132-160 years.

Forty percent of the forested land on the Chequamegon-Nicolet National Forest amounts to 527, 545 acres. Although the lower limit of old growth necessary to fulfill ecosystem function is unknown, the *Analysis of the Management Situation: Old Growth Forests* (USDA FS 2000d) suggests that a third to a half of that acreage (or 13-20% of the total forested land) be allocated to old growth and areas that are expected to develop old growth conditions. Alternatives 2-9 and the Selected Alternative designate between 18% (Alternatives 2, 9, and the Selected Alternative) and 25% (Alternative 4) of the forested land on the Chequamegon-Nicolet National Forest as old growth or developing old growth areas.

Comparison of Present Conditions to Estimates of Natural Variation (Range of Natural Variability)

Natural area losses in northern Wisconsin have been profound. Descriptions from early observers and records from the US Public Land Survey carried out in the region in the 1850s and 1860s reveal that the Forests once contained a mosaic of community types dominated by vast tracts of mature and old growth hemlock and hemlock-hardwood forest. Within this mixed conifer-hardwood matrix, small but important areas of Great Lakes pine forest also occurred. In some areas, such as the Bayfield Peninsula, a complex of open barrens, pine savanna, and pine forest developed in response to frequent fire events. Extensive wetland forests were also common throughout most of the Forests. These can be divided into two basic types: conifer bogs and swamps (black spruce/tamarack and white cedar) and hardwood swamps (black ash, red maple, and American elm) (WDNR 1995d).

A conservative estimate suggests that more than 95% of original vegetation for upland community types has been lost. Of that remaining, only a small fraction (<1%) is in an undisturbed, old growth condition (Frelich 1995). On the positive side, the region is again heavily forested, even after extensive turn of the century logging and subsequent slash fires. However, the mixed hemlock-hardwood forests have, except for small, localized areas, lost their long-lived conifer component (WDNR 1995d).

The relative importance of hardwood species was also altered as a result of past land use practices. Sugar maple was once a component of many mixed stands, found along with co-dominant hemlock and yellow birch. Today, however, sugar maple dominates many stands and hemlock and yellow birch are experiencing region-wide regeneration failure (Raile 1985). Stand structure and composition have been altered most significantly on upland-lowland transitional zones. Once dominated by long-lived conifer species, today these sites are usually forested with short-rotation stands of seral stage aspen-birch-fir forest, a condition that is perpetuated by even-aged management practices.

Structurally, most of today's forest lacks trees in the upper size classes (>24" DBH), as well as an adequate snag, den tree, and down woody debris component typical of mature and old growth forest (WDNR 1995d).

Mixtures of red oak and red maple, short rotation stands of aspen-paper birch, or plantations of red pine have replaced the once-dominant white and red pine (WDNR 1995d). Former pine barrens areas lost most of their red pine component to logging and their open, savanna-like condition to region-wide fire suppression and large-scale reforestation efforts. Today, except for the semi-restored Moquah Barrens Area, only small isolated openings remain in frost pockets and on the most nutrient poor sands. Red pine plantations dominate large areas once occupied by open barrens.

Extensive conifer swamps once dominated by white cedar have been greatly reduced by past cutting and water level fluctuations. Today, large lowland areas once forested with old growth cedar are occupied by alder thicket, disturbed wet meadows, or balsam fir (especially along riparian areas) (WDNR 1995d).

Table 3-23 lists the acreage declines of the major pre-EuroAmerican settlement plant communities of northern Wisconsin as calculated by the WDNR Natural Heritage program.

Table 3-23. Major Pre-EuroAmerican Settlement Plant Communities in Northern Wisconsin ranked as Natural Area Quality 1, 2, or 3

Community Type*	% of Pre-Euro Settlement Acres Remaining**
Northern Mesic Forest	<1 %
Northern Wet Forest	2 %
Northern Wet Mesic Forest	3 %
Northern Dry Mesic Forest	<1%
Northern Dry Forest	<1%
Boreal Forest	<1 %

** Based on Wisconsin DNR Natural Heritage Inventory, 1986*
*** Portion that is ranked as Natural Area Quality 1, 2, OR 3*

Age Class

Frelich and Lorimer (1991) estimate that at least 78% of the forests in the upper Great Lakes were in a mature or old growth stage at the time of Euro-American settlement (Table 3-24). As a whole, most of the northern forests were older than 80 years (approximate lower limit of "mature" size class), although all successional stages were evident to some extent.

Table 3-24. Percent of pre Euro-American hemlock-hardwood forest by age class.

Percentage	Size Class	Average Age	DBH (cm)
2	Sapling	20	0-10.9
11	Pole	60	11-25.9
24	Mature	100	26-45.9
54	Large	>130	> 45.9
9	Break-up*	NA	NA

Adapted from Frelich and Lorimer 1991
** Due to catastrophe, stands do not fit into any of the above categories*

Forest age-class distributions are significantly different from the pre-European settlement forest (Frelich and Lorimer 1991). The age structure of primary northern hardwood forest in Porcupine Mountains Wilderness State Park and Sylvania Wilderness Area (combined data) was compared with surrounding commercial forests in a western upper Michigan FIA survey unit (Table 3-25). The Chequamegon-Nicolet age structure is also shown for comparison.

Table 3-25. Comparison of Percentage of Landscape Occupied by Each Age Class on CNNF with Porcupine and Sylvania Wilderness and Michigan Commercial Forest

Age Class	Porcupine Mt. plus Sylvania Wilderness – Primary Forest*	CNNF**	Western Upper MI FIA survey unit – Commercial Forest
0–39	5.7	21.0	14.3
40–79	1.4	40.4	44.5
90–119	2.9	19.7	31.5
120+	90.0	2.9	9.7

**Observed percentage of 70 0.5-ha plots (Frelich and Lorimer 1991).*
***16% of Forest is typed as "no age"*
Adapted from Frelich 1995

Direct and Indirect Effects

Advantages of Designating Ecological Reference Areas

Ecological reference areas contain interactive groups of plants and animals that evolved in particular environments over the millennia. They include the full range of habitats in which plants and animals adapted to exist in the physical world. In effect, such areas represent places in which active evolution and adaptation are allowed to continue without interruption by modern man and technological support systems. These remaining areas are the least disturbed and most biologically diverse remnants of the landscape that existed here just 150 years ago. In addition to providing optimal habitat for hundreds of native species of plants and animals, reference areas provide other values and serve other functions, including: (1) acting as benchmarks to guide land use, (2) research and educational use, (3) maintenance of genetic diversity, (4) important ecosystem functions, (5) protecting natural heritage by providing a link to the past, (6) economic benefits through increased nature-based tourism, (7) natural settings for recreational pursuits, (8) areas for spiritual renewal, and (9) areas to enjoy scenic beauty. (Minnesota County Biological Survey 1994; Southeastern Wisconsin Regional Planning Commission 1997; Scientific Areas Preservation Council & WDNR 1983)

The Forests designed a network of ecological reference areas using Forest sites identified during an extensive inventory of ecologically significant features. The goal of this effort is to represent, in a system of reference areas, all native ecosystem types and seral stages across their natural range of variation, as stratified by the Land Type Association (LTA) level of the National Hierarchy of Ecological Units. Three designations--Research Natural Areas and Candidate Research Natural Areas, Special Management Areas, and Old Growth and Natural Feature Complexes (MA 8 E, F, and G, respectively)—are used to formally protect these sites.

Recreational conflicts or opportunities, existing roads or trails, research opportunities, site quality, and condition are among the factors weighed when determining which of the three designations is most appropriate for a particular site. Some sites are apportioned into more than one designation based on these and other factors. In addition, Developing Old Growth areas (MA 5, 5B, 6A and 8D) will supplement these ecological reference areas as old growth characteristics develop and their value increases. Additional special management areas were identified through an assessment of geological and cultural resources of the Forests. These sites can also serve as a benchmark or reference area.

Objectives for an Ecological Reference Network:

Provide refugia for rare species.

There is remarkable overlap between locations of rare species and candidate ecological reference areas. Therefore, protection and representation of these exemplary ecosystems also serves to protect rare and/or declining species. This is sometimes referred to as a “coarse filter” or ecosystem approach to rare species conservation. Forty-two percent of known rare plant locations on the Forests are in RNAs, Candidate RNAs, and SMAs in Alternatives 2-9 and the Selected Alternative. In Alternative 1, 32% and <5% are found in similar designations on the Nicolet and Chequamegon, respectively.

Provide potential recovery areas for rare species.

By providing high quality examples of the habitat required by rare species, we allow for populations to expand and increase.

Provide control or reference areas for research and measuring long-term ecological change.

The current lack of recognized and designated control areas limits efforts to effectively contribute to important research topics such as global climate change.

Contribute to the regional representative natural area network.

The Regional RNA program developed guidelines for establishing a regional system of RNAs and other protected areas, including regional areas representative of natural communities and ecological units. The State of Wisconsin Natural Area Program also has goals for representing the full range of natural communities in a reference area network.

Provide baseline areas for monitoring.

Federal regulations require that "all management conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land" [36 CFR 219.27 (a)(1), 219.27(b)(5), and 219.27(f)]. Ecological reference areas can provide the baseline or reference conditions necessary to determine whether or not management prescriptions are causing significant impairment of the productivity of the land. Presently, there are too few designated areas of reference (or control) quality to adequately serve as a monitoring program. Existing areas represent only a small number of ecosystems occurring on the Forest.

Provide protection for remnant ecosystems.

Only scattered remnants of the pre-EuroAmerican settlement landscape exist on the Forests due mainly to exploitive logging practices of the late 1800s and early 1900s, residential development, and intensive recreational development. Continued recreation and resource demands on the Forests may further disturb or destroy these rare features unless a concerted effort is made to ensure their protection.

Provide interpretive and educational opportunities.

These exemplary natural features could provide outstanding recreational experiences for visitors to the Forests and local publics. The Great Northwoods Bird and Nature Trail, currently in development, will likely feature some of these candidate reference areas. Ecologically significant features could serve as a foundation for a Forestwide *Naturewatch Network*, similar to the successful *Watchable Wildlife* program, which could provide high quality examples of all the Forests' ecosystems. Interpretive trails, boardwalks, and naturalist programs could be developed at a subset of these sites, and brochures, maps, websites could be used to enhance visitor access.

Additional Benefits

Creating an ecological reference area network would contribute immeasurably to maintaining overall quality of the Forest environment by maintaining biodiversity and providing areas to enjoy scenic beauty, hike, hunt, fish, and learn about the natural environment. It would also provide opportunities for more formalized educational and scientific pursuits for future generations. In addition, economic benefits might be found

from increased nature-based tourism centered on passive recreational activities. In a broad sense, it would enhance the quality of life in the region and thereby help maintain the attractiveness of the region as a place to live and work as well as visit. Moreover, by clearly identifying the most sensitive environmental lands prior to the preparation of resource development plans, such a network would enable resource development to proceed more efficiently with greater assurance of conformity with environmental regulation. Resource development activity could then proceed with greater confidence and in a potentially less costly manner because of the reduced possibility of conflicts with existing environmental regulations.

A network of ecological reference areas addresses several of the Forest Service's strategic goals, as identified in the Draft RPA Program and the Draft USDA Forest Service GPRA Strategic Plan (USDA FS 1996). For example, "The Forest Service will work to ensure the health and diversity of ecosystems while meeting people's needs. Special care will be provided for fragile or rare ecosystem components on National Forest System lands and encouraged on other lands. Protection of ecosystem is a priority in all Forest Service activities. Healthy ecosystems are those that maintain diversity of composition, structure, and function over time and are resilient to stress."

For the reasons described above, the Forests consider Candidate and existing RNAs and SMAs to be included in the minimum management requirement.

Effects on Ecological Reference Areas and Developing Old Growth from Management Area Assignment

Research Natural Areas and Candidate Research Natural Areas (RNA) and Special Management Areas (SMA)

All existing formally designated RNAs (2,500 acres) and SMAs (special areas/special interest areas; 13,000 acres) will be carried forward under all alternatives including the Selected Alternative. This totals 15,500 acres.

In Alternatives 2-9 and the Selected Alternative, 47 of the candidate special areas (not formally designated) that were identified in the 1986 Nicolet LRMP are recommended for designation as MA 8E, F or G. Of the seven candidate RNAs identified in the 1986 Nicolet LRMP, six of these are designated as MA 8E in Alternatives 2-9 (Atkins Lake, Scott Lake-Shelp Lake, Kentuck Lake Swale, Alvin Creek Headwaters, South Branch Grove, Waupee Lake). The remaining candidate RNA, Giant White Pine Grove, occurs completely within the Headwaters Wilderness area, and is not recommended for co-designation as an RNA (it will be tracked as old growth).

Six of the eight candidate special interest areas identified in the Chequamegon LRMP (Pigeon Lake Shore, Hay Lake, Chippewa Pines, Lake Ree, Springbrook Meadows, and Ghost Lake Cedars) are designated as MA 8E, F or G in Alternatives 2-9 and the Selected Alternative. In Alternatives 2-9 and the Selected Alternative, two of the candidate RNAs identified in the Chequamegon LRMP (Doering Tract and Brunsweiller River Gorge) are designated as RNAs, and one (Morgan Creek Falls) is designated as an SMA. In Alternative 1 there are no additional designations of RNAs or SMAs. However, because the remaining sites are listed as candidates in the existing Chequamegon or Nicolet Plans, the option for future designation remains under Alternative 1.

The list of sites and their recommended or existing designation is found in Appendix N. Combining existing designations with recommended designations, Alternatives 2-9 and the Selected Alternative provide 48 RNAs, 66 SMAs, and 176 Old Growth & Natural

Feature Complexes. There are a total of 290 ecological reference area designations on 246 sites (some sites may be subdivided into more than one designation). Table 3-26 provides a comparison of the acres of MA 8 E, F and G and Developing Old Growth by alternative.

Table 3-26. Acres of RNA, Candidate RNA (MA 8E), SMA (MA 8F), Old Growth & Natural Feature Complexes (MA 8G) and Developing Old Growth (MA 5, 5B, 6A, 8D)

	Alt 1	2	3	4	5	6	7	9	S.A.
RNA	2,500*	35,200	35,200	35,200	35,200	35,200	35,200	35,200	35,200
SMA	13,000*	63,900	63,900	63,900	63,900	63,900	63,900	63,900	63,900
Old Growth & NFC**	67,600	85,500	91,000	92,600	85,500	91,000	92,600	92,600	85,500
Developing Old Growth***	85,000	88,100	131,800	188,900	102,500	111,800	121,600	95,900	102,700
Total	168,100	272,700	321,900	380,600	287,100	301,900	313,300	287,600	287,300

** Includes only designated RNAs and SMAs*

*** Note that 12% of Old Growth and Natural Feature Complexes acres in Alternative 2-9 and the Selected Alternative are non-forested*

****Includes Existing Wilderness (MA 5), Potential Wilderness (MA 5B), Semi-primitive Non-motorized areas with low disturbance (MA 6A) and Wild, Scenic and Recreation River Corridors (MA 8D)*

Exemplary Natural and Cultural Features

In the 1990s an extensive inventory of ecologically significant features was conducted on the Forests. These areas were identified as those providing the best opportunities for additions to the ecological reference area network and represent a pool of sites from which potential RNAs, SMAs, and Old Growth complexes could be identified. In addition, another analysis identified significant geological and historical/cultural sites. These were added to the pool of sites considered for Special Management Area designation.

Total acres of RNAs, SMAs, and Old Growth & Natural Feature Complexes are shown in Figure 3-39. Alternative 1 has the fewest acres of RNA, SMA, and Old Growth & Natural Feature Complexes. This alternative does not add any of the sites identified in the ecological, geological, and heritage resource assessments. Alternatives 2-9 and the Selected Alternative increase allocation of MA 8E, 8F, or 8G with all of the additional areas coming from the pool of ecological, geological, or culturally significant areas. As such, they are among the most significant natural and cultural features on the Forests (see documentation of methods and findings in Landscape Analysis and Design Report, 1999). Under Alternative 1, 111,000 acres of these natural and cultural features will not receive special protective designation as MA 8E, 8F or G. Many rare species and ecosystems are found in these areas. For example, 42% of rare plant sites are found in Management Areas 8E and 8F.

Among Alternatives 2-9 and the Selected Alternative, the range of acres allocated to MA 8 E, F and G is quite narrow, with a difference of only 7,100 acres between the highest and lowest allocations. Alternatives 4, 7, and 9 have the highest allocation (192,000 acres), closely followed by Alternatives 3 and 6 (191,700 acres). Alternatives 2, 5 and the Selected Alternative have 184,600 acres (Table 3-26). Alternatives 4, 7, and 9 include all existing RNA and SMAs as well as all the sites in the pool of ecologically significant features.

The greatest difference among Alternatives 2-9 and the Selected Alternative is in their allocation of Developing Old Growth areas (MA 5, 5B, 6A, 8D), which ranges from a low of 88,100 acres in Alternative 2 to a high of 188,900 acres in Alternative 4 (Table 3-26). Under the Selected Alternative, 102,700 acres would be allocated to Developing Old Growth management areas. While these areas do not presently exhibit benchmark

ecological conditions, their value as monitoring and research areas and rare species refugia is expected to increase as old growth conditions develop.

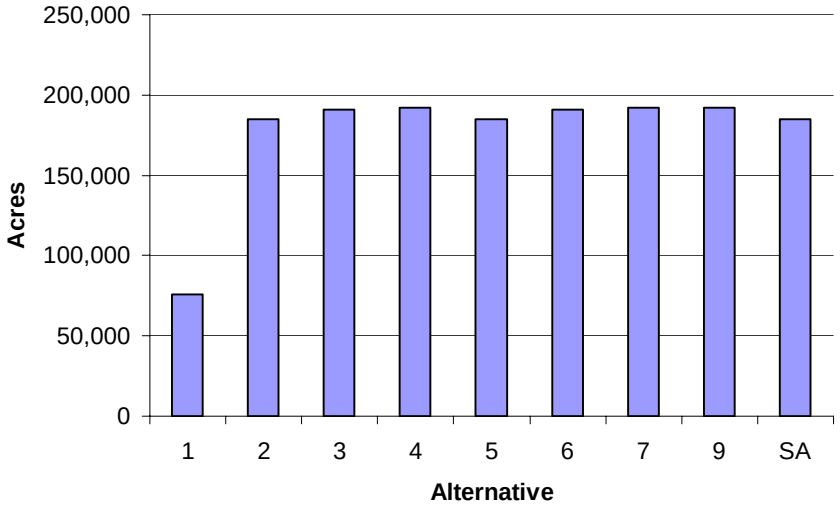

Figure 3-39. Total Acres of RNA (MA 8E), SMA (MA 8F) and Old Growth & Natural Feature Complexes (MA 8G)

Overall, Alternatives 2-9 and the Selected Alternative meet the objectives of an ecological reference area network. Alternative 1 does not meet most of the ecological reference area objectives, nor does it provide protection for the 111,000 acres of significant natural and cultural resources of the Forest.

Ecosystem Representation

The candidate pool of ecological reference areas (those areas identified through the Forestwide inventory of ecologically significant features) has the following general composition: 86% forested, 55% upland forest, 14% non-forested and 52% currently classified as unsuitable for timber production. Total acreage for the candidate pool of ecological reference areas is 190,700 acres. Alternative 4, 7, and 9 designate all these areas as either MA 8E, 8F or 8G. Alternatives 2 and 5 omit 7,000 of these acres from consideration as MA 8G, all of which are upland forest suited for timber production. As a result the general composition of MA 8 E, 8F or 8G in Alternatives 2 and 5 has a lower proportion of acres classified as suitable upland forest. The general distribution for Alternatives 3 and 6 remains similar to that of Alternatives 4, 7, and 9.

Like Alternatives 2 and 5, the Selected Alternative designates all but 7,000 of the 190,700 acres as MA 8E, 8F and 8G. These acres are comprised of 307 stands from 60 complexes. All of the 7,000 omitted acres are upland forest suited for timber production and receive the MA designation of the surrounding area.

Currently there are 51 alliances or vegetative plant communities (using the National Vegetation Classification) occurring on the Chequamegon-Nicolet National Forests. In Alternatives 2-9 and in the Selected Alternative, 44 of these alliances (86%) are represented within designated or candidate RNAs and SMAs. However, Alternative 1 has only 33% of alliances represented (this figure includes designated or candidate RNAs and SMAs, as well as all existing Wilderness areas.)

Overall, Alternatives 2-9 and the Selected Alternative provide a high degree of representation of vegetative community types, which can serve as control areas for monitoring. Alternative 1 provides a much lower degree of representation of vegetative communities, which would have a negative effect on monitoring efforts.

Old Growth

On suited lands the standard rotation age (see "Vegetation Management" section, Chapter 2 of Forest Plan) is considerably younger than the age at which old growth conditions develop (WDNR 1995). Under the maximum rotation age guideline, stands are regenerated just as they are reaching the age at which old growth conditions begin (white and red pine are an exception). Uneven-aged northern hardwoods do not have a rotation age; harvests are guided by target diameter distributions. Stands with trees in the 21-24 inch range are typically in the 120-150 year age class, which has been described as the understory reinitiation stage—the period when the initial stages of old growth characteristics begin to develop (Frelich and Lorimer 1991, Frelich and Reich 1996, WDNR 2001). In northern hardwoods managed for timber production, the largest size class is 21-22.9 inch with 3 trees per acre in that class. In MA 2B, 3B, 4B, and 6B, diameters are slightly higher with 6 trees per acre that are 21-25 inches. Therefore, on suited northern hardwoods, stands will develop into the early stages of old growth, but are unlikely to progress to the old multi-aged stage in which old growth conditions dominate (Frelich and Lorimer 1991, Tyrell et al. 1998a). Thus, it is on lands unsuited for timber production and on areas designated as Developing Old Growth (MA 5, 5B, 6A) that old growth conditions are most likely to develop and persist over time.

It is important to note that approximately 12% of the MA 8E, F, and G acres in Alternatives 2-9 and the Selected Alternative are not forested (other ecosystems such as lowland bogs are embedded within these complexes). These non-forested acres are germane to an analysis of old growth forests because they contribute to the community and structural diversity of the area and are integral to ecosystem function. In a comparison of forested acres within MA 8G, the amounts vary: 67,600 (Alternative 1); 75,200 (Alternatives 2,5, and the Selected Alternative); 80,100 (Alternatives 3 and 6); and 81,500 (Alternatives 4, 7 and 9). Similarly, open habitats in the Developing Old Growth MAs range from 21,600 acres (12% of total Developing Old Growth acreage) under Alternative 4 to 10,300 acres (11% of total) under Alternative 9. The percentage of open habitat within the Developing Old Growth MAs ranges from 15% under Alternative 2 to 9% under Alternatives 3 and 6. Under the Selected Alternative, approximately 11% of Developing Old Growth areas are unforested.

Alternatives 4, 7, and 9 contain all the sites identified in the pool of ecologically significant features identified on the Forests. Alternatives 3 and 6 excluded 63 stands in 11 different complexes, and in Alternatives 2 and 5, 307 stands are excluded from 60 complexes. Although this represents only a relatively small reduction in the total acres allocated as MA 8G, the removal of these acres from the old growth complexes makes them available for vegetation management under another management area designation. A wide range of management activities including road building, clearcutting, and other types of timber harvest would be allowed, which could change composition and structural characteristics (see "Direct and Indirect Effects for Terrestrial Ecosystem Components" section). In turn, these activities could also affect adjacent or surrounding Old Growth & Natural Feature Complexes. For example, clearcutting can increase the likelihood that adjacent stands will be blown down by wind. Also, Non-native invasive plant species can

be more likely to invade the neighboring old growth acres if management activities (timber harvest, roads, trail construction) occur within or next to their boundaries.

The loss of acres from these complexes reduces their effective size. The smaller the old growth complex, the more likely it is to be toppled by high wind and the less likely it is to recover from such events (Frelich et al. 1998, Frelich 2002, Peterson and Carson 1996). Therefore, those Old Growth & Natural Feature Complexes that have been reduced in size in some of the alternatives could be less resilient to disturbance due to their smaller size and adjacent management activities.

Perhaps the greatest difference in old growth among the alternatives is in the management direction. In Alternative 1, harvest of old growth on the Nicolet is only temporarily deferred until well beyond normal rotation age. This scenario might be better described as extended rotation. In addition, under Alternative 1 on the Nicolet land base, no uneven-aged northern hardwood stands were to be included in the old growth allocation. In Alternatives 2-9 and the Selected Alternative, MA 8G acres are removed from the suited timber base. Overall, Alternatives 2-9 and the Selected Alternative designate a larger portion of existing old growth remnants, develop more acres of old growth over time, and ensure more long-term protection of old growth than does Alternative 1.

Effects of Landscape Context on Ecological Reference Areas

As relatively small and widely scattered land units, ecological reference areas alone cannot preserve the Forests' diversity of plant and animal species. Other resource areas are essential to complement ecological reference areas. In order to maximize the functional integrity of this network, attempts have been made to expand and connect natural areas and rare species habitats with wetlands, riparian ecosystems, and alternative management areas where feasible. Ecological reference areas are integrated into larger, landscape-scale management units (such as Alternative Management Areas, Wilderness, and Semi-primitive Non-motorized areas) that are managed with complementary objectives (e.g. uneven-aged conditions, extended rotation, and lack of timber management). This section analyzes the effect that management area assignments in the surrounding landscape have on the ecological reference area network.

Alternative Management Areas (AMA)

In some alternatives, a relatively high proportion of ecological reference areas (ERAs) are embedded within Alternative Management Areas (AMAs; MA 2B, 3B, 4B and 4C). Alternatives 3 and 9 have the highest proportion of ERAs within AMAs, at 60% and 57%, respectively. This affords a higher degree of protection and compatible management. Under the Selected Alternative, approximately 23% of ERAs are embedded within AMAs (Figure 3-40).

AMAs can serve as landscape connectors from one reference area to another, thereby increasing the opportunity for dispersal and genetic exchange among plants and animals. Rare species are particularly vulnerable to isolation (Crow et al. 1994). As noted earlier, a high proportion of rare species occur within the existing and candidate ecological reference areas. Thus, Alternatives 3, 4, and 9 provide the highest degree of landscape connectivity and reduce the risks for isolation-sensitive species. Alternatives 1, 2, and 5 provide the lowest degree of connectivity. The Selected Alternative has only slightly more connectivity than Alternative 5. In Alternatives 1, 2, and 5 there are two land bases

(Park Falls and Medford) that have no AMAs. Landscape Connectivity is discussed in more detail in the *Landscape Pattern* section.

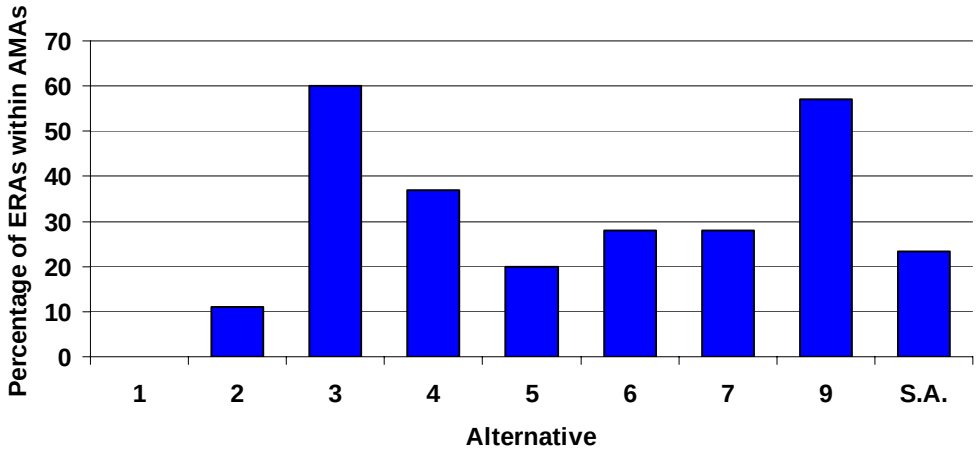

Figure 3-40. Overlap of Ecological Reference Areas (ERAs; MA 8E, 8F, 8G) with Alternative Management Areas (AMAs; MA 2B, 3B, 4B & 4C).

Wilderness

Only RNAs that occur within the boundaries of an existing or candidate wilderness area will be discussed in this section. SMAs and Old Growth & Natural Feature Complexes will not be discussed because the management prescription for Wilderness (MA 5) is as restrictive or moreso than the management area Standards and Guidelines for SMA and Old Growth; therefore there is little need for overlapping designations. Because Research Natural Areas have some additional, research-related restrictions not addressed in the management prescription for Wilderness, it is important to have distinct designations for overlapping sites.

There is some overlap of ecological reference areas (ERAs; MA 8E, 8F, 8G) with potential Wilderness areas (Management Area 5B). The amount of overlap between MA 5B areas and ERAs is illustrated in Figure 3-31 in the "Terrestrial Ecosystems Component" section of this chapter. Alternative 1 has no 5B management areas; Alternative 2 has 6,349 acres of MA 5B, but there is no overlap with ecological reference areas. The Selected Alternative has approximately 4,700 acres of ERA overlap with potential Wilderness areas.

Semi-primitive Non-Motorized, Low-disturbance Areas (MA 6A)

Figure 3-32 in the "Terrestrial Ecosystems Components" section of this chapter illustrates the degree of overlap between ecological reference areas and MA 6A areas by alternative. Overlap with these areas is generally high across Alternatives 2-9 and the Selected Alternative. Alternative 1 has no MA 6A areas.

In general, Alternatives 2-9 and the Selected Alternative provide a high degree of overlap between ecological reference areas and AMAs (MA 2B, 3B, 4B, 4C) and SPNM areas (MA 6A), but not with recommended Wilderness study areas (MA 5B). In Alternatives 3, 9, and the Selected Alternative, the majority of ecological reference areas are embedded in a complementary management area designation (i.e. AMAs).

Cumulative Effects

The cumulative effects analysis area is Province 212, or roughly the northern half of Wisconsin and adjacent portions of the Upper Peninsula of Michigan (Figure 3-1).

Unmanaged forests are limited in northern Wisconsin. Only 142,100 forested acres (1.1% of forested lands) are "reserved," or withdrawn from timber utilization (Schmidt 1997, using data for the Northeast, Northwest, and Central FIA Units). Of those, a much smaller portion is considered ecologically significant or intact. Thus, current natural area or reference area networks are not adequate for monitoring, adaptive management, or ensuring ecological sustainability.

There are two other major natural area programs in the State: (1) Wisconsin State Natural Areas (SNAs) and (2) Preserves that are protected and/or managed by The Nature Conservancy.

Wisconsin's State Natural Areas Program was the first statewide protection program in the nation. State Natural Areas (SNAs) are formally designated sites devoted to scientific research, the teaching of conservation biology, and especially to the preservation of their natural values and genetic diversity for future generations. State Natural Areas protect outstanding examples of native biotic communities and rare and endangered species of plants and animals. State Natural Areas also protect significant geological and archeological features. There are currently 353 State Natural Areas encompassing 125,000 acres of land in Wisconsin, with 72,736 acres within the cumulative effects analysis area. They range in size from less than 1 acre at Ripon Prairie in Fond du Lac County to more than 7,800 acres at Bibon Swamp in Bayfield County.

Another organization actively pursuing the protection and representation of natural communities is The Nature Conservancy. To date, the Conservancy and its members have been responsible for protecting more than 58,000 acres in Wisconsin. The Conservancy works with the State Natural Heritage Inventory Program and other science professionals to identify those places on the landscape that provide critical habitat for native plant and animal species and natural communities. It then works cooperatively with local communities and partners, such as the Forests, to protect these places in a variety of ways.

Both the State Natural Area program and The Nature Conservancy have goals of achieving a high degree of ecosystem representation within an ecological reference area network in the State. The Chequamegon-Nicolet National Forest has the opportunity to help fill "cells" within the representation framework. The Forests are seen as having significant opportunities to assist in this effort due to the compatibility of natural areas with our laws and policies. Many other public agencies do not have statutes or direction that encourage or enable natural area designation. In addition, there is considerable quality and diversity of ecosystems on the Forests, some of which are not represented on other public lands. For example, most of the State Forest land in the North occurs in only two subsections. Therefore, ecological reference areas on the Forests can represent many ecosystems that are not found or are much lower in quality and extent on other public ownerships. Current representation goals for the State Natural Area program are to have at least one example of each "matrix community" (the dominant communities that formed the background or matrix of the North prior to EuroAmerican settlement) represented in each Land Type Association (LTA). At present, 104 of 394 "cells" are filled for matrix communities (26% representation). For non-matrix communities (communities that are smaller, unique to Wisconsin, etc.) the goal is to have one example of these communities represented in each subsection. At present, 145 of 444 cells are filled for non-matrix

communities (33% representation). The designation of the recommended RNAs and SMAs in Alternatives 2-9 and the Selected Alternative would substantially improve representation goals. These sites, along with other anticipated SNA designations on State Forest land, will help achieve 67% representation of matrix communities and 58% representation of the non-matrix communities.

The Forests may play an especially important role in protecting high quality examples of a number of more uncommon community types such as those dominated by hemlock, white cedar, white pine, red pine, jack pine, Hill's oak, etc. These uncommon community types have significance at a regional scale - not only in terms of community rarity, but for other reasons as well (E. Epstein, pers. comm.). Wisconsin's county and industrial forests contain few examples (and in some cases no examples) of any of these rarer forest types that are beyond marginal quality. The State's landbase is much smaller than the National Forest; efforts on State lands are focused on securing protection for important community types and rare species that are especially well represented on the state-owned properties such as boreal and cedar seepage forests on the Brule State Forest or soft water lakes and certain pine forest types on the Northern Highland State Forest.

Thus, the Forest plays an important and unique role in ecosystem representation, in establishing benchmark or reference areas for monitoring, and in protecting rare ecosystems in the cumulative effects analysis area. Overall, Alternatives 2-9 and the Selected Alternative will have a positive and beneficial effect on these issues. Alternatives 4, 7, and 9 have the greatest effect, followed very closely by Alternatives 3, 6, and the Selected Alternative.

Wildlife

Introduction

This section discusses a wide variety of terrestrial wildlife species in terms of existing condition, current management, proposed changes in management, and effects of those proposed changes. Aquatic wildlife species are covered in the “Aquatic, Riparian, and Wetland Ecosystems” section of this chapter. Federally listed Threatened and Endangered Species, Management Indicator Communities and Species, and Regional Forester Sensitive Species are not discussed in detail in this section. They are covered in the “Species of Viability Concern” section.

It is not feasible or practical to cover effects on every terrestrial wildlife species known to occupy the Chequamegon-Nicolet National Forests (CNNF). This discussion will focus instead on species groups or examples of species potentially affected by proposed actions. It deals with issues and factors on a broad scale with respect to wildlife. We have used a combination of coarse and fine filter approaches to provide for ecological conditions that contribute to the long-term abundance and distribution of species. The “Proposed Changes and Range of Changes” section references additional discussion of issues and considerations with respect to general concerns about wildlife.

Current Condition

There are over 300 wildlife species (defined here as terrestrial vertebrate species) known to inhabit the CNNF sometime during their life cycle. These species provide users and visitors to the Forests with a wide variety of recreational opportunities, such as hunting and wildlife viewing, and are important in the many ecological processes and natural

communities in the Forests. With a few exceptions, the majority of species present at the time of EuroAmerican settlement still occur on the Forests. There have been some extirpations, such as woodland caribou and wolverine (Jackson, 1961). Some species have been extirpated but reintroduced, such as elk, fisher, and American marten. There have also been changes in relative dominance of some species and groups, due to historic land use impacts, current management practices, and management on lands adjacent to the CNNF. Population and trend data for selected species is in the General Assessment for Fish and Wildlife (USDA 1998f).

Birds make up the majority of CNNF wildlife species. Western Great Lakes forests support a rich diversity of birds because of the transition between northern boreal forests and eastern deciduous forests. The continuity of forest and the diversity of wetlands, lakes, and forest types make this area particularly significant for neotropical migratory birds (NTMB), with some of the highest breeding bird richness in North America (Howe et al., 1996; McRae, 1995).

The relative contribution the Chequamegon-Nicolet makes to wildlife varies. For some species, such as black bear, bobcat, and river otter, population densities on the Forests are similar to other areas of suitable habitat in the state. For other species, such as elk and American marten, the CNNF holds the majority of Wisconsin's populations. For some species whose range centers on the CNNF, particularly for some NTMB, habitat conditions on the Forests support high enough populations that the Forests act as a source for outlying regions.

Current Management Direction

Current wildlife management direction is based on two separate Chequamegon and Nicolet Forest Plans (USDA FS 1986a and 1986b). Wildlife abundance and distribution on the Forests depend in part on the amount, distribution, and quality of habitat. Wildlife habitat is comprised of vegetation types and features such as dead trees, water bodies, and man-made structures. The 1986 Plans include proposals to create new or additional habitat features and to manage desirable habitat that would otherwise change over time.

The 1986 Plans provide direction through goals, objectives, and management area Standards and Guidelines. Goals are broad statements describing overall achievable conditions. Examples of goals in the 1986 Plans are to “Protect and enhance habitat for threatened and endangered wildlife species” and “Provide for diversity of plant and animal communities by working toward the desired future vegetative composition, age class distribution, and spatial distribution set forth in the plan.” Objectives provide the means for achieving Forest goals, generally by implementing projects or activities. Examples of objectives in the current plans are: acres of upland openings to be constructed or maintained, acres of low-head impoundments to be constructed, and acres of prescribed fire to be accomplished. Objectives are not targets. Targets, being a measure of annual outputs, are dependent on budgets.

Standards and Guidelines are a course of action that must be followed to achieve Forest goals. In general, they limit or mitigate project-related activities, rather than require actions. Deviations from Standards must be analyzed and documented in a Forest Plan amendment. Deviations from Guidelines must be analyzed and documented in a project-level Environmental Assessment or Environmental Impact Statement. Examples of Standards or Guidelines in the current plans are: protection zones for eagle and osprey nests, site selection criteria for impoundment construction, numbers of snags or cavity trees reserved in harvest areas, and protection measures for rare plant sites.

The End-of-Decade Monitoring Report for the Chequamegon-Nicolet National Forests (1986-1996) noted some differences between proposals in the plans and actual accomplishments. Some differences are described below:

- Fewer acres of upland opening construction and maintenance than planned due to fragmentation concerns, reduced budgets, and discontinued herbicide use. Overall, upland opening acreage declined during this period.
- Fewer acres of impoundment construction than planned. Some potential impoundment sites were found unsuitable following more detailed analysis. Recent studies questioned the value of managed impoundments compared to natural wetlands. More effort than planned was put into reconstructing existing impoundments.
- More den and nest structures were installed than planned due to public interest group and private citizen involvement and increased funding through donations and cost-share agreements.
- More recreation visitor days than planned due to hunting, trapping and non-consumptive activities such as wildlife viewing.

Proposed Changes and Range of Changes

The need to change existing Forest Plan direction for managing wildlife habitat was developed in response to increased knowledge of wildlife habitat relationships, changes in wildlife populations, and increased public input. Public input has taken many forms—legal challenges to plan implementation and project-level analyses, comments on project-level scoping efforts, and comments on the plan revision process.

In 1992 the Forest Service convened a panel of scientists to address biological diversity issues on the Forests. The group reported (Crow et al., 1994) on biological diversity risks in northern Wisconsin, followed by 23 sets of management recommendations. Some wildlife and habitat recommendations include:

- Minimize forest fragmentation to protect forest interior birds and other area-sensitive or edge-sensitive species.
- Restore fire-dependent species, communities, and ecological processes.
- Provide areas with low road density in the Forests.
- Increase woody debris left behind in harvested stands, leaving live trees as well as snags.
- Leave some potential salvage sales unharvested.
- Reduce risks from Non-native invasive species in the Forests.

The End-of-Decade Monitoring Report (USDA FS 1998c) identified emerging issues not fully realized at the time the 1986 Plans were developed. Examples include: 1) the importance of landscape-scale habitat arrangement; 2) the effects of population increases of some species on other species or ecological processes; 3) declines in high public interest species such as ruffed grouse and woodcock; and 4) accurate assessment of forests with true old-growth characteristics.

The List of Problem Statements developed in 1999 as part of Forest Plan revision included a wildlife section. Analysis of current conditions, plan direction, and new information indicated that the following issues should be considered in the development of the alternatives: permanent grass/shrub openings, snags and reserve trees, shallow and deep-water impoundments, hunter-walking trails, sharp-tailed grouse, and ecological

conditions that contribute to the long-term abundance, distribution, and recovery of sensitive species. The Analysis of the Management Situation for Wildlife, another plan revision document, also identified wildlife issues that could lead to management changes. Some of these were: limiting sites for building impoundments; concerns over upland opening construction and maintenance; amount and spatial arrangement of early successional forest; age-class distribution of forest types; high densities of deer; and habitat needs for the reintroduced elk herd on the Great Divide District.

Potential wildlife-related issues were compiled from the external and internal sources described above. They were incorporated as potential changes into revision topics, management activities, and proposed direction for the revised Forest Plan. They are discussed here and elsewhere in this document as appropriate.

Biological diversity at a landscape scale is considered below and in the section on Landscape Patterns. It includes such factors as landscape pattern, fragmentation, ecosystem restoration, and alternative management strategies. Ecological reference areas, including management for old growth characteristics, are discussed below. The management of road and trail densities and areas of motorized access to reduce impacts on wildlife populations and habitat is discussed below and in the section on "Transportation and Open Road Density". Providing a suitable quantity and quality of habitat for the reintroduced elk population is discussed in both this section and in Appendix L.

Compositional and structural diversity of forest types is discussed in the section on "Ecosystem Components". Providing a suitable amount and spatial distribution of early successional forest types to maintain rare species and provide for species of high public interest, while minimizing impacts on other species or ecological functions, is presented in the Discussion of Management Indicator Communities under the relevant sections on "Species of Viability Concern". The management of riparian aspen and beaver populations to provide valuable wetland habitat while minimizing impacts on other resources, is discussed in the section on "Aquatic Riparian Ecosystems." Reducing the impacts of Non-native invasive species is discussed under "Direct/Indirect Effects of Terrestrial Ecosystem Components."

Some of the potential management changes related to wildlife issues can be made at a landscape scale through the allocation and spatial arrangement of management areas (MAs) and the desired future condition for the landscape. Acreage allocations and spatial arrangement of MAs vary by alternative, but between Alternatives 2-9 and the Selected Alternative, they vary by degree. Other changes can be implemented at a site-level scale through forestwide Standards and Guidelines. Standards and Guidelines will not vary across alternatives. However, those Standards and Guidelines proposed for Alternatives 2-9 and the Selected Alternative are different than those in Alternative 1, which follows the Standards and Guidelines of the 1986 Plans.

Direct and Indirect Effects

The wildlife resource effects analysis is based primarily on the major revision topics, as described in Chapter 2, "Description of Alternatives". This includes the wildlife-specific discussions listed above in the "Proposed Changes and Range of Changes" section as they relate to major plan revision topics. The effects analysis also includes a description of how proposed changes in Standards and Guidelines could affect wildlife resources.

Effects of ATV/Off Road Vehicles on Wildlife

All-Terrain Vehicle (ATV) use can have both direct and indirect effects on wildlife populations. Direct effects include animals being crushed, compaction of soil and snow, and the modification of the subterranean and subnivean spaces. Noise and presence disturbances can result in temporary displacement, such as when animals are scared from a trail as vehicles pass, but return shortly after. A more serious effect is long-term displacement, in which consistent disturbance causes animals to leave and not return. An example is nesting raptors flushed often enough that they eventually abandon the nest site. Many of the detrimental effects of road systems, discussed elsewhere (Roads Analysis Chequamegon-Nicolet National Forest USFS 2002a), are also generated by off-road vehicles.

Human use can have profound effects on wildlife populations. Hiking can disturb animals, particularly during sensitive breeding or nesting seasons. ATVs, however, allow greater human access to more remote areas than areas that allow hiking only. Effects include nest abandonment, declined parental care, shortened feeding times, and increased stress (Colorado DNR, 1998).

Indirect effects result from increased human access, particularly in remote areas. ATVs allow hunting and trapping at greater distances from roads and in more remote areas than accessible by foot, and may involve hauling materials for blinds, tree stands, or legal or illegal baiting. Overall recreational use appears more dispersed when ATVs are involved, rather than concentrated near roads and developed trails.

Alternative 1 would continue the two separate ATV policies for the Chequamegon and Nicolet established by the 1986 Plans. Cross-country (off-road/off-trail) use is permitted on the Chequamegon except in areas posted closed to such use, resulting in user-developed trails throughout much of the Forest. Impacts include wetland damage, erosion, and substantial ATV use for hunting. ATV use on the Forests continues to increase as national and state ATV registration increases. ATV use is not permitted on the Nicolet, except on town roads designated as ATV trails. However, illegal cross-country use occurs throughout the Nicolet and could increase in the future.

Alternatives 2-9 and the Selected Alternative involve varying degrees of change in ATV access from the current condition (see the “ATVs and Off Road Vehicles” section of this chapter for more information). In all of these alternatives, no cross-country (off-road/off-trail) ATV use on the Chequamegon is allowed. Although illegal use may continue, a decrease in Chequamegon cross-country ATV use would also decrease direct and indirect effects on wildlife caused by ATV use. Roads and trails would be closed to ATVs unless posted open. This could also result in an overall decrease in ATV use on the Chequamegon.

On the Nicolet, alternatives range from no change (no legal use except on some town roads) to a combination of designated trails, connector routes, and legal use of National Forest roads where posted. Some alternatives permit an increase in legal Nicolet ATV use, with potential for an increase in ATV-related wildlife effects.

In the Selected Alternative, ATV access on both the Chequamegon and the Nicolet will be provided through a combination of designated trails and legal use of National Forest roads where posted.

Effects of Wilderness and Recommended Wilderness Study Area Allocations on Wildlife

Wilderness areas have a number of characteristics important to wildlife habitat and wildlife populations. Evidence of human activity is low and vegetation composition and pattern result from natural disturbance rather than human-caused activities. Over time, this results in mature forest types dominated by long-lived species and well-developed structural diversity. Temporary openings, early successional forest, and small permanent openings may be found but are generally uncommon. The landscape pattern is one of more or less continuous forest cover, with little edge habitat except at wetland-upland interfaces. Human use may be present, but is dominated by low-impact forms of recreation such as hiking and cross-country skiing. Designated Wilderness areas provide the largest landbase of relatively unfragmented and undisturbed ecosystems in the Forests (USDA FS 2001a).

Typical wildlife species found in these areas reflect the more mature forest conditions and low disturbance levels. Edge species and early successional species such as chestnut-sided warbler, ruffed grouse, eastern chipmunk, and red fox may be present, but probably at lower densities than are found in Management Areas (MA) 1-4. Wilderness areas favor species such as interior forest birds and larger predators. It should be noted that the small size of many CNNF Wildernesses and the presence of roads bordering these areas somewhat diminishes the value of these areas as true “reserve” areas.

Alternative 1 involves no change as compared to the existing condition. Management would be the same for the five existing designated Wilderness areas. There would no additional areas designated as Wilderness study areas (Table 3-27).

Alternatives 2-9 and the Selected Alternative call for maintaining existing Wilderness areas and the recommendation of new Wilderness study areas (MA 5B). For a summary of existing Wilderness and Wilderness study areas by alternative see Table 3-27. Study areas were chosen from a pool of areas meeting potential Wilderness criteria. They will be managed to protect and enhance existing values for which they were selected. They will remain as Wilderness study areas unless their status is changed by a future plan revision, plan amendment, or unless formally designated as Wilderness by Congress.

Alternative 4 includes the most Wilderness study areas (56,063 acres within 8 separate areas), adding the most low-disturbance, interior habitat of all alternatives. Two potential study areas would be adjacent to existing designated Wilderness, adding value in size and continuity. Other alternatives include anywhere from one potential study area (6,349 acres in Alternative 2) to four areas (28,985 acres in Alternative 6). Under the **Selected Alternative**, 15,345 acres are recommended as Wilderness study areas, slightly more than Alternative 5 (Table 3-27).

Table 3-27. Summary of Non-Motorized Areas by Alternative

Type of Non-Motorized Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
MA 5 – Designated Wilderness	44,624	44,624	44,624	44,624	44,624	44,624	44,624	44,624	44,624
MA 5B – Recommended Wilderness Study Areas	0	6,349	7,900	56,063	15,391	28,985	25,771	15,803	15,545
MA 6A – SPNM Low Disturbance	0	11,329	64,654	92,044	20,224	20,224	41,638	14,714	20,130
MA 6B – SPNM Moderate Disturbance	0	56,034	108,212	83,239	55,782	47,984	73,101	80,954	48,000
NM areas – Non-motorized Recreation Emphasis	7,600	33,321	61,962	66,936	64,479	110,898	93,120	78,015	42,492

The value of Wilderness and Wilderness study areas to different wildlife species varies because of the cover types involved range from blocks of relatively mature northern hardwoods to younger stands of early successional types mixed with forested and open wetlands. These cover types would not change appreciably in the near future. As a result, immediate effects on wildlife due to MA 5B designation would be minimal in these areas. However, forestwide Standards and Guidelines would result in road closures and decommissioning, low-impact recreational use, and no timber harvest. If these areas remained as Wilderness study areas or if they were congressionally designated as Wilderness, the vegetation would gradually become dominated by mature, late successional cover types, resulting in gradual change in the suite of wildlife species present.

Effects of Semi-Primitive Non-Motorized (SPNM) Areas Allocation on Wildlife

Semi-Primitive Non-Motorized areas (SPNM) have characteristics and effects on wildlife somewhere between those of designated Wilderness and MAs 1-4. SPNMs may have interior roads, but these roads are closed to public motorized use, resulting in fewer human access impacts than in MA 1-4. They may have trails or dispersed campsites that encourage low-impact public use.

Vegetation management in SPNM areas varies from emphasis of natural disturbance processes similar to Wilderness areas (SPNM low disturbance; MA 6A) to use of timber harvest as part of vegetation management with some restrictions (SPNM moderate disturbance; MA 6B). Overall effects on wildlife habitat and populations will vary by alternative, as described below.

Alternative 1 involves no change to the existing condition. There are 81,812 acres managed as non-motorized (74,559 acres managed as SPNM Goal 6; Table 3-27). Timber harvest is allowed in these areas, with some restrictions on the Chequamegon in terms of size and number of clearcuts. There are no harvest limits in Nicolet SPNM areas.

Current SPNM areas vary greatly in terms of forest cover types and landscape pattern. Mature, continuous hardwood/conifer cover with a high degree of structural complexity

such as snags and cavity trees characterizes some current SPNMs. Wildlife species likely to be found in these areas include pileated woodpecker, black-throated blue warbler, black bear, and red-backed salamander. Other SPNMs have been managed with an emphasis on early successional habitat and game species, resulting in fragmented landscapes and a younger forest. Wildlife species more common to these areas include ruffed grouse, song sparrow, indigo bunting, and white-tailed deer.

The primary value of existing SPNMs to wildlife is through lowered human disturbance. However, due to the emphasis on recreational developments in many SPNMs this value is probably not as great as in Wilderness areas. Even non-motorized trails can displace wildlife if use is high enough.

Alternatives 2-9 and the Selected Alternative involve a change in SPNM management direction. SPNM areas have been subdivided into SPNM low disturbance areas (MA 6A), and SPNM moderate disturbance areas (MA 6B). In addition, a third non-motorized area category—the Non-Motorized with Full vegetation Management areas—has been developed. These non-motorized areas would be managed with the same vegetation composition guidelines as the surrounding area, but with no public motor vehicle access. They are sometimes referred to as **NM** or **XX.0** areas, with the "XX" representing the surrounding MA designation that would determine vegetation composition guidelines. For a summary of SPNM and NM areas by alternative see Table 3-27.

Some wildlife effects from the levels of SPNM/NM management depend on the level of recreational development and use. For example, if cross-country skiing was the primary use of a particular area, human impacts would be concentrated during the winter, which minimizes effects on most wildlife species. Areas developed for a wider variety of recreation activities, such as cross-country skiing, hiking, and mountain biking, might result in effects dispersed over a greater portion of the year, especially if use is high. Rock Lake on the Great Divide District is an example of high use. Areas managed under the NM designation would most likely be developed for the walking hunter. Use and effects in these areas would likely be concentrated during the fall hunt, with greater effects on hunted game species.

Effects on wildlife habitat would vary among the different SPNM and NM areas in terms of vegetation cover types. SPNM low disturbance areas (MA 6A) would generally have no timber harvest and would be managed primarily for large blocks of fairly continuous mature, late successional forest types, benefiting species such as interior songbirds, cavity nesters, and amphibians and small mammals that depend on large downed woody material. These areas would not provide quality habitat for wildlife using shrub and young forest habitat, including many game species. Alternative 4 would provide the most MA 6A among alternatives and Alternative 2 the least amount (Table 3-27). The Selected Alternative provides more MA 6A than Alternatives 1, 2, and 9, almost the same amount as Alternatives 5 and 6, and less than half as much as Alternatives 3, 4 and 7.

SPNM moderate disturbance areas (MA 6B) allow timber harvest, including clearcutting, with some restrictions. These areas are managed similar to MAs 2, 3, or 4, depending on site conditions, and therefore reflect a variety of vegetation cover ranging from even-age and uneven-age hardwoods to conifer-dominated types. There is some aspen management and other early-successional types, but not to the degree found in MA 1. These areas could support a fairly wide variety of wildlife, ranging from species of mature, interior forest, to species of young and regenerating forest, including edge-type species. Alternative 3 provides the greatest amount of MA 6B, with 108,212 acres. Other alternatives range from 0 acres (Alternative 1) to 83,239 acres (Alternative 4) (Table 3-

27). Among the action alternatives, the Selected Alternative allocates the fewest acres to MA 6B.

Non-motorized with full vegetation management areas (NM or XX.0) are managed with the same vegetation objectives as the surrounding management area, resulting in a greater variety of potential vegetation cover compared to MA 6A and 6B. One of the main goals of these area types is to provide hunting opportunities in a non-motorized setting. Therefore, it is likely some of the areas may be managed with an emphasis on game species, including an emphasis on early successional forest types. This includes clearcutting to maintain different aspen age classes, resulting in more edge, and a smaller average patch size compared to MA 6A and 6B. This benefits white-tailed deer, ruffed grouse, and woodcock, as well as species such as chestnut-sided warbler, house wren, and perhaps the golden-winged warbler. There could be greater impacts from edge effects on interior songbirds in these areas when compared to MA 6A and 6B. Alternatives 6 and 7 provide the greatest amount of NM areas. Aside from Alternative 1, the Selected Alternative provides the smallest amount of MA 6B of all Alternatives and is third lowest in its allocation to NM areas among all Alternatives (Table 3-27).

Effects of Travel Management on Wildlife

Travel management as described within the Forest Plan Revision consists of identifying areas with “open” road densities of 0, 2, and 4 miles per square mile, and assigning “total” road density upper limits to areas identified through the Recreational Opportunity Spectrum (ROS) classification system. Open road densities are based only on Forest Service roads available for public motor vehicle use (Maintenance Levels 2-5). Total road densities are based on all roads under all ownerships located in a square mile of national forest land, whether open or closed for public vehicle use (Maintenance Levels 1-5). Road density upper limits (both open and total) vary by alternative, based on acres designated for different management areas and ROS classes. Average forestwide open road density also varies by alternative.

Roads can affect wildlife and habitat in several ways. All roads disrupt habitat continuity to some degree, depending on the road type. Low standard, low use roads (Maintenance Level 2) may only be as narrow as a single vehicle, with native material for surfacing, and possibly even vegetation growth in the roadbed. This type of road offers a minimal break in habitat. Some higher standard roads are wider and surfaced with crushed gravel (generally, Maintenance Levels 3 and 4). These roads may inhibit migration for species with limited dispersal capabilities, such as small mammals and amphibians. Other roads are paved, with a wide roadbed and right-of-way clearing (generally Maintenance Levels 5 and 4). These roads inhibit migration of more wildlife species and cause noticeable vehicle mortality. Higher standard, wider roads can also break up larger areas of interior habitat, potentially affecting area-sensitive species.

The cleared corridor associated with higher standard roads acts as a linear opening in the forest and affects the surrounding area like any other edge, depending on the corridor width. Changes can occur in understory vegetation in adjacent forest stands and increase shade intolerant plants like brambles and other fruit producing shrubs. Increased predation on adjacent stands can also occur since roads often act as travel corridors for both avian and mammalian predators. Bird species can be affected by these changes depending on the width of the corridor. Schneider’s (1992) Nicolet study found little evidence of effects due to narrow openings (mostly secondary road corridors) on the distribution of most songbird species considered. However, the black-throated green warbler was found to be one of two species avoiding narrow logging roads in the study

area. Rich and Dobkin (1994) studied corridor width effects on the abundance of bird species typically associated with edge effects. They found that the relative abundance of birds studied did not vary between corridor edge and interior forest for 8-meter unpaved road corridors, but it did vary significantly with 16-meter paved roads and 23-meter power line corridors. However, they suggested small width corridors might create "ecological traps" for interior bird species exposed to increased levels of predation and parasitism while nesting or foraging at the edges.

Human road use can affect wildlife, primarily larger mammals, through legal and illegal hunting and trapping. It can also affect nesting species such as woodland raptors simply due to disturbance. Examples of affected species include black bear, coyote, goshawk, American marten, fisher, and white-tailed deer. Potential effects on wolves are covered in the Biological Assessment, and in the section, "Species of Viability Concern."

The "Roads Analysis Chequamegon-Nicolet National Forest" (USDA FS 2002a) summarizes the effects of roads on wildlife species, biotic communities, landscape patterns, and aquatic systems in more detail.

Alternative 1 follows current Chequamegon and Nicolet Plans. Both Plans target total road densities by Management Area (MA), with a desired average Forestwide total road density of 3.0 miles per square mile. Both plans called for some new road construction, but also called for the obliteration of unneeded roads. The current estimated total road mileage for the Forests is 4,038 miles for the Chequamegon (for a total road density of 3.1 mi/mi^2) and 4,984 miles for the Nicolet (4.9 mi/mi^2). Current forestwide total road density is estimated at 3.9 mi/mi^2.

Road density upper limits in **Alternatives 2-9 and the Selected Alternative** are based primarily on Recreational Opportunity Spectrum (ROS) classifications, and therefore vary according to ROS class distribution across the Forests. Management Areas 1-4 may not fit within a specific ROS class. Upper limits for road densities, closure, and decommissioning are provided in Appendix BB of the Forest Plan and guide the overall reduction of road density on the Forest.

There are several ways to compare alternatives, one of which is to compare the amount of land with an open road density of 0 miles per square mile. These areas offer no motorized public access, reduced impacts from legal and illegal hunting, and limited wildlife disturbance and displacement. However, these areas still contain some road corridors used for administrative purposes, resulting in some of the effects described earlier in this section. With 342,200 acres, Alternative 4 has the greatest amount of 0 mi/sq. mi. areas. Alternative 2 has the least with 150,900 acres. The Selected Alternative allocates 170,500 acres to areas with 0 mi/sq. mi. open road density. See the Map Packet for open road density assignments.

Another way to compare the alternatives is to compare the amount of area with a target total road density of 0 miles per square mile (Wilderness, Wilderness study areas, and SPNM low disturbance areas). These areas have low human disturbance levels, but also lack corridors that create edge effects, affect animal movements, or act as a conduit for predators. Some areas might still have road corridors from previous management activities, but these will re-vegetate over time. Alternative 4 has the greatest amount of these areas and Alternative 2 has the least.

Effects of Biological Diversity Restoration on Wildlife

Both the Chequamegon and Nicolet 1986 Forest Plans focused on providing for biological diversity at a local or stand-level scale. The plans attempted to provide for a high number of species throughout the Forests by calling for a mixture of vegetation cover types and ages, creating a high degree of edge, and relatively small patch sizes. **Alternative 1** (current plan direction) places no emphasis on sustaining or improving ecosystems of concern, such as mature interior northern hardwoods or natural red/white pine (Table 3-28). There would likely be smaller scale activities based on retaining or improving site and stand level ecosystem components, such as reserving snags and cavity trees, providing for woody debris, and underplanting long-lived conifer species such as hemlock and white pine. These activities would improve site-level habitat conditions for a number of wildlife species. This alternative also involves managing and improving existing Chequamegon Pine Barrens for the benefit of sharp-tailed grouse, upland sandpiper, and Brewer's blackbird.

There would not be any specific emphasis on providing landscape scale interior forest conditions, with some exceptions. During implementation of the 1986 Plans there were at least two attempts to provide large areas of interior forest conditions, one involving active management (Diamond Roof area) on the Lakewood-Laona district and another involving a landscape level analysis of desired future vegetation condition on the Washburn district. This alternative would likely involve some additional project-level attempts to reduce fragmentation in larger hardwood blocks to improve habitat conditions for species such as forest interior songbirds and woodland raptors.

Following appeals, litigation, and new information provided by the Scientific Roundtable on Biological Diversity, the Forests decided to focus on providing biological diversity at a landscape scale. **Alternatives 2-9 and the Selected Alternative** reflect this focus The two main approaches discussed in this section are ecosystem restoration and landscape level interior forest. These approaches were developed through Management Area (MA) direction and Standards and Guidelines. MAs provide a coarse filter to reach these goals by providing habitats and ecological conditions that are representative and resilient. All species are represented, conditions appropriate for them are distributed across the landscape, and representative ecological areas are large enough to withstand natural and anthropogenic environmental perturbations. Standards and Guidelines provide for the maintenance of specific species habitat on a finer scale. The Selected Alternative, like Alternatives 2-9, would increase emphasis on ecosystem restoration and landscape level interior forest to some degree, as shown in Table 3-28.

Table 3-28. Comparison of Biological Diversity Activities by Alternative

Biol. Div. Activity	Alt. 1 Current Plans	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
Restoration- N. Hardwood Interior Forest	0	23,000	454,000	234,000	130,000	142,000	143,000	282,000	209,000
Restoration- Pine/oak Forest	0	19,000	87,000	56,000	18,000	26,000	38,000	64,000	41,000
Restoration- Surrogate Barrens	0	10,000	13,000	13,000	13,000	10,000	13,000	13,000	13,000

Ecosystem Restoration

Alternatives 2-9 and the Selected Alternative emphasize restoration of certain ecosystems to varying degrees through allocation of Management Areas (MA). These ecosystems include the following (with the management areas that emphasize their restoration shown in parentheses): mature northern hardwood interior forest (MA 2B); oak forest with a component of pine (MA 3B); pine forest with a component of oak (MA 4B); and surrogate pine barrens (MA 4C). Management Area direction in these areas involves modified silvicultural methods and Standards and Guidelines to move conditions towards species diversity, stand structure, and disturbance processes more representative of natural communities. The result is increased habitat quality and quantity for a wide range of species. Management of 2B areas increases conifer components for species such as northern goshawk and blackburnian warbler; it increases large snags, cavity trees, and woody debris for species such as barred owl, red-backed salamander, and American marten; and it provides features such as various-sized canopy gaps and dense understory for black-throated blue warbler. Management of 3B and 4B areas increases large white pine available for black bear, common raven, and bald eagle and it maintains and increases suitable habitat for species such as pine warbler and northern parula. Management of 4C areas provides additional temporary barrens habitat in large blocks of regenerating jack pine for species such as Connecticut warbler and brown thrasher.

Alternative 3 provides the greatest level of restoration for all the ecosystem types described above, although MA 4C allocation stays relatively constant across the alternatives (Table 3-28). Alternative 2 provides the least emphasis on ecosystem-type restoration. Under the Selected Alternative, a moderate amount (compared to other Alternatives) of northern hardwood interior forest (MA 2B) and pine/oak forest (MA 3B, 4B) restoration is proposed (Table 3-28). The Selected Alternative proposes the same amount (13,000 acres) of Surrogate Barrens (MA 4C) restoration as Alternatives 3, 4, 5, 7, and 9.

Landscape Level Interior Forest

MAs 2B, 3B, and 4B provide varying amounts of emphasis on landscape level interior forest in Alternatives 2-9 and the Selected Alternative. Vegetation composition objectives and Standards and Guidelines for these areas lead to a reduction of early successional forest types and upland openings, reduced fragmentation and edge, and greater average patch size. These changes may reduce the effects of predation and parasitism on interior forest species. Management in these areas also improves landscape pattern features such as transition areas of long-lived conifer between upland and lowland areas. These changes increase habitat quality and quantity for a variety of edge sensitive and/or area sensitive birds such as barred owl, wood thrush, red-eyed vireo, Swainson’s thrush, red-shouldered hawk, and sharp-tailed grouse (species listed in Howe et al., 1992). Habitat continuity and dispersal routes would improve for species such as American marten.

The changes resulting from implementation of these MA prescriptions would also reduce habitat quality and quantity for species that utilize early successional forest types such as aspen and birch, upland openings, and forest edges. Changes would not be evident right away, but over time management direction would result in conversion of early successional, shade-intolerant species to longer lived, shade tolerant species such as sugar maple and hemlock. It is likely these MAs would show reductions in numbers of chestnut sided warbler, indigo bunting, clay-colored sparrow, and ruffed grouse. Over time deer populations could decrease in these areas as well. It is difficult to predict deer population sizes, however, due to other factors such as hunting success and winter severity.

Effects of Ecological Reference Areas Allocations on Wildlife

Ecological Reference Areas (ERAs) include areas managed as Research Natural Areas (RNAs, MA 8E), Special Management Areas (SMAs, MA 8F) and Old Growth & Natural Feature Complexes (MA 8G). In addition, Developing Old Growth areas (MA 5, 5B, 6A, 8D) are expected to contribute similar ecological values to the Forests in the future and so are included in this discussion. RNAs, SMAs, Old Growth, and Developing Old Growth have several features in common. They all have very limited or no vegetation management; natural disturbance would be the prevalent force shaping vegetation composition and structure.

Alternative 1 maintains the existing RNAs, Special Areas (a term used in the current plans, similar in definition to SMAs), and old growth designated under current plan guidelines. These designations include approximately 2,500 acres of RNAs and 13,000 acres of Special Areas. Designated old growth varied between the Chequamegon and Nicolet. An estimated 47,000 acres were withdrawn from timber harvest activity on the Chequamegon through project level decisions, but was not formally designated old growth. On the Nicolet, potential old growth areas were identified during project level analyses, with approximately 20,600 acres formally designated as old growth.

Many existing ERAs have limited wildlife value in terms of high quality features. RNAs and Special Areas designated to date do not represent the full range of ecological communities found on the Forests. In some cases, the relatively small size of the areas combined with incompatible management on adjacent lands compromised the ecological integrity of the areas. Areas identified for old growth management tend to be small and scattered, often with few true old growth attributes. Some stands were designated old growth simply because of poor quality or because they were inaccessible for timber harvest. In addition, the current Nicolet plan allows harvesting in designated old growth stands, although at a longer rotation age than normally prescribed.

Alternatives 2-9 and the Selected Alternative all include fairly similar acreage of ecological reference areas, ranging from a low of 185,000 acres to a high of 192,000 acres. The Selected Alternative, like Alternatives 2 and 5, allocates 185,000 acres to ERAs. The selection criteria for RNAs, SMAs, Old Growth, and Developing Old Growth has identified high quality representatives of most or all ecological communities found on the Forests. These areas currently exhibit characteristics of old growth and/or natural communities, or have high potential for restoration. On average, the areas would be much larger that those areas designated under the current plans.

Compared to existing conditions, the larger size, higher quality (or potential quality), and greater overall acreage dedicated to these management areas in Alternatives 2-9 and the Selected Alternative would likely benefit many wildlife species. Since ecological communities and vegetation cover types vary within and among the designated areas, the wildlife species affected would also vary. For example, an RNA or SMA with a large complex of bog, lowland shrub, and wetlands offers protected habitat for Lincoln's sparrow, Connecticut warbler, golden-winged warbler, and four-toed salamander. A large area of mature conifer allowed to experience natural mortality provides extensive foraging habitat for black-backed woodpecker and pileated woodpecker.

Old growth areas provide a variety of features. Large average tree size leads to large snags and cavity trees, providing den sites for fisher and marten, and nest sites for wood duck and barred owl. Large decadent trees with loose flaking bark provide foraging and nest sites for brown creeper and roost sites for bats. Large downed woody material provides habitat for salamanders and small burrowing mammals, and foraging sites for

black bear. As natural processes result in tree fall, canopy gaps benefit black-throated blue warbler and cerulean warbler; tip-up mounds promote regeneration of important tree species such as hemlock and yellow birch.

There could also be results unfavorable to certain wildlife species. For example, an ERA with a large component of a shade intolerant species like oak could gradually convert to shade tolerant species like sugar maple and basswood. In this example, species that forage in oak stands, such as black bear, white-tailed deer, blue jay, and gray squirrel, would experience habitat quality reductions.

Effects of Timber Harvest on Wildlife

Timber harvest is one of the primary disturbance agents affecting forest communities in the Chequamegon-Nicolet National Forests. Timber management activities help shape the diversity of habitats by affecting vegetation composition, structure, and pattern across the Forests. For the purposes of this section, effects from timber harvest are covered in terms of two treatment categories, clearcutting and partial cutting. Partial cutting describes a wide variety of treatments such as selective cutting of northern hardwoods, thinning of pine stands, and shelterwood harvest of oak or birch stands. The analysis includes effects from disturbance during logging (direct effects) as well as effects from habitat modification (indirect effects).

Clearcutting

Clearcutting is used as a silvicultural treatment to harvest and regenerate aspen and other early successional species such as balsam fir and jack pine. Clearcutting creates an immediate change in the structure and age class of a forest stand. Clearcutting converts a stand composed primarily of mature trees, with some dead, damaged, or diseased trees, to a relatively even-aged regenerating stand that may retain some snags and live mature trees. Clearcutting creates a temporary opening in the forest canopy, allowing sunlight to reach the forest floor. Depending on surrounding vegetation and the number of mature trees retained in the clearcut, the transition between the clearcut and adjacent stands may be a sharply defined edge or a more gradual change.

Direct effects of clearcutting on wildlife populations include disruption of nests and animal activities by tree felling and equipment use. There is potential for mortality, mainly among small, relatively immobile animals such as amphibians, nestling birds, or mammalian young. Other animals, including adults of most species, would simply vacate an area during such disturbance. In addition to direct mortality, loss could occur during the nesting or birthing season if nests or young are abandoned due to the disturbance. Direct effects are greatly reduced in winter harvest areas, although some permanent and early season nesters (great horned owl, northern goshawk, common raven) could be negatively affected by the destruction of nest sites or reduced suitability of the remaining trees as nest locations.

Indirect effects of clearcutting on wildlife habitat and populations can result from fragmentation and edge effects, changes in vegetation and structural diversity, and forage quality and quantity. In simple terms, fragmentation is disruption in the continuity of habitat (Robinson, 1996). Fragmentation may be caused by permanent changes, such as when woodlands are cleared for farmland or urban development. Fragmentation resulting from timber harvest is not permanent, but may result in temporary reductions in habitat quality and quantity. Fragmentation is often thought of primarily in reference to songbirds, although other species are also affected.

As habitat fragmentation increases within a given area, the amount of edge habitat increases and average patch size decreases. Increased edge leads to increases in brood parasitism and predation in songbirds, two main causes of lower reproductive success in fragmented forests (Rosenberg et al., 1999). Brown-headed cowbirds, nest parasites associated with forest edges, can be relatively common in forest areas close to agricultural fields although they are not generally recognized as a problem in the extensively forested areas of northern Wisconsin (Robinson et al., 1995).

However, increased predation rates (including nest predation) at forest edges has been implicated in numerous studies as an important factor affecting wildlife populations. Predators are common in fragmented habitats with large amounts of edge where they concentrate their efforts, rather than in the interior of larger forested tracts. Examples of predators affecting songbirds include skunk, red fox, red squirrel, blue jay, and common crow. Ground nesting birds are especially vulnerable to increased predation rates.

Treatment of a stand by clearcutting also changes the structure of the stand and can result in rapid changes in the species assemblage inhabiting the stand. Birds in particular respond to changes in age and structure of a forest stand over time, with an almost complete species turnover following clearcutting (Probst et al., 1992).

In terms of bird species, a mature forest stand is likely to feature tree canopy feeders such as warblers and vireos, as well as bark foragers such as nuthatches, woodpeckers, and brown creepers. Aerial pursuers like swallows and ground foragers such as sparrows and house wrens dominate freshly harvested stands. As a stand regenerates and develops a dense shrub layer, more understory foliage feeders are found, including many warbler species. These changes are positive or negative depending on the species considered. Species requiring large quantities of snags and large cavity trees may lose quality habitat following clearcutting. On the other hand, many bird species currently of high concern depend on shrub-sapling habitat. For example, Thompson et al. (1993) used Partners in Flight criteria such as global abundance and distribution, population trends, and breeding ground threats to rank viability concerns for neotropical migrant bird species. Highly ranked bird species from shrub-sapling habitat included golden-winged warbler, chestnut-sided warbler, and mourning warbler. Some bird species are commonly associated with lowland shrub habitat, but utilize regenerating aspen of certain ages. The golden-winged warbler, in particular, utilizes regenerating aspen stands that are less than ten years old and is seldom found in aspen stands older than that.

Dense regenerating aspen is favored by some species due to the thick cover provided. The American woodcock uses lowland shrub and dense early successional forests for feeding and nesting. The ruffed grouse, a popular game bird, uses mature aspen for feeding on buds and catkins, but also uses dense young growth for cover and brood raising. The snowshoe hare also uses sapling aspen forest for browse and cover. The hare is an important prey species for a wide range of predators including bobcat, goshawk, and great horned owl.

Harvested aspen stands provide an abundance of forage used by a number of species. The rapid regeneration of aspen sprouts provides a large volume of woody browse in addition to the woody browse from shrub growth encouraged by increased sunlight. Increased sunlight also produces a flush of herbaceous growth absent in mature stands.

We use Regenerating Aspen Forest as a Management Indicator Community for numerous species, including white-tailed deer and ruffed grouse. White-tailed deer, as an edge/early successional species, utilize young aspen browse and feed heavily on herbaceous growth produced in clearcuts. Their numbers are influenced by available forage, as well as

climate and hunter harvest. Clearcutting increases deer populations on a local level by causing deer to move into recently harvested areas to take advantage of increased forage, and on a landscape level by maintaining higher amounts of a preferred forest type.

Deer populations are a controversial topic in forest management, affecting or being suspected of affecting a number of other animal and plant species. They have been termed a keystone species, meaning that they influence abundance and distribution of other vertebrate species by directly competing for limited resources and by altering habitat features that determine the distributions of other species (McShea and Rappole, 1992; Rooney and Waller, in press). However, while the Forests can manage habitats such as Regenerating Aspen Forest, it cannot manage white-tailed deer. The State of Wisconsin has the authority to manage the herd, and does so by setting goals, seasons, and the harvest, and by providing micro-management on State lands.

The increased forage found in recently harvested aspen stands also provides food for a number of other wildlife, such as mice (seeds and berries), songbirds (seeds, insects, and berries), grouse (seeds, insects, berries, aspen leaves), bear (berries and nuts), and snowshoe hare (aspen bark, aspen and shrub twigs).

Partial Cutting

Partial cutting (i.e. intermediate and selection cuts) accomplishes various silvicultural goals in a variety of forest types. The number of trees per acre is reduced, resulting in a more open stand structure below the forest canopy. The canopy layer is temporarily changed from a dense closed canopy that provides almost 100% shade to a more open canopy that allows some sunlight to reach the forest floor. This increased sunlight allows more vigorous growth of tree seedlings, shrub species, and herbaceous plants. Stands managed by partial cutting eventually grow back to a closed canopy, often with greater structural variation than before harvest.

There are fewer direct effects from partial cutting compared to clearcutting, since fewer trees would be removed. Indirect effects are also reduced compared to clearcutting, since a partial tree canopy and a distribution of various tree sizes would be maintained.

Since there is less change in vegetation structure resulting from this activity, there is less change in wildlife communities compared to clearcut areas. In terms of bird communities, harvested stands (partial cutting) typically retain much of the mature forest bird community and also provide habitat for species using the shrub/sapling layer (Thompson et al., 1995).

One of the main structural effects of partial cutting is the creation of gaps in the canopy. Since more sunlight is reaching the forest floor compared to an unharvested stand, there is a substantial response by herbaceous plants, tree seedlings, and shrub species. This response creates a distinct change in the stand structure, creating more diversity in terms of vertical layering and understory species. These gaps provide habitat for bird species that might not otherwise inhabit a closed-canopy forest. Several species characteristic of canopy gaps and understory vegetation in hardwoods, such as veery and black-throated blue warbler, show higher abundances in uneven-aged managed forests than in even-aged or old growth forests (Howe et al., 1996).

There are other long-term effects from partial cutting. Growth of the remaining trees is increased due to greater sunlight and reduced competition, improving the overall structure of the stand. Since the selection of trees for removal often targets lower quality individuals, there can be a loss of some potential snags and cavity trees, impacting habitat for bark gleaners and species using cavities and downed logs, such as pileated

woodpecker, American marten, fisher, raccoon, and salamander. However, existing Standards and Guidelines require that at least some of these trees be retained.

Alternative 1 includes the highest timber harvest level, both in terms of acreage considered suitable for timber production (900,000 acres), and in terms of the maximum level of timber produced from suitable land under Forest Plan constraints (average annual Allowable Sale Quantity, or ASQ – 146 million board feet per year). As a result, Alternative 1 has the greatest overall effect on wildlife populations and habitat. The effects are positive or negative, depending on the species and their requirements.

Alternative 1 would result in an average of approximately 5,600 acres of clearcut harvest per year (Table 3-29). In addition to including the most timber harvesting of all the alternatives, Alternative 1 also includes the greatest amount of aspen management and clearcutting (approximately 5,570 acres per year). In spite of this, a forestwide decline in aspen over a 10-year and 100-year period is projected for this alternative due to a number of factors. Some areas such as Wilderness would not be available for harvest, which would cause aspen stands to gradually convert to other types. Standards and Guidelines for trout stream management and visual quality objectives would not allow aspen management in certain locations. Finally, composition objectives, especially for hardwood management emphasis areas, encourage a certain amount of aspen conversion on quality hardwood sites. This long-term aspen loss leads to a loss of habitat for some wildlife species. However, it also results in less aspen clearcutting and associated concerns in some areas of the Forests. Alternative 1 results in an average of approximately 15,890 acres of partial cutting per year (Table 3-29).

Table 3-29. Annual Projected Timber Management Activities (in acres) during the 1st Decade by Alternative.

	Alternatives								
Treatment Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**S.A.**
Intermediate cuts	5,870	7,150	6,720	6,780	7,040	7,030	6,980	7,100	7,100
Selection cuts	9,580	7,770	6,990	6,590	7,540	7,290	7,250	7,370	7,530
Shelterwood cuts	960	1,260	1,130	1,060	1,050	990	1,050	1,070	1,490
Clearcuts	5,010	4,410	3,640	3,580	3,960	4,260	3,780	3,730	3,980
Site Prep for Planting	340	770	630	610	700	670	640	630	640
Planting	350	1,070	1,130	1,090	1,180	1,050	1,120	1,130	1,050
Underplanting	0	230	10	10	10	60	10	10	200
Site Prep for Nat Regen (chainsaw)	4,320	3,500	3,350	3,250	3,290	3,360	3,280	3,310	3,490
Site Prep for Nat Regen (scarify/burn)	1,440	860	260	270	500	760	390	330	720
Release	350	1,300	1,140	1,110	1,190	1,110	1,130	1,130	1,250
Pruning & Seedling Protection	0	230	10	10	10	60	10	10	200

Alternatives 2-9 and the Selected Alternative involve varying amounts of timber harvest but all reduce harvest levels (i.e. lands suitable for harvest, ASQ, and average treated acres per year) compared to Alternative 1. Alternative 2 involves the most timber harvesting of these alternatives, with approximately 4,400 acres of clearcut harvest per year. However, even this alternative results in a substantial long-term decrease in aspen, from 332,000 acres to 267,000 acres over 100 years (see Table 3-37). Other alternatives involve less clearcutting, ranging from approximately 3,650 acres (Alternative 3) to 4,250 acres (Alternative 6) per year (Table 3-29). Therefore, these alternatives all result in reduced effects compared to Alternative 2 and especially compared to Alternative 1. The

Selected Alternative projects approximately 4,000 acres of clearcut harvest annually during the first decade (Table 3-29).

Compared to Alternative 1, Alternatives 2-9 and the Selected Alternative generally lead to 1) reduced long-term habitat fragmentation and edge effects; 2) reduced effects on structural and vegetative diversity of affected stands; and 3) reduced forage created in the affected stands. A long-term indirect effect of reduced clearcutting under these alternatives is a gradual reduction in acreage of early successional types. Without clearcutting or other major disturbances, early successional types will eventually convert to more shade tolerant forest types. This represents a potential loss of habitat for species described earlier as dependent on the forage or cover of shrub/sapling habitat.

The amount of partial cutting (intermediate and selection cuts) also varies between Alternatives 2-9 and the Selected Alternative, although not as dramatically as annual amounts of clearcutting (Table 3-29). Alternative 2 actually involves more partial cutting than Alternative 1, with a yearly average of approximately 15,940 acres. The Selected Alternative is projected to result in approximately 13,000 acres of partial cutting annually.

Proposed Changes – Wildlife Standards and Guidelines

Management direction in forest plans is determined in part by application of Standards and Guidelines. This Forest Plan revision involves changes in several general areas of Standards and Guidelines for Alternatives 2-9 and the Selected Alternative. These changes would not apply to Alternative 1, which maintains the Standards and Guidelines established by existing plans. Changes that could affect wildlife populations or habitat are briefly described below along with the potential effects.

Restrictions on ATV Trail Locations

Standards and Guidelines developed for plan revision place more limits on ATV trail location than the current Chequamegon Plan. The current plan places few restrictions on trail location other than requiring that areas of obvious conflict such as Wilderness areas and trails closed to motorized use be avoided. New Standards and Guidelines (Alternatives 2-9 and the Selected Alternative) prevent construction in sensitive areas such as wetlands, riparian areas, erodible soils, next to Wilderness or other non-motorized areas, or in areas considered least suitable for ATVs. These restrictions further decrease the potential for impacts to sensitive wildlife habitat in Alternatives 2-9 and the Selected Alternative compared to the current Chequamegon plan (Alternative 1). ATV use on the Nicolet land base is not permitted under the existing Forest Plan.

Aspen and Beaver Management

Current plans discourage aspen management within 200 feet of Class I and selected Class II trout streams on the Nicolet and within 300 feet of Class I and II trout streams on the Chequamegon (Alternative 1). These measures reduce beaver activity on trout streams by removing their favored food source through gradual conversion to other forest types. However, recent research and observations indicate beaver will travel further than 300 feet from a stream to obtain food and dam building material. As a result, the 2004 Forest Plan includes a Forestwide Standard that prohibits the regeneration of aspen within 300 feet or 450 feet of selected trout streams in order to reduce beaver activity and effects along these streams. There are also more specific Forestwide Guidelines regarding silvicultural methods for speeding aspen conversion and beaver and dam removal.

Potential effects resulting from implementation of these Guidelines along selected streams include fewer beaver and less wetland habitat for species such as waterfowl, wading birds, and amphibians. Only high quality trout streams are managed under these Guidelines. The majority of Forest streams are managed for a variety of wildlife and habitats, including beaver and beaver ponds. Effects of these changes on aquatic species are discussed under *Aquatic, Riparian, and Wetland Ecosystems.*

Biological Diversity

Both current plans have only general guidelines about biological diversity, centered on providing a diversity of tree species and habitats spread across the forest landscape (Alternative 1). The 2004 Forest Plan includes Forestwide Standards and Guidelines related to reintroduction of native species, maintenance and improvement of stand-level components and structure, and protection of rare habitats. More detailed Standards and Guidelines related to biological diversity are found in Management Area (MA) prescriptions, specifically MA 2B, 3B, and 4B. Direction in this section includes maintenance and improvement of both stand-level and landscape-level components of biological diversity. The potential effects of implementing these new Standards and Guidelines have been incorporated into Biological Diversity effects addressed previously in this section.

Non-native Invasive Species

Non-native Invasive Species (NNIS) include a wide range of plant and animal species that were intentionally and unintentionally introduced into Chequamegon-Nicolet ecosystems. They are aggressive and successfully compete against native species, reducing their numbers or displacing them entirely. NNIS affect wildlife by altering the amount or quality of forage and nesting or hiding cover, and by changing the intensity of competition and predation. The existing plans (and Alternative 1) do not address NNIS. The 2004 Forest Plan includes Standards and Guidelines that reduce the extent and the impact of existing NNIS locations and reduce the potential for establishment of new locations. Detailed NNIS information is found elsewhere in this document.

Cumulative Effects

The cumulative effects analysis for wildlife species focuses on issues related to access and vegetation management that were discussed under Direct and Indirect Effects. Access discussions include road densities, motorized vehicle trails, and non-motorized areas. Vegetation management discussions include timber harvest, landscape pattern, and biological diversity. The cumulative effects area for this analysis is the same geographic area used as part of the Species Viability Evaluation process, and includes the portion of Province 212 within Wisconsin and the western part of Michigan. This roughly corresponds to the northern half of Wisconsin and the western portion of the upper peninsula of Michigan.

Historical Context - Wildlife

Some of the primary historical factors affecting wildlife habitat in the cumulative effects analysis area include the massive deforestation and slash fires of the late 1800s and early 1900s followed by the gradual recovery of ecological communities since that time. Large areas of mature forests or old growth, with complex structure and large patch size, dominated the area before EuroAmerican settlement. Most of the original forested area of

northern Wisconsin was converted to huge areas of burned brushlands, with some attempts at farming.

Over time, the forests gradually regrew and recovered. However, much of the area, including the National Forests, is still in recovery. Today's forests are still quite different from pre-European settlement forests in terms of species composition, structural complexity, and landscape pattern. Northern hardwood forests are relatively young and even-aged, with less species diversity, vertical structure, natural canopy gaps, large woody debris, and other structural features than pre-European settlement forests. The quantity of long-lived conifer species such as white pine, hemlock, and white cedar have been greatly reduced, both in terms of overall coverage and as a component within other forest types. Much of the acreage of conifer type existing today is of plantation origin, even-aged and with limited structural and species diversity. The pattern of forest types today differs from pre-EuroAmerican settlement forests in that average patch sizes are smaller and there are fewer large blocks of interior mature forest (USDA FS 2000a). For more detail on current conditions compared to the estimated Range of Natural Variability, see the section on "Comparison of Present to RNV" in this chapter.

The relative dominance of early successional species also changed greatly over recent history. Prior to EuroAmerican settlement and influence, the aspen-birch type occupied a much smaller portion of the landscape than it does today. Estimates of the historical extent of this cover type include a total of 300,000 acres in northern Wisconsin (Cleland, 2000); a total coverage in Wisconsin of approximately 5% based on original land survey records (WDNR 1996a); and a basal area percentage ("relative dominance value") of 3.5 in northern Wisconsin (Schulte et al., 2002). Since it is a disturbance-dependent forest type, some areas were generated and maintained by natural disturbance such as windthrow and fire. Some areas of this type also resulted from fires caused by Native Americans, although the importance of this activity on more mesic soils has been debated (Lorimer, 2001). Following massive clearcutting and burning around 1900, aspen-birch coverage peaked in the 1930s. Since that time aspen-birch coverage gradually declined in Wisconsin due primarily to conversion to other types. Over 61 years (1935 to 1996) aspen-birch declined by approximately 36% (Cleland et al., 2000). However, it is still the second most prevalent forest type in the Lake States Region (Minnesota, Wisconsin, and Michigan).

There are several aspects of vegetation management on non-federal lands in northern Wisconsin pertinent to a cumulative effects discussion. There are large areas of industry-owned forest land managed to maintain a forest cover. However, the emphasis on different forest types varies widely according to ownership. Many non-industrial private lands are also managed for forest products. However, the extent of early successional types declined even more on these lands in recent years than on the National Forests (Cleland presentation, 2000). Agricultural lands are still present in relatively fertile soils, resulting in pasture and cropland near the Forests and on private lands within the Forests. There are a number of notable areas of contiguous forest managed by state, county, and tribal governments offering areas of compatible management adjacent to the Chequamegon-Nicolet, or even linking different units of the Forests. Examples include the Menominee Indian Reservation, Northern Highland-American Legion State Forest, and Flambeau River State Forest. The location and importance of these areas was summarized in the Forest Plan revision document, Task Team 18-Wildlife Linkages (2/18/2000 draft).

Recreational development of both federal and non-federal lands increased over the past years. The National Forests became a more desirable recreational use destination. Nearby

private lands saw similar increases in use, including vacation home development. This often resulted in the subdivision of larger blocks of undeveloped forestland into smaller developed parcels with many owners with different interests. Lands throughout northern Wisconsin, both within and outside of the National Forests, saw large increases in off-road vehicle recreation use.

Future Trends - Wildlife

A cumulative effects analysis requires the analysis of proposed actions together with past actions (historical context) and potential future activities both in and out of the project area. Potential future activities within the project area (the Chequamegon-Nicolet) will not be described here since potential future activities are described for each of the alternatives for the next 10-15 years. Potential future activities for lands outside the Chequamegon-Nicolet are difficult to predict due to the large geographic area and diverse ownerships. However, several predictions can be made based on recent and current trends: 1) it is likely recreational use will continue to increase, including increased use of motorized off-road vehicles and dissection of lands into vacation properties; 2) most industrial forestland will probably continue as such, although recently some industrial land has been parceled into vacation properties; and 3) some private agricultural lands have recently been converted to other uses such as conifer plantations, vacation or hunting properties, or just natural conversion to brush and forestland due to lack of agricultural use. Perhaps the areas with the most certain future management are areas managed by county, state, and tribal agencies. It is likely that these areas will continue to be managed in ways similar to previous and current management.

Alternative 1 represents the least movement toward estimates of Range of Natural Variability in terms of vegetation management. In spite of this, some changes are expected in overall coverage of different vegetation types and condition. As mentioned previously, there would be a long-term decline in acreage of the aspen type under this alternative, due to composition guidelines and implementation of Standards and Guidelines established by the 1986 Plans. There would also be a gradual maturation of the northern hardwood type and a gradual increase in structural complexity of northern hardwood and upland conifer types.

This alternative offers no change over the current condition in terms of recreational emphasis. There would probably be a continued increase in use of motorized recreation vehicles on the Chequamegon and no use of ATVs on the Nicolet, except on town roads designated for such use. There are no additional areas proposed for non-motorized recreational emphasis.

Management under this alternative is more similar to management outside the Forests' boundaries than other alternatives, and therefore does not offer substantial compensating management in terms of many landscape level concerns. In other words, any concerns over trends in northern Wisconsin, such as disturbance from off-road/off-trail ATV use, fragmentation from forest management, or lack of ecosystem restoration, would not specifically be addressed by substantial changes in National Forest management.

Alternative 2 addresses many of the issues emerging during the revision process, but at a lower level compared to Alternatives 3-9 and the Selected Alternative. For example, 40,000 acres is designated landscape level interior forest; ecosystem restoration is initiated on 50,000 acres of Alternative Management Areas, including additional acres of Pine Barrens. Additional Wilderness areas are proposed and designated for non-motorized recreation. Off-road/off-trail ATV use is no longer allowed on the Chequamegon, but some ATV trails

would be added on the Nicolet. This alternative maintains fairly high levels of aspen management, but there would still be a greater long-term decline in this forest type compared to Alternative 1.

Alternatives 3-9 and the Selected Alternative will result in the greatest overall management change compared to the existing condition. In terms of mature interior forest types, there is an increase in emphasis of ecological reference areas, Alternative Management Areas, as well as new Standards and Guidelines for stand and landscape level biological diversity. These changes compensate for management occurring on some ownerships outside the Forests, including agricultural lands and highly fragmented non-industrial private forestlands, by providing higher quality and quantity of habitat for species such as neotropical migrant birds, cavity nesters, forest raptors, and amphibians. It should be noted that not all ownerships outside the Forests utilize management that is dissimilar or incompatible with the management proposed under these alternatives. There are some notable exceptions of highly compatible management on tribal lands, state forests, and private industrial ownerships. These other ownerships can have an additive effect in landscape level management, increasing the value of the Chequamegon-Nicolet for wildlife species of high value or concern. For example, many of the management changes proposed for the northern hardwood type would benefit woodland raptors such as northern goshawk and red-shouldered hawk. Valuable habitat for these species on the Menominee Reservation, which abuts the Nicolet, has the effect of increasing the probability of species interaction and ecological conditions that contribute to the long-term abundance and distribution of species.

Changes proposed to increase mature northern hardwood and pine/oak types can have effects outside the Forests by providing source populations for many neotropical migrant bird species. Some studies indicate that extensively forested, relatively unfragmented areas like the Chequamegon-Nicolet, and northern Wisconsin in general, can provide a surplus of birds to help maintain populations in more fragmented areas within the species' ranges (Flaspohler et al., 2001; Robinson et al., 1995).

The Selected Alternative, like Alternatives 3-9, provides a greater long-term decrease in aspen compared to Alternatives 1 and 2. The effects of this decrease are compounded by similar or greater declines in aspen on non-industrial private lands in Wisconsin. This could result in continued downward trends for birds such as ruffed grouse and many neotropical songbirds that utilize shrub/sapling habitat. The ruffed grouse has well-recognized cyclic populations, but is also showing a long-term decrease in population in Wisconsin due to declining aspen acreage (USDA FS 1998f). Studies have noted declines in a number of songbirds utilizing shrub/sapling habitat (Hunter et al., 2001; Askins, 1993; Smith et al., 1993). A number of these species are tied more closely to lowland shrub habitat than regenerating aspen, although they use aspen for nesting and feeding. If there is a continued decrease in aspen on the forest and on other ownerships, these types of birds will lose some habitat, although lowland shrub habitats will not be affected in the same way.

White-tailed deer are closely tied to early successional types like aspen. However, deer populations are closely tied to other factors such as hunter success and winter severity. There is the potential for a decrease in long-term deer populations in the National Forests under these alternatives, but these effects could be masked by milder winters, a decrease in hunter interest or success, or management activities on nearby private land.

The introduced elk herd is known to favor aspen in fall and to a lesser degree in winter (John Schmidt, unpublished data). The elk herd core range and buffer range is limited to

the Great Divide district, a small portion of the Washburn district, and some private and county lands adjacent to the Chequamegon Forest. The cumulative effects analysis area for elk will only include the core and buffer ranges, since the current Management Plan and Environmental Assessment for the Clam Lake Elk Herd (WDNR, 2000b) focuses primarily on these areas. The core range includes large areas of aspen emphasis in all alternatives, although even in this area a decrease in aspen coverage is projected in some alternatives (including the Selected Alternative). Over 10 years there would not be substantial changes in aspen amounts or other favored types in the core range or cumulative effects area. However, over 100 years there could be more substantial changes in habitat availability, assuming management direction stayed the same. In the core range, fall and winter habitat could be affected by decreases in aspen, with the greatest impacts seen in Alternatives 3, 4, and 9. Long-term habitat changes within the larger cumulative effects area would probably be similar to those within the core range. A more detailed analysis of elk habitat in relation to revision alternatives can be found in Appendix L.

Alternatives 2-9 and the Selected Alternative propose similar amounts of surrogate barrens (from 10,000 to 13,000 acres). Because of the specialized management required to maintain Pine Barrens, most existing and potential barrens habitat is on public lands. For example, the General Assessment for Fish and Wildlife (USDA FS 1998f) found one third of statewide suitable habitat for sharp-tailed grouse is found on the Chequamegon-Nicolet. One of the threats to this species and other barrens wildlife is isolation of populations. These alternatives alleviate this problem by managing more acreage for barrens and surrogate barrens on National Forest land, thereby offering more contiguous habitat together with other ownerships.

Alternatives 2-9 and the Selected Alternative designate substantially more acreage for non-motorized recreation emphasis, including areas of proposed Wilderness. The Chequamegon-Nicolet already offers the most Wilderness management in the state. As areas outside the Forests are developed and motorized recreation increases, these additional non-motorized areas could offer an important refuge for species affected by high disturbance levels. Even species with currently stable populations could be affected throughout northern Wisconsin in the future by increased disturbance, motorized access, and legal and illegal hunting and trapping. Therefore, this management change could have beneficial cumulative impacts not just on the National Forest but throughout northern Wisconsin on species such as the gray wolf, black bear, bobcat, American marten, northern goshawk, and spruce grouse.

Species of Viability Concern

Introduction

The ecological conditions that contribute to the long-term abundance and distribution of species that are federally listed as Threatened or Endangered, species that are Regional Forester Sensitive Species, and Management Indicator Species are subjects of great concern to the Forests. This section reviews the current conditions for those species, the current management direction(s) for them (if any), the proposed changes and range of changes based on proposed Standards and Guidelines, the direct and indirect effects of Alternative Plans given those Standards and Guidelines, and the estimated cumulative effects on the respective species.

The process used to assess population trends and determine the potential impacts on those populations involved first identifying key factors affecting the respective species, both in

terms of habitat needs and potential negative anthropogenic effects. The key factors for animal species and the groups of plant species associated with habitat types are given in Appendix J. Plants were identified as having habitat affinities because such groupings helped address management needs and because, for many species, there is very little information available other than suggested habitat affinities. Indicators were then identified; indicators are quantifiable elements that represent the statuses of key factors, such as acreage of jack pine 30 years old or greater. The program "SPECTRUM" generated values of such indicators with projections at 10 and 100 years. The overall process is presented in a process paper (Granholm, *in litt*.). Cumulative effects determinations for animals are individual species determinations (Appendix J), but the known and projected effects on species are also reflected in this section in terms of groups of species, where appropriate.

Current Condition

Current conditions are the existing affected environment described below.

Threatened and Endangered Species

Gray Wolf

As of April 1, 2003, the wolf is listed as federally threatened in Wisconsin. The process to drop the wolf from the federal list began in 2003. In 1999, the Wisconsin Department of Natural Resources (WDNR) reclassified the wolf from state endangered to state threatened. Wolves are found in all geographic units of the Chequamegon, and are now found in limited numbers in the northern portion and extreme southern portion of the Nicolet, due in part to the relocation of problem wolves to that area by the WDNR. Threats to wolves include illegal shooting, road mortality, and disease. The Forests will continue to consult with the Fish and Wildlife Service concerning gray wolf, and will participate in region-wide assessments.

Bald Eagle

The bald eagle is listed as federally threatened. Eagles breed throughout the Forests where there is a combination of fish-producing lake and stream systems, super-canopy nest trees, and relatively low disturbance levels. Some birds leave the area for a short time during winter, but some stay in the area year-round, feeding primarily on carcasses in winter. Bald eagles have been gradually increasing both statewide and forestwide for the past several decades. Threats to eagles include pollution and toxins, illegal shooting, road mortality, habitat degradation, and changes in prey base (fish). The Forests will continue to consult with the Fish and Wildlife Service concerning bald eagle, and will participate in region-wide assessments.

Canada Lynx

The Canada lynx (*Lynx canadensis*) was federally listed as Threatened on March 24, 2000, with an effective date of listing of April 24. The species occasionally occurs in forested areas of northern Wisconsin but is not thought to have a resident population there (US Fish and Wildlife Service, 2003a).

In a letter dated April 28, 2000, the US Fish and Wildlife Service (FWS) stated that the presence of resident lynx on the Forests is unlikely and listed reasons to support this determination. They included the rarity of lynx taken during land trapping, rare encounters by hunters with hounds, rare sighting of tracks or individuals, the coincidence

of the few sightings within the last 50 years with periods of peak populations in Canada, and lack of forest types generally associated with lynx populations.

The *US Fish and Wildlife Service Biological Opinion On the Effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada Lynx* concluded that the Chequamegon-Nicolet National Forests were "found to lack sufficient or adequate lynx habitat and lacked evidence that resident lynx populations were present or that lynx occurred persistently over time" (USFWS, 2000, p. 3). In addition to other studies, this opinion was based on consideration of the Canada Lynx Conservation Assessment and Strategy (Ruediger et al., 2000) which detailed the effects of National Forest land and management plans on Canada lynx in the contiguous United States.

Weiland (2002) summarized contributions to the *Biological Opinion*, including the following: 1) There is an insufficient snow pack, an indicator of suitable lynx habitat; 2) Bobcats may competitively exclude lynx in Wisconsin; and 3) Classic lynx habitat is and was historically limited in Wisconsin and it is unlikely that present forest types on the Chequamegon-Nicolet National Forests could sustain lynx populations. Weiland (2002) also reported that no lynx had been detected on the Forests during the National Lynx Detection Protocol 1999-2001 during which attempts were made to secure hair samples for DNA analyses by the use of scent attractants and hair snags.

The Forests will continue to consult with the Fish and Wildlife Service concerning lynx and will participate in region-wide assessments.

Kirtland's Warbler

Kirtland's warbler (*Dendroica kirtlandii*) was federally listed as an Endangered Species in 1973. With the exception of one nesting record in Ontario in 1945 (Speirs, 1984), the known breeding range is confined to 13 counties in the north-central area of the Lower Peninsula. Since 1995, there has been a small breeding population in the Upper Peninsula (Weinrich, 1996).

Singing males have been located in Wisconsin, summarized by Trick (*in litt.*, 2002). There was a peak of seven individuals in 1988. There have been no documented birds since 1998. The 10 Wisconsin counties, each with one or more documented males, are Marinette, Florence, Forest, Oneida, Vilas, Price, Iron, Ashland, Sawyer, and Bayfield. There are no records of Kirtland's warblers on the Forests.

Breeding habitat for Kirtland's warbler is large, relatively homogenous stands of jack pine with scattered small openings. Most nests are found in stands greater than 80 acres. Warblers colonize a site when jack pine trees are 5 to 7 feet high, an average age of 5 to 8 years old. Breeding tapers off as trees grow larger and there is less contact of lower branches with the ground. This specific nesting habitat is the limiting factor for the species (Byelich et al., 1976, rev. 1985).

There are currently an estimated 20,494 acres of jack pine 0-19 years old on the Forests. There are very large tracts of jack pine, e.g., 600-800 acre tracts on the Bayfield sand plain. There is no proposed management direction for this species.

Fassett's Locoweed

Fassett's locoweed (*Oxytropis campestris* v. *chartacea*) is currently the Chequamegon-Nicolet National Forests' only federally listed plant species. There have been two known sites on Forest property. One site was extirpated in the 1920s and returned in the 1990s

on adjacent private land. Since then it was again extirpated due to a high water period that has damaged the site. However, there is a potential for reoccurrence at this site when the water levels recede. The other site is in good health and the population is expanding, with up to 10,000 individuals.

Species on the Regional Forester's Sensitive Species List

A Regional Forester Sensitive Species (RFSS) is a species of plant or animal from one or more National Forests or Grasslands that is officially designated as such by one or more Regional Foresters on the basis of 1) a decline in numbers or occurrences and evidence indicating that it could be proposed for federal listing as threatened or endangered if action is not taken to reverse or stop the downward trend; and/or 2) continual degradation or loss of its habitat that may result in population declines leading to federal listing as threatened or endangered if action is not taken to reverse or stop the decline; and/or 3) a population or habitat that is stable but limited.

Plants

The Chequamegon-Nicolet National Forests are on the edge of the geographic ranges of many RFSS plants. Experts on the Species Viability Evaluation (SVE) panel concluded that many of these species have always been rare in this area and may continue to be rare despite management decision by the Forest (SVE, 2002). However, this highlights the need for protecting edge-of-range species to conserve genetic diversity that may occur in individuals surviving in this area (see Appendix J, Biological Evaluation RFSS Plants for more information).

RFSS plants were grouped by general habitat preference. Due to the programmatic nature of the Forest Plan, this grouping approach was determined to be the most efficient method of communicating differences among the proposed alternatives on plants. Also, since little information exists about many of the RFSS plant species, there was insufficient information to consider some species individually among alternatives.

In general, RFSS plant habitat quantity, habitat quality, and population trends are either decreasing or stable on the current Forest landscape. The determinations given for all habitat groups are mostly "MINT" (may impact individuals but not likely to cause a trend to federal listing or loss of viability). A few determinations are "NI" (no impact) on the Chequamegon landbase (Alternative 1) and a few are "BI" (beneficial impact) on the combined Chequamegon-Nicolet (Alternatives 3, 4, and 9).

Animals

Presently, 27 animal species on the Regional Foresters Sensitive Species (RFSS) list have been documented and identified on the Chequamegon-Nicolet National Forests. Four other listed species possibly occur on the National Forests because of habitat presence, but no occurrences were documented. Table 3-30 shows habitat associations for the 31 RFSS that occur or possibly occur on the Chequamegon-Nicolet. As shown, 29 of these species are associated with the following four broad associations: interior hardwoods, brushlands and barrens, riparian and aquatic, and upland and lowland conifer. The remaining two species are not closely associated with any of the four categories and were considered separately.

Table 3-30. Regional Forester's Sensitive Animal Species Habitat Associations

Species	Interior Hardwoods	Brushland and Barrens	Riparian and Aquatic	Upland and Lowland Conifer	Considered Individually
Northern goshawk	X				
LeConte's sparrow		X			
Red-shouldered hawk	X				
Black tern			X		
Trumpeter swan			X		
Spruce grouse				X	
Connecticut warbler				X	
Black-backed woodpecker				X	
Sharp-tailed grouse		X			
Upland sandpiper		X			
Swainson's thrush					X
Cerulean warbler	X				
American marten	X				
Wood turtle			X		
Lake sturgeon			X		
Greater redhorse			X		
Pugnose shiner			X		
Ellipse mussel			X		
Henry's elfin butterfly		X			
Northern blue butterfly		X			
Brown arctic butterfly		X			
Tawny crescent butterfly		X			
West Virginia white butterfly	X				
Extra-striped snaketail dragonfly			X		
Pygmy snaketail dragonfly			X		
Zebra clubtail dragonfly			X		
Green-faced clubtail dragonfly			X		
Northern myotis bat	X				
Eastern pipistrelle bat	X				
Bullhead mussel			X		
Forcipate emerald dragonfly					X
Total	7	7	12	3	2

Interior hardwoods associated species. The seven species in this group are closely associated with northern hardwood forests, especially large unfragmented patches. Presently, there are approximately 447,000 acres of northern hardwoods within the CNNF, 15% of which occur in patches 100 acres or larger. See the *Current Condition* section for *Landscape Patterns*.

Considerable work was done on the northern goshawk, red-shouldered hawk, and American marten because they are Management Indicator Species associated with another Management Indicator (Mature Northern Hardwood Interior Forest). Additionally, one is state listed as Threatened, another is state listed as Endangered, and the third is federally listed by the Fish and Wildlife Service as a Species of Concern and

is state listed as a Species of Special Concern. All three are listed as Regional Forester Sensitive Species (USFS).

Northern goshawk. The goshawk is listed by the FWS as a Species of Concern and the State of Wisconsin as a Species of Special Concern. It is found at low densities throughout the Forests, although numbers are generally higher on the Nicolet. Although nesting territories can be found in a variety of forest types including pine, aspen, and northern hardwoods, this species prefers larger blocks of mature, closed-canopy forests with a variety of structural features. Threats include loss of nest sites, collection for falconry, and increased predation by great-horned owl and fisher.

Red-shouldered hawk. The red-shouldered hawk is state listed as Threatened. Like the goshawk, it is found at low densities throughout the Forests, although numbers are higher on the Nicolet, especially in the southern portion. The species is often described as a bottomland forest species. However, on the Chequamegon-Nicolet it is often found in mature upland forests with continuous canopy and some conifer present. Most nest sites are close to open wetlands or small openings. Threats include competition from more open-dwelling raptors such as great-horned owl and red-tailed hawk, predation from mammals such as raccoon and fisher, and disturbance or loss of nesting areas.

American marten. The marten is state listed as Endangered. Marten were recently reintroduced to both the Chequamegon and Nicolet, but have been slow to expand their range, especially on the Chequamegon. Currently, they are found only near the original release sites. Marten lack strong dispersal capabilities which have been further diminished by fragmentation of suitable habitat. Habitat continuity is therefore important, along with structural features such as large woody debris, large cavity trees, and tip-up mounds.

Brushlands and barrens species. The seven species in this group are closely associated with brushland and/or pine barrens. Presently, there are 12,800 acres of this habitat within the CNNF: 4,800 acres in the Riley Lake Wildlife Management Area and 8,000 acres in the Moquah Barrens Area.

Riparian and aquatic species. The 12 species in this group are closely associated with riparian and/or aquatic habitats. See *Aquatic, Riparian and Wetland Ecosystems* section for more detail on the current condition of riparian and aquatic resources.

Upland and lowland conifer species. The three species in this group are closely associated with upland and/or lowland conifer. Presently, there is approximately 182,000 acres of lowland conifer habitat on the CNNF. Including the lowland conifer acres, the total amount of habitat currently available to spruce grouse, Connecticut warbler, and black-backed woodpecker is estimated at 254,000 acres, 194,700 acres, and 210,000 acres respectively.

Other species

Swainson's thrush. This species is most closely associated with large tracts of mature hardwood/conifer forest with a conifer understory.

Forcipate emerald dragonfly. This species is most closely associated with bogs and peatlands. Presently, there are approximately 137,000 acres of non-forested lowland, much of which is comprised of bogs and peatlands, within the CNNF.

Management Indicator Communities and Species

Management Indicators are "plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they might represent" (FSM 2620.5, WO amendment 2600-91-5).

Management Indicator Species (MIS) were selected as part of the development and analysis of the existing Chequamegon and Nicolet plans. Eighteen MIS were selected for the Chequamegon and 33 for the Nicolet. There were 40 species selected for the two forests and 11 species common to both lists. Each MIS represents a recognizable habitat category reflecting age and vegetative composition features. Changes in populations of these species are expected to reflect changes in the quality and/or quantity of habitat they represent. Additionally, MIS represent other species with similar habitat needs whose populations increase or decrease with habitat changes.

Specifically, Management Indicator Species are intended to:

- Represent many habitats or ecosystems on the Forests;
- Narrowly associate with specific habitat types;
- Represent a suite of other species also associated with the specific habitat type; and
- Respond through population or other paramenter changes to changes in habitat quality or quantity.

The End-of-Decade Monitoring Report for the two forests (Implementing the Forest Plans, 1986-1996) was unable to make strong conclusions about population changes in MIS because of inconclusive monitoring data. Additionally, the report was unable to associate population changes or trends with changes in habitat quality or quantity. Essentially, some basic assumptions made in the current Forest Plans about habitat specificity, response to change, and the ability to monitor effectively were weak or invalid.

Other publications critiqued the MIS approach and found similar weaknesses. Landres et al. (1988) critiqued the use of vertebrates as "ecological" indicators, questioning the use of one species as a representative of many other species with similar habitat requirements. They concluded there are inherent weaknesses that limit the effectiveness and credibility of using vertebrates as ecological indicators and that these weaknesses are not easily overcome. They suggested using indicators "only when other assessment options are unavailable." Alverson et al. (1994:218-221) criticized selection and monitoring decisions made in the Chequamegon and Nicolet Forest Plans. They specifically criticized the reliance on birds and mammals as MIS, the choice of habitat generalists, monitoring of habitat to assess trends of MIS, and reliance on population trends versus other more important life history parameters. Niemi et al. (1997) questioned the use of bird species as MIS on the Chequamegon National Forest. They concluded most species chosen were not abundant enough to allow meaningful statistical tests of changes in their populations, and few species could truly be associated with specific habitat types, casting doubt on the ability of a few species to serve as indicators for the well-being of many other species.

Management Indicators provide information to the decision-maker because changes in their abundance, quality, or distribution are indicative of the effects of management activities. One of the goals for management of the Chequamegon-Nicolet is to provide

ecological conditions that contribute to the long-term abundance and distribution of species throughout the planning area (36 CFR 219.19). Analyzing the quantity and quality of the selected Management Indicators determines how each alternative meets this goal.

The management indicator communities and species do not differ between the Selected Alternative and Alternatives 2-9. The Selected Alternative and Alternatives 2-9 recognize four Management Indicator Communities and seven Management Indicator Species (MIS). Presented below are the current statuses of the Management Indicator Communities and the MIS that are not already federally listed or Regional Forester Sensitive Species. Existing condition and specific requirements for gray wolf and bald eagle are covered in greater detail in Biological Evaluations and Biological Assessments. Existing condition and specific requirements for northern goshawk, red-shouldered hawk, and American marten are covered in greater detail in the Biological Evaluations.

Management Indicator Communities

The communities selected as indicators for the Selected Alternative and Alternatives 2-9 are reviewed below. Most are degraded due to over-browsing, landscape fragmentation, altered disturbance regimes, exotic species introduction, and forest management practices. Aspen regeneration was included as an indicator because it is an ecosystem of high public concern, both in terms of long-term declines and potential impacts to other resources due to maintenance of this type.

Mature northern hardwood interior forest. There are approximately 446,400 acres of northern hardwood on the Forests. However, much of that acreage is immature and/or highly fragmented, and may be lacking the species and structural diversity more typical of high quality northern hardwood ecosystems. An analysis identified mature northern hardwood interior habitat for the revision process, using 30, 90, and 300-meter buffers around fragmenting features (Roberts and Gustafson, 2002 draft report). “Mature” was defined as 80 years old or more, and included 80+ year old aspen, assumed to convert naturally to hardwood. This resulted in a present condition of approximately 52,000 acres (30 meter buffer), 18,600 acres (90 meter buffer) and 300 acres (300 meter buffer) of mature, interior northern hardwood forest. Some small-scale restoration type activities have occurred in these types on the forest, such as underplanting to increase species diversity. However, many of the acres described as existing mature interior forest are still lacking important features typical of natural northern hardwood ecosystems.

Mature natural red and white pine forest. There are approximately 107,800 acres of red pine and 21,800 acres of white pine on the Forests. However, much of that is immature and/or highly fragmented. Additionally, the majority of red pine acreage originated as plantations and lacks the species and structural diversity typical of high quality natural pine ecosystems. An analysis also identified mature red and white pine interior habitat for the SVE process, using 30, 90, and 300 meter buffers around fragmenting features. “Mature” was defined as 70 years old or more. This analysis resulted in a present condition of approximately 9,200 acres (30 meter buffer), 1,700 acres (90 meter buffer) and 0 acres (300 meter buffer) of mature, interior red and white pine forest. Some small-scale restoration type activities have occurred on the Forests in these types, such as underplanting to increase species diversity. However, many of the acres described as mature interior forest are still lacking important features typical of high quality natural pine ecosystems.

Pine barrens. There are approximately 12,700 acres defined as “open land emphasis” for the SVE process. This includes 5,220 acres in the Riley Lake area and 7,481 acres in

Moquah barrens. The Riley Lake area has a large percentage of wetlands and more limited structural diversity than the Moquah barrens. Although current management at Riley Lake is similar to that used to maintain pine barrens, it cannot be considered a true barrens in terms of ecological conditions or vegetation cover. Characteristics of the Moquah barrens are more typical of a true pine barrens. Recent attempts were made in both areas to restore missing compositional components, including removing exotic plant species, planting native vegetation, transplanting sharp-tailed grouse, and using prescribed fire on a regular basis.

Regenerating aspen forest. There are approximately 111,000 acres of aspen on the Forest between the ages of 0 and 19 years. These young-age aspen areas tend to be fairly fragmented due to regulations that restrict clearcuts to less than 40 acres in size. The vast majority of young-age aspen results from harvest, although some aspen regeneration occurs due to natural disturbance, such as fire or blowdown. Species and structural diversity varies among aspen regeneration areas. Some stands have a fair amount of standing mature trees and snags, downed woody debris, and other species such as balsam fir and hardwood regeneration, while other stands are lacking these features.

Management Indicator Species

Three Management Indicator Species—northern goshawk, red-shouldered hawk, and American marten—are also Regional Forester Sensitive Species and are discussed in the sections on RFSS.

Two Management Indicator Species, the bald eagle and the gray wolf, are listed by the Fish and Wildlife Service and are discussed under the sections on Threatened and Endangered Species.

The two additional Management Indicator Species discussed here are the brook trout and the Canada yew.

Brook trout. The brook trout is a popular game fish found in cool and cold-water streams and spring ponds on the Forests. There are approximately 463 miles of Class I trout streams on the Forests (Class I streams have self-sustaining trout populations) and 609 miles of Class II trout streams (Class II streams have trout reproduction but sometimes require stocking to maintain fishable populations). In addition to cool water temperatures, brook trout require suitable spawning sites, relatively stable water flow, and structural features such as overhead cover, woody debris, and deeper holes. Threats include loss or degradation of habitat features, elevated stream temperatures, and sedimentation.

Canada yew. Canada yew is not listed by the state as threatened or endangered, and is not listed as a RFSS for the Forests. Information regarding historic distribution is not well documented, but the species was once an important ground cover in much of the northeastern part of the country. Reasons for its decline are not entirely known, but possibilities include deforestation and severe fires a century ago, and over-browsing by white-tailed deer. Canada yew is still a major component of the shrub layer in areas with limited browse pressure, such as islands and the snowbelt south of Lake Superior. The most likely habitat for yew is the northern hardwood type, although it was also found in other forest types. Canada yew is found within the Forests, but at low densities and in a heavily browsed condition. It is more common in the Penokee Range area, perhaps because deeper snows and rugged terrain limit deer browsing or because of historic differences in fire intensity. It is common for sites with Canada yew to be protected from clearcutting or other major disturbances. Many Forest sites have been monitored in past

years to document population size and health, and to determine whether reproduction is occurring. Moderate to heavy browse pressure decreases reproduction by removing the fruiting branch tips.

Current Management Direction

The Current Management Direction is prescribed by the 1986 Forest Plans for the Chequamegon and Nicolet National Forests.

Threatened and Endangered Species

Recovery Plans and Conservation Strategies provide direction for Threatened and Endangered species. This section deals with the three Threatened/Endangered species known to occur on the Forests: gray wolf, bald eagle, and Fassett's locoweed. It also includes Canada lynx and Kirtland's warbler, two species that are known to occur in northern Wisconsin but are not thought to have breeding populations on the Forests. Biological Evaluations are presented in Appendix J. Biological Assessments have been prepared for the Selected Alternative.

Gray Wolf

Management is directed by the Wisconsin Wolf Management Plan (WIDNR, 1999a), and by Forestwide Standards and Guidelines concerning road densities and the protection of denning and rendezvous sites.

The number of wolves on the Chequamegon-Nicolet National Forests is expected to remain stable in areas where they currently exist. As wolves colonize unused suitable habitat, especially on the Nicolet Forest, the population is expected to increase.

Bald Eagle

Forestwide Standards and Guidelines protecting nests and nesting territories direct management activities.

Canada Lynx

There are currently no management directions specific to the Canada lynx in the Nicolet Plan. The Chequamegon Plan, however, has a standard of maintaining or decreasing the miles of road open to public motorized use to limit conflicts with lynx.

Kirtland's Warbler

There is currently no management direction specific to Kirtland's warbler in either of the 1986 Plans.

Fassett's Locoweed

In the current Chequamegon Forest Plan there is a Forestwide Standard that states, "Sites where plants classed as endangered, threatened, or watched will be protected according to the management recommendations in the WDNR 'Field Survey Report of Endangered, Threatened, and Rare Vascular plants of the Chequamegon National Forest, 1981.'" In addition to the WDNR recommendations, there is a Fassett's Locoweed Recovery Plan (U.S. Fish and Wildlife Service, 1991) currently used for locoweed site management. The Recovery Plan has the following objectives:

1. Protect lake shorelines with populations of Fassett's locoweed, in all cases pursuing the strongest, appropriate method.
2. Develop and initiate management activities, which are necessary to population maintenance.
3. Monitor existing populations.
4. Re-survey lakeshores with historical populations and those with potential habitat during years of low lake levels.
5. Develop and distribute educational materials and give presentations to interested groups concerning Fassett's locoweed and its conservation.
6. Conduct research on selected aspects of the biology and ecology of Fassett's locoweed to determine the best protection and management strategies necessary for long-term population survival.
7. Consider introducing propagules of Fassett's locoweed at locations without extant populations but appropriate habitat, if adequate conservation cannot be achieved through protection of naturally occurring populations.

Other than the previously stated regulations, there currently is no special land management designation of either of the two known locoweed site besides being a rare plant site. Locoweed sites are too small to be recognized by MA allocations, and the sites are protected under authority of the Endangered Species Act.

Species on the Regional Forester Sensitive Species List

Plants

The current Forest Plans (1986) do not provide a conservation strategy for RFSS. We are currently managing to provide ecological conditions for populations only through project level planning. Alternatives 2-9 and the Selected Alternative will allow for conservation strategies on a Forestwide scale.

There is little direction for protection of RFSS plants in the current 1986 Nicolet Forest Plan. In general, there are Standards that outline listing of a species on the RFSS list and the rational for performing Biological Evaluations before projects are implemented. The following species have specific Guidelines in the 1986 Plan: dwarf bilberry, ginseng, calypso, stoloniferous sedge, northern bog sedge, sheathed sedge, ram's head lady's slipper, stygian rush, white adder's mouth, small round-leaved orchid, small purple bladderwort, showy lady's slipper, Missouri rock-cress, rugulose grape fern, Braun's holly fern, foam flower. These Guidelines are fairly limited in their scope and in some cases only refer to the lower density of roads that occur in the area where the species is located.

In the 1986 Chequamegon Forest Plan there are more Standards and Guidelines directly mitigating RFSS plant sites. This regulation includes items such as buffer zones, listing of new species, surveying for sites, compliance with the recovery plan for Fassett's locoweed, limiting use of pesticides in RFSS sites, and limiting possible hydrological effects (for more information see Appendix J, Biological Evaluation RFSS Plants).

As more information became available, the need for an inventory process for rare and threatened plants on the Forests became evident. Therefore, after both plans were published the Forests implemented a screening and inventory process for management projects occurring within federal boundaries. This process screens habitat and includes surveys of possible sites of RFSS plants in proposed project areas. The Chequamegon

and Nicolet landbases receive varying levels of detail for this fine filter protection of species.

Animals

As with plant species, the current Forest Plans (1986) do not provide a conservation strategy for RFSS. We are currently managing to provide for populations only through project level planning and will continue to do so under Alternative 1. Alternatives 2-9 and the Selected Alternative will allow for conservation strategies on a Forestwide scale.

Goals

The 1986 Chequamegon National Forest LRMP (Forest Plan) lists the following goals, which affect sensitive species management:

- Provide the greatest diversity Forestwide for purposes of protecting and maintaining a variety of habitats for all plants and more than 300 species of animals, for purposes of maintaining healthy gene pools, for purposes of controlling insect and disease infestations, and for purposes of meeting a variety of other resource management objectives (Chequamegon LRMP, IV-1).
- Provide vegetative diversity that will support viable populations of native mammals, reptiles, and amphibians (Chequamegon LRMP, IV-2).
- Cooperate with WDNR in reintroduction of the American marten (Chequamegon LRMP, IV-2).

The Nicolet National Forest LRMP lists the following goals, which affect sensitive species management:

- Provide for diversity of plant and animal communities by working toward the desired future vegetative composition, age class distribution, and spatial distribution set forth in the plan (Nicolet LRMP, 21).
- Provide for special non-vegetative habitat requirements consistent with overall planning objectives (Nicolet LRMP, 21).
- Protect and manage species that are endangered, threatened, sensitive, or of special Forest concern so that they can be removed from these categories (Nicolet LRMP, 21).
- Wildlife habitat goals will meet National Forest Management Act (NFMA) requirements to: (1) Maintain viable populations of all species, (2) Improve habitat for Management Indicator Species, and (3) Protect and enhance habitat for endangered, threatened, or sensitive species (Nicolet LRMP, 21).

Standards and Guidelines (Forestwide)

The Chequamegon Plan's Forestwide Standards and Guidelines address the maintenance of minimum viable populations of wildlife species. The Standards and Guidelines also direct the management of double-crested cormorant and common loon, both listed as sensitive species. There are no Standards and Guidelines specific to any of the remaining 20 sensitive species listed in the Chequamegon Plan, or for those species added to the list since the completion of the Plan (Table 3-31). The Chequamegon Plan does identify Forestwide Standards and Guidelines for wetlands, seeps and ponds, dead and down logs, beaver management, small openings maintenance, nesting structures, deer yards, snags and den trees, forage and cover, and old growth. Directly or indirectly, these Standards and Guidelines affect sensitive species populations.

The Nicolet Plan's Forestwide Standards and Guidelines address the maintenance of minimum viable populations of wildlife species and the management of 28 identified candidate sensitive species. There are no Standards and Guidelines specific to any of the species added to the list since the completion of the Nicolet Plan (Table 3-31). The Nicolet Plan does identify management Standards and Guidelines for permanent openings, non-forested wetlands, impoundments, woodland ponds, riparian transition zones, old growth, reserve trees, and artificial nest/den structures. Directly or indirectly, these Standards and Guidelines affect sensitive species populations. The Nicolet Plan references Forest Service Manual 2600: Nicolet Supplements 10, 11, 13, 14, 15, and 18 for additional direction pertaining to management of wildlife populations and habitat.

Table 3-31 lists Sensitive Species from 1986 Forest Plans and species added to the RFSS list since completion of the Plans.

Table 3-31. Species from 1986 Forest Plans and Current Regional Forester's Sensitive Species List

Species	Chequamegon Plan	Nicolet Plan	Current RFSS
American marten	X	X	X
Lynx	X		
Bobcat	X	X	
Wood turtle	X	X	X
Common loon	X	X	
Double-crested cormorant	X		
Osprey	X	X	
Northern goshawk	X	X	X
Cooper's hawk	X	X	
Red-shouldered hawk	X	X	X
Spruce grouse	X	X	X
Sharp-tailed grouse	X		X
Sandhill crane	X	X	
Black-backed woodpecker	X		X
Olive-sided flycatcher	X		
Yellow-bellied flycatcher	X		
Loggerhead shrike	X		
Magnolia warbler	X		
Cape May warbler	X		
Lincoln's sparrow	X	X	
Lake sturgeon	X		X
Tremblay's salamander	X		
Black tern		X	X
Upland sandpiper		X	X
Common merganser		X	
Merlin		X	
Northern harrier		X	
Long-eared owl		X	
Barred owl		X	
Solitary vireo		X	
Eastern bluebird		X	
Grasshopper sparrow		X	
LeConte's sparrow		X	X
Savannah sparrow		X	
Vesper sparrow		X	
Clay-colored sparrow		X	
Blackburnian warbler		X	
Redside dace		X	
Greater redhorse		X	X
Trumpeter swan			X

Species	Chequamegon Plan	Nicolet Plan	Current RFSS
Connecticut warbler			X
Swainson's thrush			X
Cerulean warbler			X
Pugnose shiner			X
Ellipse mussel			X
Henry's elfin butterfly			X
Northern blue butterfly			X
Brown arctic butterfly			X
Tawny crescent butterfly			X
West Virginia white butterfly			X
Extra-striped snaketail dragonfly			X
Pygmy snaketail dragonfly			X
Zebra clubtail dragonfly			X
Green-faced clubtail dragonfly			X
Northern myotis bat*			X
Eastern pipistrelle bat*			X
Bullhead mussel*			X
Forcipate emerald dragonfly*			X
Total	22	28	31
** Species that are not yet known from the Chequamegon-Nicolet National Forests*			

Standards and Guidelines (Management Area)

The existing Chequamegon and Nicolet plans both contain Management Area (MA) direction. However, neither plan contains direction specific to sensitive species listed in the plans or species added to the Regional Forester's Sensitive Species list after the plans were completed. Although not specific to sensitive species, MA direction contained in both Plans does directly affect their habitat.

Northern goshawk. Management activities focused on protecting nesting trees and the immediate area around the nest site.

Red-shouldered hawk. Management activities focused on protecting nest trees and the immediate area around the nest site.

American marten. Management activities focused on maintaining large areas closed to dry-land trapping, and on providing structural features through snag and den tree retention.

Management Indicators

Currently, there is no formal plan providing for landscape scale Mature Northern Hardwood Interior Forest, Mature Natural Red and White Pine Forest, or Regenerating Aspen Forest. Management of Pine Barrens addresses primarily the Moquah barrens and Riley Lake area. There are no Standards or Guidelines protecting Canada yew populations or their habitat management.

The species recognized as Management Indicator Species (MIS) in the 1986 Plans for the Chequamegon National Forest and the Nicolet National Forest, respectively, are listed in Table 3-32.

Brook Trout

The overall quality of trout habitat improved over the current planning period due to beaver management, in-stream habitat improvement projects, and a gradual improvement in riparian habitat conditions. The brook trout is an excellent indicator for the relatively

few species found in cold-water communities. Management activities are directed by Forestwide Standards and Guidelines that protect riparian areas, encourage mature, long-lived riparian forests, and guide stream restoration and beaver management.

Table 3-32. Management Indicator Species on the respective 1986 Forest Plans

Common Name	Listing for the CNF	Listing for the NNF
Common loon	X	X
Thirteen-lined ground squirrel	X	X
White-tailed deer	X	X
Ruffed grouse	X	X
Pileated woodpecker	X	X
Pine warbler	X	X
Blackburnian warbler	X	X
Barred owl	X	X
Brook trout	X	X
Bald eagle	X	X
Gray wolf	X	X
Spring peeper	X	
Ring-necked duck	X	
Common yellowthroat	X	
Sharp-tailed grouse	X	
Brown creeper	X	
Olive-sided flycatcher	X	
Muskellunge	X	
Eastern gray squirrel		X
Beaver		X
Bobcat		X
Wood duck		X
Spruce grouse		X
Northern three-toed woodpecker		X
Downy woodpecker		X
Red-eyed vireo		X
Black-throated green warbler		X
Ovenbird		X
Scarlet tanager		X
Common raven		X
Song sparrow		X
Chestnut-sided warbler		X
Lincoln’s sparrow		X
Marsh hawk		X
American bittern		X
Sedge wren		X
American woodcock		X
Great crested flycatcher		X
Eastern bluebird		X
Largemouth bass		X

Proposed Changes and Range of Changes

This section presents the Proposed Changes and Range of Changes for Alternatives 2 through 9 and the Selected Alternative.

Threatened and Endangered Species

Bald Eagle

The Forests will continue to consult with the Fish and Wildlife Service concerning bald eagles and will participate in region-wide assessments. Forestwide Standards and Guidelines protecting nests and nesting territories direct management activities.

Canada Lynx

The Forests will continue to consult with the Fish and Wildlife Service concerning lynx and will participate in region-wide assessments.

Gray Wolf

The Forests will continue to consult with the Fish and Wildlife Service concerning gray wolves and will participate in region-wide assessments. Forestwide Standards and Guidelines concerning road density and protection of wolf den and rendezvous sites as well as the Wisconsin Wolf Management Plan (WDNR, 1999a) direct management.

Kirtland's Warbler

There is no proposed management direction for this species. Alternatives 2-9 and the Selected Alternative provide for the maintenance, management, and increase of Pine Barrens as a Management Indicator Community. These and surrogate pine barrens (MA 4C) may provide habitat for this species.

Fassett's Locoweed

In the 2004 Forest Plan, both sites known to support or to have supported populations of Fassett's Locoweed will be designated as Ecological Reference Areas. One site is completely on National Forest land. The other is on a lakeshore, only one-third of which is National Forest land. Consequently, not all potential habitat will be protected by Forest regulations.

In addition to the land management designation, in the Forest Plan the following Standard was specifically created to manage the Fassett's locoweed sites: "Protect and manage all known plant sites utilizing direction from the Fassett's Locoweed Recovery Plan (U.S. Fish and Wildlife Service, 1991). All land use activities (except population monitoring and those activities necessary to protect the site) will be excluded from water's edge to the high water mark and within a buffer zone 200 feet inland from the high watermark of locoweed populations."

Species on the Regional Forester Sensitive Species List

Under Alternatives 2-9 and the Selected Alternative, the designation of Ecological Reference Areas protects plant RFSS sites. Compared to the current condition, the addition of these areas would almost double the protection to element occurrences of RFSS plants in any of the proposed alternatives (see Appendix J-Biological Evaluation RFSS Plants, for more details). In addition to the proposed land allocations, the

Forestwide Standards and Guidelines in the Forest Plan protect sites inhabited by RFSS plants in all kinds of habitat. Protection (standards and guidelines) for animal species on the RFSS list are provided in Chapter 2 of the Forest Plan. Further protection to animal RFSS is provided through land allocations (MA designation) and Management Area-specific standards and guidelines.

Management Indicator Communities and Species

The Notice of Intent to revise and combine the Chequamegon and Nicolet Forest Plans (1996) called for changes to the Management Indicator Species (MIS) process and suggested ways in which MIS selection and monitoring might be improved. Recent proposed revisions of the planning regulations do not describe MIS use. However, revision of the 1986 Forest Plans was done under the existing 1982 National Forest Management Act (NFMA) planning regulations. New information and ideas can be incorporated into the selection process, but the Forests are required to meet at least the minimum requirements of 1982 regulations.

Existing planning regulations describe categories of species to be considered for MIS. 36 CFR 219.19 includes the following categories: state and federally listed threatened and endangered plants and animals; species with special habitat needs that might be influenced by Plan activities; species commonly hunted, trapped, or fished; non-game species of special interest; and species selected because their population changes indicate the effects of management activities on other species or on water quality. Language in FSM 2621 (WO amendment 2600-91-5) expanded MIS to include Management Indicators, which can include species, species groups, or habitats of high concern. These Management Indicators support the recovery of federally listed species, provide continued ecological conditions that contribute to the long-term abundance and distribution of sensitive species, and enhance management of wildlife and fish for various values or uses.

In 1997, an interdisciplinary team of Forest specialists evaluated 52 animal species and approximately 68 plant species for their potential as MIS, using a standard form that included a number of evaluation criteria. Included in the evaluation were federally listed species, all species listed as Regional Forester Sensitive Species (RFSS) or Forest special concern at that time, as well as some species of special interest. In the summer of 2002, additional species were considered, including recent additions to the RFSS list; species commonly hunted, fished, trapped, or harvested (including plant species); and species discussed as part of the Species Viability Evaluation process. Evaluation criteria were expanded to include more recent Regional guidance. Documentation provided in the Planning Record lists all species evaluated as potential MIS, together with how well they met evaluation criteria.

Final selection of Management Indicators took the limitations of using single species to represent a wide range of habitats and species into account. The overall approach chosen was to use a limited number of MIS, together with “Management Indicator Communities.” The use of communities as indicators is consistent with Manual direction and can more efficiently meet requirements to meet broad objectives for associated wildlife and plant communities. Species and communities chosen as indicators are the same for Alternatives 2-9 and the Selected Alternative.

The choice of which species to use as indicators was based in part on how each species met the various selection criteria. There was no attempt to develop a list of MIS representing the full range of ecosystems, communities, or habitat types on the Forests;

most habitat types do not have a MIS associated with them. Most MIS were selected either to meet a limited objective of maintaining ecological conditions that contribute to the long-term abundance and distribution of species or to enhance recovery for those individual species listed as threatened, endangered, or sensitive.

The choice of communities as indicators was based on levels of public and management concerns. The Species Viability Evaluation process identified 27 communities of concern for the Chequamegon-Nicolet National Forests, such as red/white pine, riparian zones, lakes with fluctuating shoreline, and rock outcrops. A smaller number of communities were identified as degraded in the "Analysis of the Management Situation: Ecosystem Restoration (USDA FS 2000c). In choosing indicator communities, we started with those included on these lists then narrowed the selection to those communities for which management objectives and Standards and Guidelines were developed as part of the Plan revision process. The use of these communities as indicators allows us to compare the effects of the various alternatives and to monitor the effectiveness of Plan activities in restoring the health of communities and in reaching Plan objectives.

The use of Management Indicators in general is not designed to be an all-encompassing biological monitoring program. Instead, it is only one part of a comprehensive inventory and monitoring program associated with Forest Plan revision and implementation. For example, a wide variety of other plant and animal species, as well as communities and conditions, will be evaluated and monitored to address issues outside of the Management Indicator framework. Selected Management Indicators are presented in Table 3-33.

Table 3-33. Selected Management Indicators and Associated Species or Conditions of Interest

Management Indicators	Species of Interest or Other Conditions Associated with Management Indicators
Mature northern hardwood interior forest	Red-eyed vireo*, black-throated green warbler*,least flycatcher*, eastern wood-pewee*, red-backed salamander, barred owl, hemlock, yellow birch, American marten
Mature natural red/white pine forest	Pine warbler*, blackburnian warbler*, red-breasted nuthatch*, white pine regeneration
Pine barrens	Clay-colored sparrow*, vesper sparrow*, Brewer's blackbird*, brown thrasher*, eastern towhee*, sharp-tailed grouse, *Botrychium rugulosum*, brown arctic butterfly, upland sandpiper
Regenerating aspen forest	House wren*, chestnut-sided warbler*, indigo bunting*, white-tailed deer, American woodcock, ruffed grouse
Gray wolf	Support recovery of federally listed species
Bald eagle	Support recovery of federally listed species
Northern goshawk	Viability concerns; landscape level habitats
Red-shouldered hawk	Viability concerns; landscape level habitats
American marten	Viability concerns; landscape level habitats
Brook trout	Cold-water stream community
Canada yew	Browsing pressure

** Species of interest*

Some species of interest, indicated by "*" in Table 3-33, are associated with Management Indicators based on "Indicator Value Analysis." The Natural Resources Research Institute (NRRI, University of Minnesota, Duluth) developed these species lists based on a process developed by Dufrene and Legendre (1997) using data from the annual Chequamegon breeding bird survey. This process assigns a value to species based on both specificity (uniqueness to a particular forest cover type) and fidelity (frequency within that cover type). The higher the value, the better a species is an indicator of that cover type.

Direct and Indirect Effects

This section describes direct and indirect effects of Alternatives 1-9 and the Selected Alternative on federally-listed species, RFSS, and management indicators. Key factors and population trends are presented in Appendix J, where Determinations are given in terms of No Impact, Beneficial Impact, May Impact Individuals but Not Likely to Cause a Trend to Federal Listing or Loss of Viability, and May Impact Individuals and Likely to Result in a Trend to Federal Listing or Loss of Viability. Direct and indirect effects are summarized here.

Threatened and Endangered Species – Direct and Indirect Effects

This section deals with the three Threatened or Endangered species known to occur on the Forest: bald eagle, gray wolf, and Fassett's locoweed. It also includes Canada lynx and Kirtland's warbler, two species that are known to occur in northern Wisconsin but are not thought to have breeding populations on the Forests. Biological Evaluations are presented in Appendix J. Biological Assessments have been prepared for the Selected Alternative.

Gray Wolf

All alternatives, including the Selected Alternative, provide suitable vegetation cover types for wolves and their prey. Forestwide Standards and Guidelines protect wolf den and rendezvous sites by restricting land use activities (i.e. tree harvest, use of existing roads or trails, etc.) and prohibiting the construction of new roads and trails. However, there are some differences between alternatives in terms of areas allocated to non-motorized recreation. This could affect key habitat factors of overall road densities and disturbance of potential denning and rendezvous sites. Chequamegon wolf populations have been stable and will likely remain that way under all alternatives, with reproduction making up for natural or human-caused mortality. However, colonization by wolves on the Nicolet has been slow. Pack activity was documented in December 2002 but remains low (Wydevin et al. 2003). Alternatives providing more non-motorized areas could benefit the wolf and possibly result in a more rapid Nicolet recovery due to lower levels of human access and reduced potential for illegal shooting or trapping. Amount of non-motorized areas in the alternatives, from most to least, are as follows: 4 – 3 – 7 – 6 – 9 – 5 – Selected Alternative – 2 – 1 (Figure 3-41).

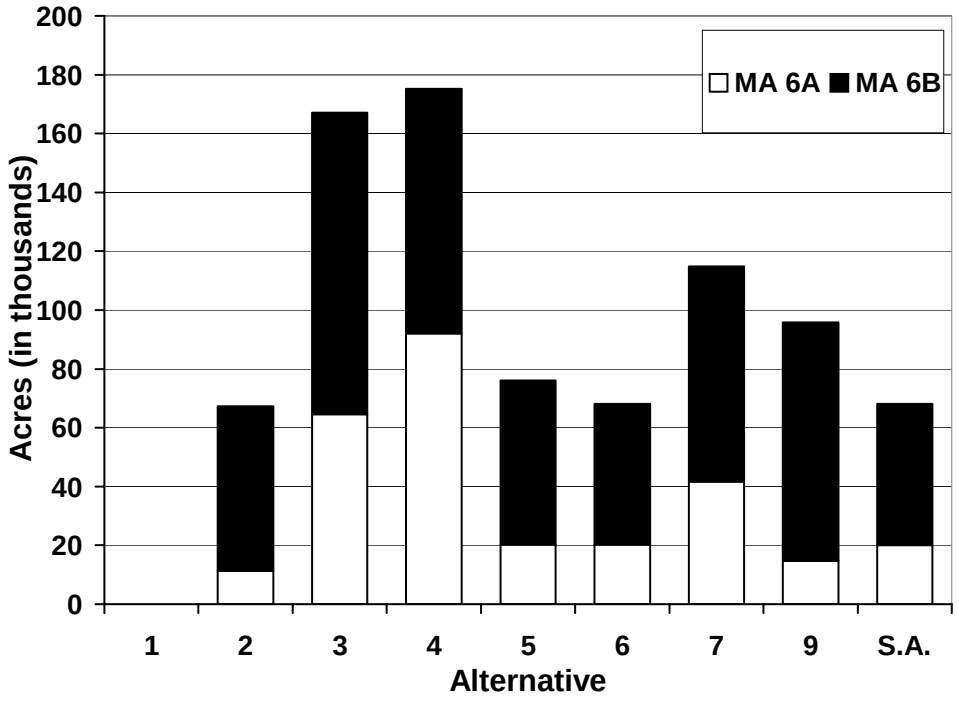

Figure 3-41. Total Area of SPNM (MA 6A and 6B) by Alternative.

The number of wolves on the Chequamegon-Nicolet National Forests is expected to remain stable in areas where they currently exist. As wolves colonize unused suitable habitat, especially on the Nicolet landbase, the population is expected to increase. Compared to Alternatives 2-9 and the Selected Alternative, wolves may increase at a slower rate and rise to lower levels under Alternative 1 because of higher open road density and greater off-road vehicle access.

Bald Eagle

Stable or increasing populations are predicted for all alternatives, including the Selected Alternative. Habitat requirements for eagles include large productive lake and river systems with low disturbance levels and adequate white pine (favored) super canopy nest trees. Standards and Guidelines protect all known eagle territories on the Forests, in all alternatives. Standards and Guidelines common to Alternatives 2-9 and the Selected Alternative also protect aquatic and riparian habitats and encourage management of white pine. There are some minor differences in management among alternatives. Water bodies greater than 10 acres located within non-motorized areas range from a low of 1,700 acres (Alternative 1) to 6,060 acres (Alternative 4) (Table 3-9 in the "Present and Future Actions" discussion in "Terrestrial Ecosystems Components"). However, the habitat area available in non-motorized areas does not appear to be a limiting factor, especially as eagles become more tolerant of humans. There are also differences among alternatives in allocation of MAs 2B and 4B, both of which have additional white pine management guidelines. However, MA 2B and 4B allocations are not expected to result in any noticeable differences in overall quality of nesting habitat Forestwide.

Canada Lynx

None of the alternatives preclude habitat maintenance for lynx or the maintenance of corridors for their movements.

Kirtland's Warbler

Alternatives 2-9 and the Selected Alternative provide for the maintenance, management, and increase of Pine Barrens as a Management Indicator Community. These and surrogate pine barrens (MA 4C) may provide habitat for this species.

The amount of jack pine acreage aged 0-19 years after 10 years is shown for each alternative in Figure 3-42. The total ranges from a low of 19,860 acres (Alternative 3) to a high of 23,080 acres (Alternative 2). The Selected Alternative is projected to provide 22,910 acres of young jack pine in ten years (Figure 3-42).

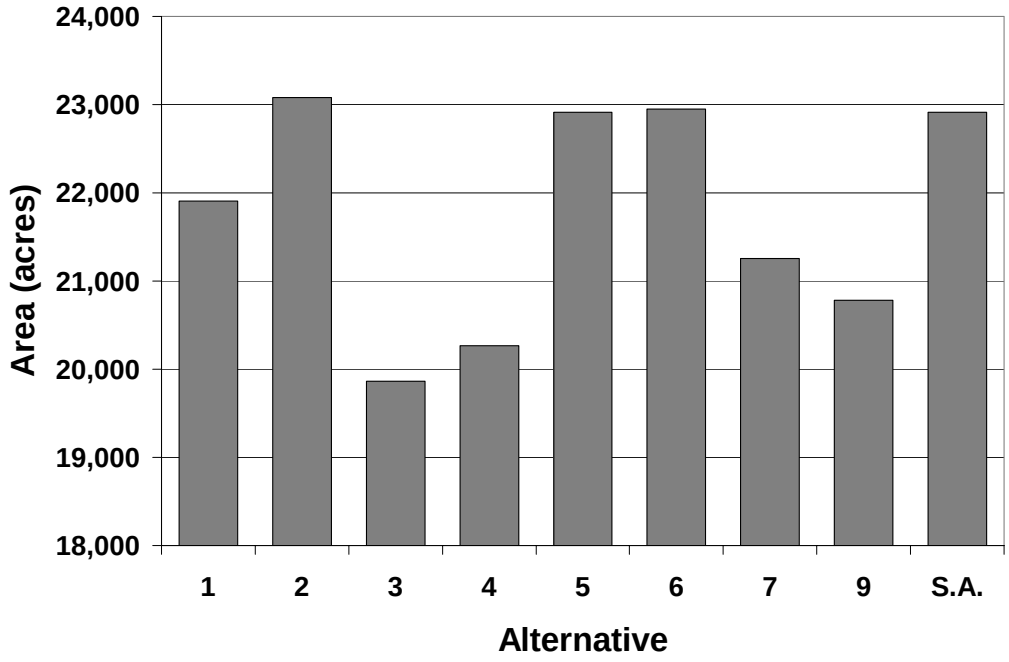

Figure 3-42. Jack Pine Acreage Aged 0-19 Years Across Alternative Plans at the End of 10 Years

Fassett's Locoweed

In Alternatives 2-9 and the Selected Alternative, Fassett's locoweed sites are not expected to be affected by any kind of forest management because the sites are designated as Ecological Reference Areas and because of Forestwide Standards protecting the species. Population monitoring and protection activities will continue on the sites, but all other activities are prohibited.

Species on the Regional Forester's Sensitive Species List – Direct and Indirect Effects

Plants

The determinations for all alternatives across all habitat groups are 'MINT' or better (MINT= may impact individuals but not likely to cause a trend to federal listing or loss of

viability). In three habitat groups (i.e., Forested Wetland, Mesic Forest, and Cliff/Talus/Rock), Alternatives 3, 4, and 9 were given the determination of 'BI' (BI=beneficial impact). For more details see Appendix J, Biological Evaluation RFSS Plants.

Overall, no direct effects are expected due to the mitigations that occur under Forestwide Standards and Guidelines to protect known sites. However, indirect effects such as deer herbivory, beaver damage, illegal ATV use, and competition from Non-native Invasive Species may be lessened in the Selected Alternative because of its emphasis on interior forest. However, Alternatives 3, 9, and 4 place a greater emphasis on interior forest conditions than the Selected Alternative (Table 3-20). The Selected Alternative, like other alternatives, emphasizes continuous canopy and minimizes ATV trail and other road construction (see Appendix J, Biological Evaluation RFSS Plants for details).

Animals

Interior hardwoods associated species

Northern goshawk. Stable or increasing populations are predicted for all alternatives. Key goshawk factors include availability of mature interior hardwood and conifer forest, lowland conifer forest, adequate prey base, as well as the social factor of nest site disturbance. Measures common to all alternatives protect known nest sites from excessive human disturbance and from habitat alteration such as clearcutting and road building. Management direction common to the Selected Alternative and Alternatives 2-9 provides more long-term suitable habitat through MA Standards and Guidelines that reduce fragmentation, encourage mature interior forest, and increase structural features such as mature conifer. Implementation of these measures varies by alternative according to MA allocation. For example, Alternatives 3, 4, and 9 provide the greatest area of interior hardwood forest (MA 2B). Under the Selected Alternative, northern hardwoods interior forest accounts for 209,000 acres. Alternative 1 also calls for some long-term habitat improvement through general maturation of hardwood and conifer types, and through existing efforts in project-level habitat improvement.

Alternatives also vary in terms of human disturbance effects. Alternatives with less motorized access, more designated non-motorized areas, and fewer miles of roads and motorized trails provide favorable goshawk habitat. Alternatives 3, 4, and 7 have the greatest potential for reducing human disturbance. Alternative 1 involves no additional non-motorized areas, but continues the practice of closing or decommissioning unnecessary roads. All alternatives, including the Selected Alternative, call for a reduction of road density forestwide.

In summary, Alternatives 1 and 2 likely will result in stable goshawk populations due to nest site protection and a minimum level of habitat improvements. The Selected Alternative and Alternatives 3-9 offer the best potential for population increase because of landscape scale management guidelines and lower levels of motorized vehicle access. Alternatives 3 and 4 are most favorable to the species.

Red-shouldered hawk. All the alternatives predict stable or increasing populations, although there is uncertainty due to the location of the Forests at the periphery of the range of the species. Key factors for red-shouldered hawk include availability of mature closed canopy northern hardwood or mixed conifer/hardwood forest, and interspersed open wetlands as foraging areas. Common measures in all the alternatives include protecting known nest sites from excessive human disturbance and from habitat alterations such as clearcutting and road building. As with the northern goshawk,

improving landscape scale habitat over the long term, through MA Standards and Guidelines, would encourage closed canopy mature hardwood forest, reduce fragmentation, and protect and manage lowland and riparian conifer forests. These MA Standards and Guidelines would only apply to the Selected Alternative and Alternatives 2-9, and would vary by alternative based on allocation of the different MAs. Alternatives 3 and 4 offer the greatest improvement in habitat conditions, particularly due to the allocation of MA 2B. However, it is not known whether this would eventually result in increased populations. Currently, there is suitable habitat unoccupied by red-shouldered hawks, possibly because the Forests are located at the periphery of the range of the species.

Cerulean warbler. Habitat conditions for cerulean warbler are expected to remain stable or improve under all alternatives. With the exception of Alternative 1, all alternatives (especially the Selected Alternative and Alternatives 3-9) provide for interior forest conditions that would be favorable to cerulean warblers. Timber harvesting, which temporarily increases forest fragmentation, would occur under all alternatives, but Standards and Guidelines for MAs 2A, 2B, and 2C that maintain continuous blocks of northern hardwood would apply across the Selected Alternative and Alternatives 2-9.

There are no known breeding populations of cerulean warblers on the Chequamegon-Nicolet National Forests, but there are documented occurrences. Within Wisconsin, this warbler is at the northern periphery of its range, which does not presently include the National Forests (Robbins, 1991). Cerulean warblers are known to have extended their range northward within Wisconsin in the past, but little extension has occurred since 1968 (Robbins, 1991). Suitable habitat is currently available within the National Forests and Standards and Guidelines regarding northern hardwood blocks would apply across the Selected Alternative and Alternatives 2-9.

American marten. Habitat conditions for marten are expected to remain stable or improve under all alternatives. There are two known populations of American marten on the Forest and both of them were introduced. These populations may be too small to be maintained by natural reproduction. Nevertheless, based on habitat conditions, marten populations are expected to remain stable or improve under all alternatives. Key factors concerning marten habitat are landscape scale distribution of mature interior hardwood forest and level of habitat fragmentation, and local scale structure including large and small woody debris and large cavity trees.

For a comparison of interior forest emphasis by alternative see Table 3-20 in the “Direct and Indirect Effects, Biological Diversity” discussion earlier in this section. Alternative 1 does not emphasize additional large blocks of continuous hardwood habitat. However, existing areas of this habitat will likely be maintained, either through existing protected areas or by project level decisions concerning harvest prescriptions. Current examples of this habitat in or near marten populations include the Chequamegon’s Penokee Range, and the Nicolet’s Headwaters Wilderness and Argonne Experimental Forest. Existing Standards and Guidelines provide minimum levels of cavity trees and woody debris. All alternatives maintain existing areas on both landbases that are closed to dry-land trapping in order to protect marten and fisher populations.

West Virginia white butterfly. The amount and quality of West Virginia white butterfly habitat is expected to remain stable or increase under all alternatives. MAs 2A, 2B, and 2C all emphasize northern hardwoods and conditions most closely associated with the West Virginia white butterfly. The combined amount of MAs 2A, 2B, and 2C ranges from 447,000 acres under Alternative 1 to 677,000 acres under Alternative 9. The

Selected Alternative allocates 645,700 acres to MA 2A, 2B, 2C (Figure 3-43). Standards and Guidelines that protect known locations of toothwort, host plant of the West Virginia white butterfly, would apply across the Selected Alternative and Alternatives 2-9. Populations of West Virginia white butterfly are expected to remain stable or increase because the amount and quality of habitat is expected to remain stable or increase.

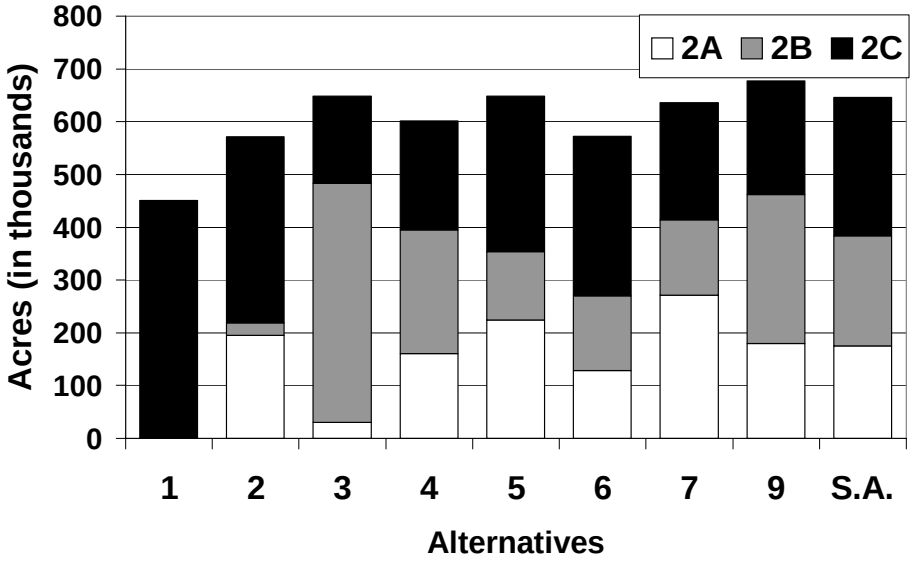

Figure 3-43. Northern Hardwoods Emphasis (MA 2A, 2B, and 2C) by Alternative

Northern myotis. The amount and quality of foraging and roosting habitat for northern myotis bats is expected to remain stable or increase under the Selected Alternative and Alternatives 2-9. Protection of riparian and bottomland forest is likely to benefit this species. There are no documented occurrences on the Forests and little data existing on the current status of their population(s). Management under the Selected Alternative and Alternatives 2-9 is not expected to be detrimental to the species.

Eastern pipistrelle. The amount and quality of foraging and roosting habitat for eastern pipistrelles is expected to remain stable or increase under the Selected Alternative and Alternatives 2-9. There are no documented occurrences on the Forests and little data existing on the current status of their population(s). Management under the Selected Alternative and Alternatives 2-9 is not expected to be detrimental to the species.

Brushlands and/or pine barrens associated species.

LeConte's sparrow. The amount and quality of open habitat suitable for LeConte's sparrow will remain stable or increase under all alternatives. Expansion of the Riley Lake Wildlife Management Area under the Selected Alternative and Alternatives 2-9 would increase suitable habitat by 400 to 1,200 acres. This would provide a large block of contiguous habitat for LeConte's sparrow. The amount and quality of sedge meadow and shallow marsh habitat is closely associated with the number of active and abandoned

beaver ponds. Standards and Guidelines affecting beaver management would apply across the Selected Alternative and Alternatives 2-9. Consequently, the amount and quality of the associated habitats is expected to be the same across these alternatives. LeConte's sparrow populations are expected to remain stable or increase under all alternatives because the quantity and quality of habitat is expected to remain stable or increase.

Sharp-tailed grouse. Sharp-tailed grouse habitat is expected to remain stable or improve under all alternatives. Sharp-tailed grouse habitat is found within the Riley Lake Wildlife Management Area and the Moquah Barrens Area, which combined form MA 8C. The amount of habitat remains at its present level under Alternative 1, but increases by 6,000 to 7,000 acres under all other alternatives. MA 4C, which is intended to serve as surrogate pine barrens, may provide additional habitat for sharp-tailed grouse in the northwestern part of the Chequamegon Forest. Sharp-tailed grouse populations are expected to remain stable or increase under all alternatives because the quantity and quality of habitat is expected to remain stable or increase. In the Selected Alternative the amount and quality of sharp-tailed grouse habitat likely would remain stable within the cumulative effects area. Seven sites outside the National Forests are managed for conditions favorable to sharp-tailed grouse. These sites are on public lands and likely will continue to be managed in this manner. All nine sites within the state are isolated from each other, and this will not change.

Upland sandpiper. The amount and quality of upland sandpiper habitat is expected to remain stable or increase under all alternatives. Upland sandpipers prefer open grassland or barrens habitat. On the Chequamegon Forest this habitat is found within the Riley Lake Wildlife Management Area and the Moquah Barrens Area, which combined form MA 8C. The amount of habitat remains the same under Alternative 1, but increases by 6,000 to 7,000 acres under all other alternatives. Upland sandpiper populations are expected to remain stable or increase under all alternatives because the quantity and quality of habitat is expected to remain stable or increase. In the Selected Alternative the amount and quality of upland sandpiper habitat likely would remain stable within the cumulative effects area. Upland sandpiper habitat includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County, and the eastern region of Wisconsin where this bird is more numerous.

Henry's elfin butterfly. The amount and quality of habitat for Henry's elfin butterfly is expected to remain stable or increase under all alternatives. Henry's elfin butterfly prefers open grassland/brushlands or barrens habitat. On the Chequamegon Forest this habitat is found within the Riley Lake Wildlife Management Area and the Moquah Barrens Area, which combined form MA 8C. The amount of acres allocated to MA 8C remains at its present level of 12,700 acres under Alternative 1, but increases by 6,000 to 7,000 acres under all other alternatives. Populations of Henry's elfin butterfly are expected to remain stable or increase because the amount of habitat is expected to remain stable or increase. In the Selected Alternative the amount and quality of Henry's elfin butterfly habitat likely would remain stable within the cumulative effects area. Suitable habitat within the cumulative effects area includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County.

Northern blue butterfly. The amount and quality of habitat for the northern blue butterfly is expected to remain stable or increase under all alternatives. The northern blue butterfly is known to occur at four sites on the Chequamegon-Nicolet National Forests. It is always found in association with its host plant dwarf bilberry, but the presence of dwarf bilberry does not in itself indicate the presence of the northern blue butterfly (Wolf and

Brzeskiewicz, 2002). Standards and Guidelines to protect and increase populations of dwarf bilberry would apply under the Selected Alternative and Alternatives 2-9. Populations of northern blue butterfly are expected to remain stable or increase because the amount of habitat is expected to remain stable or increase.

Brown arctic butterfly. The amount and quality of habitat for brown arctic butterfly is expected to remain stable or increase under all alternatives. The brown arctic butterfly prefers barrens habitat. On the Chequamegon Forest this habitat is found within the Moquah Barrens Area. The Moquah Barrens Area would remain at its present size of 8,000 acres under Alternative 1, but would increase by up to 7,000 acres under all other alternatives. MA 4C, which provides conditions similar to barrens, may also provide habitat for this species. The amount of acres allocated to MA 4C ranges from no emphasis under Alternative 1, 10,000 acres under Alternatives 2 and 6, and 13,000 acres under the remaining alternatives. Standards and Guidelines that protect known locations of the species and maintain habitat would apply in the Selected Alternative and Alternatives 2-9. In the Selected Alternative, the amount and quality of brown arctic butterfly habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County. Populations of brown arctic butterfly are expected to remain stable or increase because the amount and quality of habitat is expected to remain stable or increase.

Tawny crescent butterfly. The amount and quality of habitat for tawny crescent butterfly is expected to remain stable or increase under all alternatives. Tawny crescent butterfly prefers barrens habitat. On the Chequamegon Forest this habitat is found within the Moquah Barrens Area. The Moquah Barrens Area would remain at its present size of 8,000 acres under Alternative 1, but would increase by up to 7,000 acres under all other alternatives. MA 4C, which provides conditions similar to barrens, may also provide habitat for this species. The amount of acres allocated to MA 4C ranges from no emphasis under Alternative 1, 10,000 acres under Alternatives 2 and 6, and 13,000 acres under the remaining alternatives. Standards and Guidelines that protect known locations and maintain habitat would apply in the Selected Alternative and Alternatives 2-9. Populations of tawny crescent butterfly are expected to remain stable or increase because the amount and quality of habitat is expected to remain stable or increase. In the Selected Alternative the amount and quality of tawny crescent butterfly habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County.

Riparian and/or aquatic associated species.

Black tern. The amount and quality of black tern habitat would remain stable under all alternatives. The greatest threat to black terns on the National Forests is nest destruction from fluctuating water levels and wave action caused by motorized watercraft. Standards and Guidelines that apply across the Selected Alternative and Alternatives 2-9 would maintain water levels on impoundments with nesting terns and protect known territories. Habitat within non-motorized areas, which range from 125,000 acres under Alternative 1 to 342,000 acres under Alternative 4, afford increased protection from wave action caused by motorized watercraft. Under the Selected Alternative, 170,500 acres of the Forests are managed for non-motorized use. In spite of this, known tern nesting sites do not occur within existing or proposed non-motorized areas.

Trumpeter swan. The amount and quality of trumpeter swan habitat would remain stable or increase under all alternatives. The increased emphasis on non-motorized areas under

the Selected Alternative and Alternatives 2-9 likely would reduce human disturbance and improve the quality of the habitat. Shallow marshes, closely associated with beaver activity, often provide wetland habitat suitable for trumpeter swans. Standards and Guidelines affecting beaver management would apply across the Selected Alternative and Alternatives 2-9. Consequently, the amount and quality of the associated habitats is expected to be the same under these alternatives.

Wood turtle. The amount and quality of wood turtle habitat is expected to remain stable or increase under all alternatives. Standards and Guidelines that provide greater protection to known and potential nesting sites, as well as Standards and Guidelines general to riparian areas, would apply under the Selected Alternative and Alternatives 2-9. This would improve habitat quality under these alternatives beyond what would be expected under Alternative 1. Wood turtle populations are expected to remain stable or increase because the quality and quantity of habitat is expected to remain stable or increase.

Lake sturgeon. The amount and quality of lake sturgeon habitat is expected to remain stable or increase under all alternatives. The number of deep pools and barriers to migration associated with large warm-water rivers would not change under any of the alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of Best Management Practices (BMPs) that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Lake sturgeon populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Greater redhorse. The amount and quality of greater redhorse habitat is expected to remain stable or increase under all alternatives. The amount of rocky substrate and barriers to migration would not change under any of the alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Greater redhorse populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Pugnose shiner. The amount and quality of pugnose shiner habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Pugnose shiner populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Ellipse mussel. The amount and quality of ellipse mussel habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize

erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Ellipse mussel populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Extra-striped snaketail dragonfly. The amount and quality of extra-striped snaketail dragonfly habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Extra-striped snaketail dragonfly populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Pygmy snaketail dragonfly. The amount and quality of pygmy snaketail dragonfly habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Pygmy snaketail dragonfly populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Zebra clubtail dragonfly. The amount and quality of zebra clubtail dragonfly habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Zebra clubtail dragonfly populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Green-faced clubtail dragonfly. The amount and quality of green-faced clubtail dragonfly habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines pertaining to watershed protection, stream crossings, and stream channel integrity. Green-faced clubtail dragonfly populations are expected to remain stable because the quantity and quality of habitat is expected to remain stable or increase.

Bullhead mussel. The amount and quality of bullhead mussel habitat is expected to remain stable or increase under all alternatives. Road and trail crossings have the greatest effect on stream channel integrity. These effects are expected to decline, albeit at different rates, under all alternatives. All alternatives include the use of BMPs that would minimize erosion and sedimentation in the vicinity of water bodies. The Selected Alternative and Alternatives 2-9 would include additional Standards and Guidelines

pertaining to watershed protection, stream crossings, and stream channel integrity. Nonetheless, the bullhead mussel has not been documented on the Forests.

Upland and lowland conifer associated species.

Spruce grouse. The amount and quality of lowland conifer habitat, which comprises about 70% of the spruce grouse habitat on the National Forests, would remain stable across all alternatives. The remainder of the habitat, which is comprised of jack pine, balsam fir, and upland spruce, is expected to decrease from its present amount of 72,500 acres by 10-29% across the alternatives. Under the Selected Alternative, this habitat component decreases to approximately 62,000 acres. MA 1B contains direction to increase conifer habitat in areas where spruce grouse occur. The amount of MA 1B ranges from 27,000 acres under Alternative 4 to 86,000 acres under Alternative 2, with no emphasis in Alternative 1. Under the Selected Alternative, 40,000 acres are allocated to MA 1B. Standards and Guidelines to maintain a mosaic of conifer habitat and manage access to reduce incidental harvest of spruce grouse would apply across the Selected Alternative and Alternatives 2-9. Spruce grouse populations are expected to remain stable because the quality and quantity of the majority of their habitat is expected to remain stable. There is one small breeding population of spruce grouse known on the National Forests, and several other known occurrences.

Connecticut warbler. The mature lowland coniferous habitat where this species is most abundant would remain unchanged across all alternatives. No management would occur in this habitat type under the Selected Alternative and Alternatives 2-9 unless it benefited species of concern. Mature jack pine with a dense shrub understory, like that sometimes found in pine barrens, also provides habitat for Connecticut warblers. The amount and distribution of this habitat is more limited than the lowland coniferous habitat that is interspersed across much of the forest.

Pine barrens restoration would occur on 15,000 acres under all alternatives except Alternative 1, where it would occur on 8,000 acres. MA 4A and 4C (surrogate pine barrens) would also provide suitable habitat conditions for Connecticut warblers. The combined amount of MAs 4A and 4C ranges from 124,000 acres under Alternative 6 to 183,000 acres under Alternative 1. Under the Selected Alternative, approximately 150,000 acres are allocated to MA 4A and 4C. Standards and Guidelines that encourage the restoration and maintenance of jack pine for Connecticut warblers would apply across the Selected Alternative and Alternatives 2-9. The quantity and quality of Connecticut warbler habitat is expected to remain stable or increase under all alternatives. Connecticut warbler populations are expected to remain stable or increase under all alternatives because the quantity and quality of habitat is expected to remain stable or increase.

Black-backed woodpecker. The amount and quality of lowland conifer habitat, which comprises over 90% of all black-backed woodpecker habitat on the National Forests, would remain stable under all alternatives. In ten years, the remaining 10% of black-backed woodpecker habitat (older jack pine and balsam fir forest) would range from 18,000 to 28,000 acres across the alternatives, a reduction of 0-36% from the current amount. Under the Selected Alternative, 19,400 acres of this habitat would exist after 10 years, a reduction of 31%. The older age classes of jack pine and balsam fir are more susceptible to wind throw and fire, which attract the beetles that serve as food for black-backed woodpeckers. MA 4B, which ranges from no emphasis under Alternative 1 to 65,000 acres under Alternative 3, contains direction to leave 15-25% of potential salvage areas unharvested for each disturbance event. Standards and Guidelines that maintain

decadent conifer habitat also would apply across the National Forests under the Selected Alternative and Alternatives 2-9.

Black-backed woodpecker populations are expected to remain stable under all alternatives because the quality and quantity of the majority of the habitat is expected to remain stable. Even in preferred habitats, black-backed woodpeckers are considered uncommon to rare except when populations irrupt in response to fires and outbreaks of wood-boring insects (Corace, et al. 2001). These events and the associated population peaks are unpredictable and temporary, usually lasting for several years until food sources dwindle.

Other species.

Swainson's thrush. The amount and quality of lowland conifer is expected to remain stable or increase under all alternatives. Mature mixed upland deciduous/conifer habitat is most closely associated with MA 2B. It ranges from no emphasis under Alternative 1 to 452,000 acres under Alternative 3. The Selected Alternative allocates 209,000 acres to MA 2B. Standards and Guidelines that protect known nesting sites and that provide for management of Swainson's thrush habitat would apply across the Selected Alternative and Alternatives 2-9. Swainson's thrush populations are expected to remain stable or increase under all alternatives because the quantity and quality of habitat is expected to remain stable or increase.

Forcipate emerald dragonfly. The amount and quality of forcipate emerald dragonfly habitat is expected to remain stable across all alternatives. No management activities would occur within the sphagnum bog habitat associated with this species.

Management Indicators – Direct and Indirect Effects

Mature Interior Northern Hardwood Forest

There are several different measures comparing alternatives in terms of effects on this community (Table 3-34). The total area of the northern hardwood type increases slightly within 10 years in all alternatives, including the Selected Alternative, and increases substantially in 100 years, even in Alternative 1 (current plans) (Table 3-34). This is due to conversion of early successional types, primarily aspen, as called for by composition objectives and Standards and Guidelines. The greatest increase in northern hardwood is in Alternatives 3 and 4. However, not all of this acreage is considered "mature, interior forest." Some stands might be relatively small, surrounded by immature forest types, or lacking structural features typical of high quality mature northern hardwood forest.

Another measure comparing this community by alternative is the total allocation of MA 2B. This MA has composition and management guidelines that eventually result in an increased conifer component, larger average tree size, formation of natural tree gaps and tip-up mounds, and increased numbers and sizes of snags and cavity trees. MA direction also results in landscape scale changes such as larger patch size and reduced fragmentation. Alternative 1 has no MA 2B areas. All other alternatives have at least some allocation of MA 2B, with Alternative 2 having the least (22,800 acres) and Alternatives 3 and 4 having the most (over 600,000 acres). The Selected Alternative allocates approximately 209,000 acres to MA 2B.

Another measure for this community type is interior mature northern hardwood acreage existing after 100 years. This was determined using HARVEST, a spatial timber harvest simulation model (Roberts and Gustafson, 2002 draft report), simulating management

activities over 100 years. The program models events such as clearcuts that create openings in a forested landscape. Random openings were placed on the landscape according to management direction specified by the different alternatives. The openings were then buffered to determine remaining areas of "interior" forest (the buffer width used for this effects comparison is 90 meters). "Mature" was defined as over 80 years old for northern hardwoods. The figures produced are only comparative estimates and should not be used as predictions of interior forest conditions. Under this model, Alternative 1 had the lowest amount of mature interior northern hardwood habitat after 100 years, and Alternatives 3 and 4 had the highest amount (see Table 3-34). Although the Selected Alternative was not modeled by Roberts and Gustafson, it is likely that the projected acreage of interior mature northern hardwoods would be similar to that of Alternative 5 or 9, which have 200,000 acres and 210,000 acres, respectively (a 5% difference) (Table 3-34).

Table 3-34. Mature Northern Hardwood Interior Forest Environmental Measures

Environmental Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
Total Acres Northern Hdwd in 10 Years	450,000	450,900	451,400	451,100	451,200	451,200	451,100	451,300	451,100
Total Acres Northern Hdwd in 100 Years	510,200	540,600	603,100	602,000	562,600	562,000	581,800	578,700	572,500
Landscape Scale Emphasis (MA 2B)	0	22,800	453,400	234,400	129,700	142,000	143,300	282,300	209,100
Interior Mature Northern Hdwd After 100 years	120,000	180,000	220,000	220,000	200,000	190,000	210,000	210,000	N/A*

** Selected Alternative was not modeled by Roberts and Gustafson.*

Mature Natural Red and White Pine Forest

Similar measures were used to compare the Selected Alternative to the other alternatives for this community as were used for mature interior northern hardwood. The area of red and white pine over 70 years old was used as one measure (see Table 3-35). Little variation is seen in 10 years, but more variation among the alternatives is noted after 100 years. Approximately 70% of the area shown after 10 years is red pine and the majority of that acreage is plantation origin. Even 70+-year-old plantation red pine lacks many features typical of natural origin red or white pine stands. Species diversity is low, except on richer sites where there may be an understory of deciduous trees. There is little structural diversity, since the trees are even-aged and generally healthy with few snags and cavity trees. There is also little woody debris on the ground in most of these stands.

Another measure providing a better community comparison by alternative is MA 4B. As with MA 2B, this Management Area has composition objectives and management guidelines that will eventually result in species diversity and stand structure more typical of natural mature red and white pine stands, including a diverse mixture of tree species,

older average age and larger average tree size, some restoration of natural disturbance processes, and landscape scale features such as larger patch size, reduced fragmentation, and restoration of upland-lowland transition forest types. Alternative 1 has no areas of MA 4B. The remaining alternatives range from a low of 1,670 acres (Alternative 5) to a high of 64,700 acres (Alternative 3). The Selected Alternative, at 30,400 acres, falls in the middle of the range of alternatives in terms of allocations to MA 4B (Table 3-35).

Another measure for this community is acreage of mature (70 years old or more) interior red and white pine forest determined using the HARVEST model described above for mature northern hardwood. This model shows little variation among alternatives after 100 years, with a range of 5,500 acres to 7,500 acres (Table 3-35). Although the Selected Alternative was not modeled by Roberts and Gustafson, it is likely that the projected acreage of mature natural red and white pine forest would be similar to that of Alternatives 5 and 9.

Table 3-35. Mature Natural Red and White Pine Forest Environmental Measures

Environmental Measure	Alt. 1 Current Plans	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
Total Acres Mature Pine in 10 Years	58,700	59,900	59,900	60,000	60,000	60,000	60,000	60,000	60,000
Total Acres Mature Pine in 100 Years	62,900	71,600	72,700	71,600	66,600	68,000	68,100	71,700	69,900
Landscape Scale Emphasis (MA 4B)	0	16,500	64,700	50,000	1,670	19,600	29,500	52,900	30,400
Interior Mature R&W Pine After 100 Years	5,500	6,000	6,000	6,000	6,000	7,500	6,000	6,000	N/A*

** Selected Alternative was not modeled by Roberts and Gustafson*

Pine Barrens

Two measures compare effects by alternative on the pine barrens community. One measure shows the acreage of "true pine barrens" (see Table 3-36). This includes the Moquah barrens, together with additional "satellite" barrens developed in most alternatives. The satellite barrens will be located near or adjacent to the larger existing core area. These satellite barrens are created through harvest of mature vegetation (mostly jack pine and other early successional tree species such as aspen and northern pin oak) in clearcuts up to 300 acres. Satellite barrens are maintained mostly in an open condition through prescribed fire, although satellite barrens generally retain a higher percentage of tree cover than the Moquah barrens. Both Moquah and the satellite barrens have vegetation and wildlife species typical of naturally occurring pine barrens and other large open grassy areas. There is little variation among alternatives in this measure. Alternative 1 has approximately 8,000 acres, slightly more than existing conditions since current plans allow for expansion of the Moquah area. All other alternatives raise the amount of permanent barrens to approximately 14,000 acres.

Another measure compares alternatives in terms of allocation of MA 4C, or "surrogate barrens" emphasis. Surrogate barrens are temporary barrens, created in suitable sites by large (up to 1,000 acre) clearcut harvests of jack pine. These harvested areas would be allowed to regenerate to jack pine (see Table 3-36), but would provide conditions similar

to pine barrens until the jack pine reached about 10 feet in height. In addition to the temporary barrens habitat, some small (less than 10 acre) open patches will likely remain in a permanent condition of grass, forbs, and shrubs. Because of the varying ages of jack pine and other types, only a small part of MA 4C areas will be in this barrens habitat at any one time. Alternative 1 has no MA 4C. The remaining alternatives all have a fairly similar allocation of MA 4C, ranging from approximately 9,900 acres to 12,800 acres (see Table 3-36).

Table 3-36. Pine Barrens Environmental Measures

Environmental Measure	Alt. 1 Current Plans	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
Total Acres- True Barrens	8,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000
Surrogate Barrens Emphasis (MA 4C)	0	9,921	12,797	12,797	12,797	9,921	12,797	12,763	12,797

Regenerating Aspen Forest

One of the measures comparing effects of the alternatives on the regenerating aspen community is allocation of aspen emphasis areas (Table 3-37). MAs 1A, 1B, and 1C all emphasize early successional forest types, although they vary in some details. MA 1A calls for the highest composition of aspen type of any Management Area, with a goal of 50-75% by area. MA 1B also emphasizes aspen, but puts more emphasis on mixed aspen-conifer stands, with components of balsam fir, spruce and pine mixed with aspen. The overall aspen composition goal in this Management Area is 35-55%. MA 1C has the same aspen composition goal as 1B, but calls for a higher composition of northern hardwood. Aspen emphasis (MA 1) ranges from a high of 428,300 acres in Alternative 1 to a low of 242,200 acres in Alternative 4 (Table 3-37). There are 291,000 acres of aspen emphasis (MA 1) under the Selected Alternative (Figure 3-44).

Another measure is acreage of aspen after 100 years, assuming that the direction outlined in the 2004 Plan was continued over the long term. Within 10 years there will be little change in overall aspen acreage. However, after 100 years there will be obvious effects due to management direction and Management Area allocation in different alternatives. For example, Alternative 3 shows more conversion of aspen to northern hardwood types, resulting in a substantial decrease in aspen over the long term. These changes project aspen acreage ranging from 185,000 acres (Alternative 3) to 266,700 acres (Alternative 1). Under the Selected Alternative, there will be approximately 216,200 acres of aspen (of all age classes) on the Forests after 100 years (Table 3-37).

The most disparate measure for this community is the regenerating aspen acreage in 100 years, again assuming plan revision direction would continue. Projections for the Selected Alternative indicate that 74,400 acres of aspen less than 20 years old will be present on the Forest in 100 years (Table 3-37). Projections indicate a range among alternatives from 68,300 acres (Alternative 4) to 99,200 acres (Alternative 1). Projections were also made for 10 years from present, but these figures do not show substantial variation between the Selected Alternative and the other alternatives. This aspen regeneration would result primarily from clearcut of aspen and mixed aspen types, although there could also be small amounts resulting from natural disturbance such as windstorm damage. Regeneration from natural disturbance results in more structural features than after regeneration following harvest. However, management guidelines

under the Selected Alternative and Alternatives 2-9 require the maintenance of some features during harvest, such as scattered live mature trees, snags, and cavity trees.

In general, species associated with regenerating aspen forest are expected to decline in numbers as acreage on the Forests allocated to aspen emphasis declines under the Selected Alternative or any of the other alternatives. Whether or not a species will decline and the magnitude of the impact will depend on what features of aspen habitat are important to it and the degree to which these features are available elsewhere in the landscape. In the case of the golden-winged warbler, only the youngest aspen stands (less than 10 years of age) are inhabited by the species, so reductions in overall aspen acreage on the Forests are not representative of reductions in golden-winged warbler habitat (see *Analysis Of The Impact On Avifauna Of Reduced Aspen Coverage In Wisconsin*, a plan revision document). Ample amounts of lowland shrub habitat in addition to the ephemeral young aspen stands are more important to the golden-winged warbler than the overall aspen acreage present in the landscape. In addition, while some bird species, such as the red-headed woodpecker, forage in regenerating aspen forest, foraging areas are not likely to be a limiting factor for the species. In the case of the red-headed woodpecker, standing dead trees for nesting and food caching limit their numbers.

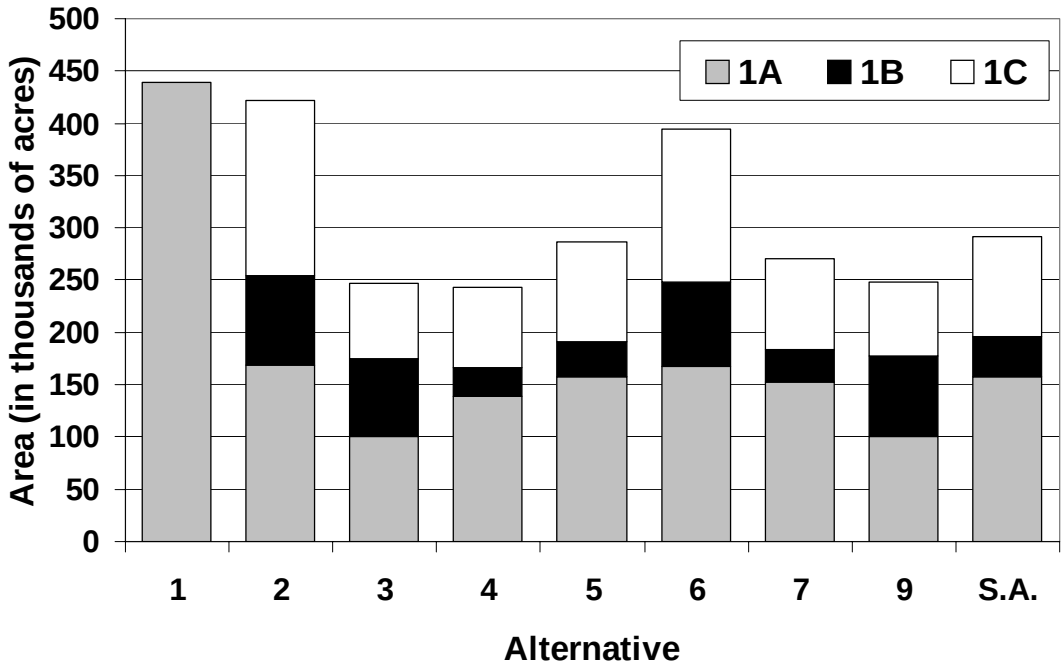

Figure 3-44. Early Successional Vegetation Emphasis (MA 1A, 1B, and 1C) by Alternative

Table 3-37. Regenerating Aspen Environmental Measures

Environmental Measure	Alt. 1 Current Plans	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 9	Sel. Alt.
Aspen Area Emphasis (MA 1A,B,C)	400,000	421,600	246,000	242,200	285,900	394,800	270,700	250,400	291,000
Total Acres Aspen in 10 Years	331,700	329,500	330,100	326,600	331,300	330,500	330,100	328,000	329,900
Total Acres Aspen in 100 Years	266,700	249,400	185,000	188,600	228,000	230,600	209,600	203,500	216,200
Aspen < 20 Years Old, in 10 Years	77,100	75,100	74,100	73,600	75,000	74,500	74,300	74,400	74,300
Aspen < 20 Years Old, in 100 Years	99,200	84,300	75,800	68,300	81,500	84,200	74,700	71,800	74,400

Brook Trout

Trout populations are expected to remain stable or improve under all alternatives, including the Selected Alternative. Key factors for brook trout include relatively stable stream flows, cool or cold-water temperatures, and abundant instream cover. Groundwater-fed streams in particular provide quality brook trout habitat. One of the greatest impacts to trout habitat in recent years is beaver activity and beaver damming, resulting in higher water temperatures, siltation, loss of riparian tree cover, and modified stream channels. Beaver activity is encouraged by regeneration of aspen adjacent to streams, since young aspen is a favored food of beaver.

The primary difference between alternatives concerning trout habitat is in management of riparian aspen. Current Standards and Guidelines restrict aspen management within 300 feet of Class I and II trout streams (Chequamegon) or within 200 feet (Nicolet). However, there are still areas within these corridors that support aspen. A GIS analysis, “Issue-based Aquatic Assessment for the Chequamegon-Nicolet, September 12, 2002”, estimated 12,340 acres of aspen within 300 feet of Class I and Class II streams on the Chequamegon-Nicolet. Under Alternative 1 direction, much of the aspen acreage within these zones acres would convert to longer-lived conifer and hardwood types, except where aspen is maintained by natural disturbances. Alternatives 2-9 and the Selected Alternative include restrictions on regeneration of aspen within 450 feet of selected trout streams; other Class I and II trout streams would have no aspen regeneration within 300 feet. Therefore, implementing these alternatives would result in greater long-term conversion of aspen, with fewer beaver related effects on trout habitat.

All alternatives involve beaver removal and instream trout habitat projects on Class I and II trout streams. These activities help speed the recovery of key habitat features in treated streams.

Canada Yew

Key factors concerning Canada yew include local scale management that maintains canopy closure and minimizes disturbance, and landscape scale factors that might reduce the potential for deer herbivory. Alternative 1 does not involve any landscape scale emphasis on large patch interior forest that could reduce deer activity in portions of the Chequamegon-Nicolet. In addition, Alternative 1 does not include any Standards and Guidelines protecting known yew sites, although it has been common practice to protect sites from timber harvest, road construction, and other ground disturbing activities. Therefore, Alternative 1 provides, at best, stable population levels. A continued lack of regeneration due to moderate to high levels of deer browse could eventually result in population declines.

The Selected Alternative and Alternatives 2-9 maintain ecological conditions that contribute to the long-term abundance and distribution of Canada yew, with Alternatives 3, 4, and 9 potentially increasing populations. The Selected Alternative and Alternatives 2-9 involve varying allocations to interior forest emphasis (MA 2B). The Selected Alternative allocates approximately 209,000 acres to Northern Hardwoods Interior Forest. For alternatives at the lower end of the range (Alternative 2 and 5), it is unlikely there would be noticeable effects on deer populations and browse intensity due to Management Area allocation. At the high end of the range (Alternatives 3, 4, 9, and, to a lesser extent, the Selected Alternative) it is possible there will be local declines in deer populations and deer herbivory over the long term due to changes in available forage. However, these predicted changes can be offset by mild winters and changes in hunting mortality.

Standards and Guidelines under the Selected Alternative and Alternatives 2-9 do not protect known yew sites, although project-level protection would likely continue. These alternatives include Standards and Guidelines specific to MAs 2B, 3B, and 4B that involve indirect protection, such as increasing intervals between harvest, reducing clearcuts, and reserving natural disturbance areas from salvage harvest.

Relatively large Canada yew occurrences are found within the Penokee Range. The Selected Alternative, as well as Alternatives 3-9, protect much of this area through allocations of MA 5B (recommended Wilderness study areas), MA 6A (low disturbance SPNM), as well as MA 2B (uneven-age interior hardwood forest).

Cumulative Effects

Cumulative effects are the effects on Management Indicator Communities, Management Indicator Species, RFSS, and Threatened and Endangered Species within the overall region of northern Wisconsin (the Cumulative Effects Area or CEA), unless a different geographic area is stated (drainage systems, for example). This area is generally ecological subregion 212 in northern Wisconsin and the western Upper Peninsula of Michigan (McNab and Avers, 1994).

Cumulative effects were assessed by Forest Service staff based on Ecological Judgments by outside experts on ecological conditions for likely future abundance and distribution, species distributions, habitat quality and quantity, and population trends. Please see the Biological Evaluations (*FEIS Appendix J*) for a more detailed summary of the potential effects of the proposed alternatives on the TES and RFSS.

Threatened and Endangered Species – Cumulative Effects

Bald Eagle

The bald eagle population will continue to increase under Alternatives 2-9 or the Selected Alternative. The population in Wisconsin reached a low point in the 1960s and since that time has gradually increased both within the National Forests and within the cumulative effects area. (The cumulative effects area roughly corresponds to the primary breeding range of the bald eagle in Wisconsin, which is the northern portion of the state.) In 1973, the state had 108 occupied territories; this increased to 754 territories by 1999 (Dhuey and Skoloda, 2000). On the Chequamegon-Nicolet, the number of occupied territories increased from 27 in 1975 to 64 occupied territories in 1999 (see Table 3-38). All alternatives should result in either stable or increasing populations, for the following reasons; 1) Productivity (number of young produced per occupied nest) continues to average over 1.0, the goal established in the Northern States Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service, 1983); 2) Population growth on the Forests may be leveling off , but unoccupied suitable habitat remains; 3) It is unlikely that unoccupied suitable habitat under National Forest ownership will be lost or degraded due to development; 4) Other important habitat features such as nest trees and the fisheries resource will continue to be protected and managed; 5) Active territories will continue to be protected through existing and Standards and Guidelines; and 6) Privately owned shoreline will continue to be affected by development. (However, this development has not prevented eagle population increases outside of the Forests to date.)

Table 3-38. Bald Eagle Activity*

Year	Wisconsin Breeding Pairs	CNNF: Occupied Territories	CNNF: Successful Territories
1975	111	27	16
1976	149	26	18
1977	151	30	23
1978	141	33	18
1979	151	32	28
1980	175	34	19
1981	188	34	25
1982	207	33	21
1983	198	30	18
1984	239	31	24
1985	214	33	24
1986	244	38	25
1987	295	43	33
1988	326	37	32
1989	336	38	27
1990	358	45	34
1991	414	52	38
1992	424	49	36
1993	464	54	35
1994	533	51	31
1995	583	53	39
1996	626	56	42
1997	645	59	48
1998	689	64	45
1999	754	64	49

*a*compiled from Dhuey and Skoloda (2000) and USFS survey data.*

Gray Wolf

Gray wolf populations will continue to increase under Alternatives 2-9 or the Selected Alternative with the potential for more rapid wolf colonization on the Nicolet due to greater emphasis on non-motorized areas.

Wolves are expected to increase in number and expand their range into unused suitable habitat in coming years. The Wisconsin Wolf Management Plan (WDNR, 1999) identifies over 5,800 square miles of favorable wolf habitat within the state with 2,200 square miles already occupied by wolves. Public lands, including the National Forests, comprise much of this area. The amount of favorable habitat could support as many as 500 wolves. This exceeds the state management goal of 350 wolves as well as the 250-wolf threshold required to remove state and federal protections.

Increases in human population and development are expected on private lands across much of northern Wisconsin. This will increase the importance of National Forest lands in maintaining wolf populations.

Canada Lynx

Canada lynx sighted in northern Wisconsin are generally thought to be Canadian immigrants searching for prey due to low populations of prey species to the north. The US Fish and Wildlife Service concluded that records of lynx from Wisconsin and Michigan most likely were transient dispersing animals (USFWS, 2003, pp 56-59). Therefore, the cumulative effects of Forest management activities would be on a scale even larger than the generally considered area of northern Wisconsin. The Forests may provide a corridor for lynx movement between Michigan and Minnesota, and thus contribute to connectivity on a truly regional scale.

Kirtland's Warbler

Northern Wisconsin is not considered the cumulative effects area for this species. Rather, the cumulative effects area would be northern Wisconsin and the existing breeding range of the species in the Upper and Lower Peninsulas of Michigan.

Today, there are approximately 150,000 acres managed as designated Kirtland's warbler management units on state and National Forest lands in Michigan (Ennis, 2002). Intense management of this land is designed to provide approximately 38,000 acres of suitable nesting habitat at any time (DeCapita, *in litt*). The availability of approximately 22,000 acres of jack pine 0-19 years old on the CNNF after the next 10 years, the extensiveness of the Forests' jack pine blocks, the recent establishment of a breeding population in the Upper Peninsula of Michigan, and recent documentation of singing males in northern Wisconsin suggest that the Forests could have a breeding population within the time-span of the new Forest Plan.

Fassett's Locoweed

Due to the large amount of non-federal ownership of potential habitat for Fassett's locoweed, those areas that are federally owned are important to the protection of this species. The overall ecological conditions that contribute to the long-term abundance and distribution of this species decline as the surrounding area is considered. Threats such as shoreline development, hydrologic regime change, recreational use, and trampling can cause mechanical damage and negatively affect habitat.

Species on the Regional Forester's Sensitive Species List – Cumulative Effects

Plants

In the late 1800s and early 1900s, forests in northern Wisconsin were harvested and severe wildfires in debris left from logging soon followed. In the 1930s, National Forests began to be established, with a goal of restoring the land to a forested state. During the last 10 to 15 years under the 1986 Forest Plans, the emphasis on the CNNF was forest management at the stand level. For revision of the 1986 Plans, the Forests identified a need to consider landscape pattern and provide for interior forest conditions as well as patches of open land adjacent to forested land. Large patches can improve ecological conditions that contribute to the long-term abundance and distribution of species by decreasing dispersal distance (Primack, 1993) and by supporting "mainland" populations that may function as sources to smaller peripheral habitat patches. It is likely that plant species requiring interior forest conditions will benefit over time from Management Area allocations in the 2004 Forest Plan. However, conditions within the cumulative effects area may not improve over time due to fragmented land ownership patterns and potential development.

Animals

Interior hardwoods associated species.

Northern goshawk. The ecological conditions that contribute to the long-term abundance and distribution of northern goshawk are predicted to show some improvement on the Forests under Alternatives 3 and 4, with habitat conditions in these alternatives potentially offsetting disturbance and habitat loss on other ownerships. In northern Wisconsin, the conditions for northern goshawk will remain at their current levels, with existing management on the Forests barely compensating for habitat loss and disturbance on other ownerships.

Red-shouldered hawk. The ecological conditions that contribute to the long-term abundance and distribution of the red-shouldered hawk will decrease under Alternative 1 due to continued forest fragmentation and increased human disturbance within its range in the state. The species is expected to at least maintain stable populations under most of the other alternatives, including the Selected Alternative, although ecological conditions could decline under Alternative 2 due to lower amounts of interior forest conditions.

Cerulean warbler. Most of the Cumulative Effects Area (CEA) is not included within the range of the cerulean warbler, but changes in the CEA, especially in lands of other ownership, could affect potential cerulean warbler habitat. Dividing private lands into smaller ownership parcels is likely to increase within the CEA over time. Disparate objectives among landowners increase the likelihood that forested areas will become fragmented and less suitable for cerulean warblers.

American marten. Ecological conditions that contribute to the long-term abundance and distribution of American marten will probably remain stable under Alternatives 2, 6, and 7, but improve under other alternatives, with the greatest improvement under Alternative 3. The differences between alternatives are due to the emphasis placed on managing for interior forest conditions on the Chequamegon-Nicolet. Marten populations will remain stable. Effects from activities outside the Forests are expected to be limited because of the marten's currently limited range.

West Virginia white butterfly. There is a lot of potential habitat available within the Cumulative Effects Area, but it is unknown how much habitat contains toothwort, this species' host plant, or how that habitat is affected by management activities.

Northern myotis. This species is not documented on the Forests and records of it in northern Wisconsin are extremely rare. Division of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area of northern Wisconsin over time, and the loss of mature bottomland forest would be detrimental to this species. A limiting factor may be the availability of mines in nearby Michigan that are used as hibernacula. If buildings provide additional hibernacula in the Cumulative Effects Area, some development may benefit the species.

It may be argued that the Cumulative Effects Area of this species encompasses the area on the Michigan Upper Peninsula with abandoned mines with known or suspected hibernacula. Regardless of the definition of the Cumulative Effects Area for the species, its long-term distribution and abundance may be dependent on the closure of mines in that area and how they are managed, or not managed, as bat hibernacula.

Eastern pipistrelle. This species is not documented on the Forests and records of it in northern Wisconsin are extremely rare. The Forests will provide mature, large trees that will benefit the species in the summer as roosting sites, but a limiting factor may be the availability of mines in nearby Michigan that are used as hibernacula. It may be argued that the Cumulative Effects Area of this species encompasses the area on the Michigan Upper Peninsula with abandoned mines with known or suspected hibernacula. Regardless of the definition of the Cumulative Effects Area for the species, its long-term distribution and abundance may be dependent of the closure of mines in that area and how they are managed, or not managed, as bat hibernacula.

Brushlands and/or pine barrens associated species.

LeConte's sparrow. The amount and quality of LeConte's sparrow habitat likely would remain stable within the Cumulative Effects Area under all alternatives. The adoption of wetland water quality standards in 1991 drastically slowed the loss of wetlands within Wisconsin. This includes the shallow marshes and sedge meadows important to LeConte's sparrow. Best Management Practices (BMPs) designed to minimize effects on water quality have been in place statewide since 1995. BMPs apply to activities such as timber harvesting and road building within wetlands, streams, and riparian areas on all ownerships.

The Wisconsin Department of Natural Resources identified northern sedge meadow as a priority grassland habitat for management within the Northern Highland/Lake Superior Lowland, an area that covers much of the Cumulative Effects Area (Sample and Mossman, 1997). This includes 65,000 acres of permanent grassland in blocks greater than 100 acres, including 38% sedge or wet grass meadows, and encompasses the Crex Meadows/Fish Lake Complex, which has the most permanent grassland bird habitat in the state. Within the Cumulative Effects Area, the ecological conditions that contribute to the long-term abundance and distribution of LeConte's sparrow are predicted to remain at their present levels under all alternatives.

Sharp-tailed grouse. The amount and quality of sharp-tailed grouse habitat likely would remain stable within the cumulative effects area. Seven sites outside the National Forests are managed for conditions favorable to sharp-tailed grouse. These sites are on public lands and likely will continue to be managed in this manner. All nine sites within the state are isolated from each other, and this will not change.

Upland sandpiper. The amount and quality of upland sandpiper habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County, and the eastern region of Wisconsin where this bird is more numerous.

Henry's elfin butterfly. The amount and quality of Henry's elfin butterfly habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County.

Northern blue butterfly. Within the Cumulative Effects Area, the northern blue butterfly was recorded at three sites outside the National Forests. Only one location supports a population not threatened by habitat degradation. In the absence of management, the northern blue butterfly is likely to become locally extinct at the other two sites.

Brown arctic butterfly. The amount and quality of brown arctic butterfly habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County.

Tawny crescent butterfly. The amount and quality of tawny crescent butterfly habitat likely would remain stable within the cumulative effects area, which includes the jack pine barrens that extend from the southwestern corner of Burnett County to southern Bayfield County.

Riparian and/or aquatic associated species.

Black tern. The black tern declined range-wide over the past four decades for unknown reasons. Wetlands protection in general and nesting sites in particular are the focus of local conservation efforts. The adoption of wetland water quality standards in 1991 drastically slowed the loss of wetlands within Wisconsin. Best Management Practices (BMPs) designed to minimize effects on water quality have been in place statewide since 1995. BMPs apply to activities such as timber harvesting and road building within wetlands, streams, and riparian areas on all ownerships. For these reasons it is likely black tern habitat would remain stable within the Cumulative Effects Area.

Trumpeter swan. The amount and quality of trumpeter swan habitat likely would remain stable within the Cumulative Effects Area. The adoption of wetland water quality standards in 1991 drastically slowed the loss of wetlands within Wisconsin, but not before 47% of the original wetlands had been lost. BMPs designed to minimize effects on water quality have been in place statewide since 1995. BMPs apply to activities such as timber harvesting and road building within wetlands, streams, and riparian areas on all ownerships.

Wood turtle. The amount and quality of wood turtle habitat within the CEA is expected to remain stable. BMPs designed to minimize effects on water quality have been in place statewide since 1995. BMPs apply to activities such as timber harvesting and road building within wetlands, streams, and riparian areas on all ownerships. Predation at communal nesting sites and illegal collection for biological supply houses and the pet trade will continue to be problems for this species.

Lake sturgeon. Subdivision of private lands into smaller ownership parcels is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the lake sturgeon. The removal of dams along

some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Greater redhorse. Subdivision of private lands into smaller ownership parcels is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the greater redhorse. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Pugnose shiner. Subdivision of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the pugnose shiner. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Ellipse mussel. Freshwater mussels as a group have dramatically declined throughout North America because of habitat destruction from dams, dredging, channelization, siltation, and contaminants, and because of the expansion of Non-native mollusk populations such as zebra mussel (Williams and Neves, 1995). A number of these threats to freshwater mussels also apply within the cumulative effects area. The Northern Rivers Initiative and Wisconsin Waters Project, two large-scale efforts to protect water bodies within the state, were launched recently. These efforts seek to coordinate public, private, and government interests, offering the best opportunity for the continued existence of many freshwater mussel populations.

Extra-striped snaketail dragonfly. Subdivision of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the extra-striped snaketail dragonfly. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Pygmy snaketail dragonfly. Subdivision of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the pygmy snaketail dragonfly. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Zebra clubtail dragonfly. Subdivision of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the zebra clubtail dragonfly. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Green-faced clubtail dragonfly. Subdivision of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Constructing access roads to subdivided property likely will follow. Roads contribute sediment and affect stream channel integrity, factors important to the green-faced clubtail dragonfly. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of Best Management Practices have helped and will continue to improve and maintain aquatic habitats throughout Wisconsin.

Bullhead mussel. This species is not documented on the Forests and records of it in northern Wisconsin are extremely rare. Freshwater mussels as a group have dramatically declined throughout North America because of habitat destruction from dams, dredging, channelization, siltation, and contaminants, and because of the expansion of Non-native mollusk populations such as zebra mussel (Williams and Neves, 1995). A number of these threats to freshwater mussels also apply within the cumulative effects area. In recent years, two large-scale efforts to protect water bodies within the state—the Northern Rivers Initiative and Wisconsin Waters Project—have been launched. The coordination of public, private, and government interests sought by these efforts offers the best opportunity for the continued existence of many freshwater mussel populations.

Upland and lowland conifer associated species.

Spruce grouse. The amount and quality of spruce grouse habitat likely would remain stable within the cumulative effects area. The range of the spruce grouse within Wisconsin is confined to all or portions of Sawyer, Bayfield, Ashland, Price, Iron, Oneida, Vilas, Langlade, Forest, and Florence counties. The black spruce-tamarack bogs that comprise the majority of spruce grouse habitat are inaccessible, of low economic value, and unsuitable for development. They are likely to remain unchanged over time.

Connecticut warbler. The amount and quality of Connecticut warbler habitat likely would remain stable within the cumulative effects area. The black spruce-tamarack bogs where Connecticut warblers are found are inaccessible, of low economic value, and unsuitable for development. They are likely to remain unchanged over time. The cumulative effects area also includes the remainder of the jack pine barrens that extends from the southwestern corner of Burnett County to southern Bayfield County. There have been concerns over the loss of this habitat through conversion to other forest types.

Black-backed woodpecker. The amount and quality of lowland conifer habitat likely would remain stable within the cumulative effects area. In large part this habitat is inaccessible, of low economic value, and unsuitable for development. The amount and quality of older jack pine and balsam fir is likely to remain stable or decline within the cumulative effects area because of shorter rotations and more aggressive salvage logging on many state, county, and private lands outside the National Forests.

Other species.

Swainson's thrush. Changes in land ownership could affect Swainson's thrush habitat. Division of private lands into smaller ownership parcels is likely to increase within the Cumulative Effects Area over time. Disparate objectives among landowners increase the likelihood that forested areas will become fragmented and less suitable for Swainson's thrushes.

Forcipate emerald dragonfly. This species is not documented on the Forest and records of it in northern Wisconsin are extremely rare. Division of private lands into smaller ownership parcels, especially along shorelines, is likely to increase within the Cumulative Effects Area over time. Construction of roads to access subdivided property likely will

follow. Roads contribute sediment and affect stream channel integrity, factors probably important to the forcipate emerald dragonfly. The removal of dams along some rivers, the advent of the Clean Water Act, and the application of BMPs have helped in the improvement and maintenance of aquatic habitats throughout Wisconsin.

Management Indicators – Cumulative Effects

Cumulative effects for most indicators were discussed in more detail in other sections of this document and are referenced here. Effects on indicator habitats are discussed in the Cumulative Effects section for "Terrestrial Ecosystems" and the Cumulative Effects section for "Wildlife"; effects on bald eagle and gray wolf are discussed in Biological Evaluations and Biological Assessments, and summarized above. Effects on northern goshawk, red-shouldered hawk, and American marten are discussed in the Biological Evaluations, and summarized above. Effects on brook trout are discussed in the Cumulative Effects section for "Aquatic, Riparian, and Wetland Ecosystems", and below.

The same cumulative effects area used for this discussion was used for the Wildlife Cumulative Effects analysis [Province 212, Ecological Sections I, J, K, O, Q, T, X, Y, and Z (designations *in prep*.)].

Management Indicator Communities

In general, Alternative 1 would result in relatively stable conditions within the cumulative effects area during the planning period, although some increasing and decreasing trends would be noted in the long-term. The mature interior northern hardwood and natural red and white pine forest types would continue to mature and structural diversity would gradually increase. This reflects an overall maturation and recovery of these types that has been ongoing in the state since early in the 20th century. Pine barrens would probably remain stable or possibly decrease in coverage, since conversion to other forest types on other ownerships could cancel the effects of the small-scale restoration efforts on the Forests. Regenerating aspen would continue to gradually decrease in coverage, especially when combined with decreases on other ownerships.

Alternatives 2-9 and the Selected Alternative may result in greater improvements in quantity and/or quality of some indicators than Alternative 1. Mature interior northern hardwood and natural red and white pine forest types may see a greater improvement under these alternatives than seen under Alternative 1. In particular, Alternatives 3-9 and the Selected Alternative may show large improvements in these forest types due to Management Area allocations with specific ecosystem restoration emphases. Pine barrens coverage and quality may remain stable under Alternatives 2-9 and the Selected Alternative with the increased restoration emphasis on the Forests balancing for the loss of barrens on other ownerships. Aspen regeneration will decrease more under these alternatives than under Alternative 1.

The Selected Alternative is likely to result in improvements in quantity and/or quality of some indicators over their existing condition. Mature interior northern hardwood and natural red and white pine forest types are likely to see a greater improvement under this alternative than seen under the current Plans due to the emphasis on ecological restoration. Pine barrens coverage and quality may remain stable under the Selected Alternative with the Forests' increased emphasis on restoration balancing for the loss of barrens on other ownerships. Aspen regeneration is the only management indictor

community that is expected to decrease in coverage under the Selected Alternative or any of the other Alternatives (although the decrease would be less pronounced under Alternative 1).

Brook Trout

Brook trout populations will remain stable throughout the cumulative effects area, with gradual improvements on the National Forests and other ownership being offset by habitat degradation on lands of other ownerships. Populations may increase more under Alternatives 2-9 and the Selected Alternative than under Alternative 1 due to improved riparian and in-stream conditions.

Canada Yew

Canada yew populations may gradually decline because of deterioration of habitat conditions on lands outside the National Forests due to insufficient protection and high levels of disturbance. Compared to Alternative 1, there is a better chance of maintaining ecological conditions that contribute to its long-term abundance and distribution under Alternatives 2-9 and the Selected Alternative, and especially under Alternatives 3-9 and the Selected Alternative. Additional protection and interior forest management on the Forests will potentially offset habitat conditions on other ownerships.

Monitoring

Management Indicators and trends provide the basis for evaluating plan implementation results. Selected Management Indicators and associated conditions and elements to be monitored are shown in Table 3-39. The strategy for monitoring is presented in Chapter 4 of the 2004 Forest Plan. Detail on monitoring of Management Indicators and other conditions and trends can be found in the *Forest Annual Monitoring Plan*, a separate document.

Table 3-39. Management Indicators: Ecological Conditions and Selected Elements to be Monitored

Management Indicator	Compositional, Structural, Spatial Elements*	% Forest Inclusions	Distribution by Age Class	Interior/ Edge Habitat	Crown Closure, Gap Size	Conifer Component (mature, regenerating)	Tree Size/ Age Classes	Populations of Associated Songbirds	Population	Habitat
Mature northern hardwood interior forest	+			+	+	+	+	+		
Mature natural red/white pine	+			+	+	+	+	+		
Pine barrens	+	+						+		
Regenerating aspen	+		+	+				+		
Gray wolf									+	+
Bald eagle									+	+
Northern goshawk									+	+
Red-shouldered hawk									+	+
American marten									+	+
Brook trout									+	+
Canada yew									+	

** Compositional, Structural, and Spatial Elements to monitor for the Indicators shown above:*
a. Acres of indicator type across Forest
b. Patch size
c. Native plant species diversity
d. Within-stand features, including snag and den tree density, amount of coarse woody debris
e. Shrub layer- density, coverage

Fire Management

Introduction

The fire management program on the Chequamegon-Nicolet National Forests consists of the following three basic factors: fire suppression, prescribed fire for ecosystem maintenance and restoration, and hazardous fuels reduction. Fire prevention has a lesser position on the Forests and is handled cooperatively with the State of Wisconsin since the state has an extensive fire prevention program.

The incidence and extent of wildfire on the Forests is low due to a moist regional climate, predominance of broad-leaved trees, abundant lakes and streams, and extensive support from a state fire organization which allows for rapid detection and response. Figures for fire statistics include only that portion of the National Forests for which the US Forest Service is responsible. Based on agreements with the State of Wisconsin, the Medford District and the Lakewood-Laona District south of County Roads C and W are under the protection of State of Wisconsin fire protection units.

The Forests averaged 25 wildfires per year over the past 16 years with the total area burned per year ranging from 10-500 acres. The drought years of 1986 and 1987 were exceptions; approximately 1,300 acres burned during both years. The dry, pine-dominated ecosystems of the northern Washburn District, northeastern Park Falls-Medford District, northwestern Eagle River-Florence District, and southeastern Lakewood-Laona District hold the highest potential for wildfires. Large fires (approaching 1,200 acres) have burned other areas, especially when a wind disturbance event was followed by drought. Damaged power lines are the most common cause of wildfire on the Forests, followed by debris burning, and miscellaneous human-caused fires. Lightening strikes account for very few fires.

Fire played an integral role in regional natural forest ecosystems, as evidenced by fire-adapted plant communities, General Land Office notes from the original land survey, and fire scar data. Under pre-EuroAmerican settlement conditions, fire intervals across the pine forests were estimated at 20-150 years, though few of these were actually severe enough to kill the stands (Stearns 1997, GLA 1997). Even though fire occurred, it was not a prominent player in upland broad-leaved forests. Since the "cut and burn" era of the late 19th and early 20th centuries, fire has largely been suppressed on the Chequamegon-Nicolet and in Wisconsin overall.

Prescribed fire is a management tool used in the Moquah Barrens and Riley Lake wildlife areas. On a smaller scale, prescribed fire is used for maintenance of non-forested openings, reforestation, and activity fuels and hazardous fuels reduction. To a minor degree it has been used for ecosystem restoration, such as underburning in pine, oak, and birch. As more effort is made toward restoring natural forest ecosystems, and as attention toward hazardous fuels reduction continues to mount, the opportunities for using prescribed fire are likely to increase, provided it is found socially acceptable and the necessary resources are available. The areas burned per year on the Forests using prescribed fire ranged from 260-2,400 acres during the past 16 years.

Current Condition

The Forests operate under an offset fire protection agreement with the Wisconsin Department of Natural Resources (WDNR). Under this agreement the WDNR provides wildfire protection services for federal and private lands both within the Medford unit land base and the Lakewood-Laona District south of County Roads C and W. Concurrently, the Forest Service provides wildfire protection for federal and private lands within the remaining national forest boundary. The Forests also operate under agreement with the Bureau of Indian Affairs, U.S. Department of Interior, to provide wildfire protection services for Potawatomi Tribal lands within the national forest boundary. The Forests do not rely on volunteer fire departments to assist in wildfire suppression.

Fire season for the Chequamegon-Nicolet National Forests is defined as April 1st to May 31st. During fire season, the Forests are classified under fuel model E of the National Fire Danger Rating System (NFDRS). Once the vegetation has fully leafed out, the fuel model changes to R, a group representing slow burning ground fires. In both cases the primary fire-carrying fuels are hardwood and needle litter on the forest floor. Most fires are suppressed or naturally burn out before reaching 5 acres.

Aside from cured grasses, jack pine and red pine are the most flammable forest types and are usually found in monotypic plantations. These stands often support hardwood shrub understories, which can considerably mitigate the risk for crown fires. Currently, 186,200 acres are assigned to Management Area (MA) 4 where conifer stands predominate.

Young pine plantations and upland conifer stands that exhibit poor self-pruning on dry soils (or senescent jack pine stands beginning to break up) hold a recognized risk for greater fuel hazard. Stands with these conditions create the focal point for hazardous fuels reduction. Nearly 160 communities in and around the Chequamegon-Nicolet National Forests are currently identified as communities at risk for wildfire under the National Fire Plan. Hazardous fuels reduction projects are being designed to reduce community risks.

Current Management Direction

Currently, the Forests subscribe to a policy of complete suppression of all wildfire starts, due in part to the mosaic of commingled ownerships, in part to avoid compromising marketability of timber due to char, and in part to keep fire suppression costs and impacts on the land to a minimum. According to the Federal Wildland Fire Policy, human life is the highest priority for protection, followed by property and natural or cultural resources. Prioritization at this point is based on the relative values to be protected, commensurate with fire management costs. Assessment and prioritization of values at risk have yet to be conducted on a forestwide basis. It has been done locally when situations dictated a need for heightened fire preparedness, as in the case of the Delta-Drummond storm of 1999.

In Wilderness, Semi-Primitive Non Motorized areas, and ecological reference areas, higher value is placed on the lack of human-caused disturbance. As such, fire suppression by hand tools is the first line of defense against wildfires. Policy on the Chequamegon-Nicolet National Forests allows mechanized fire suppression tactics in these areas should hand tools prove inadequate.

Current direction allows prescribed fire as a management tool. Mechanical methods are relied on for hazardous fuels reduction.

Proposed Changes and Range of Changes

No current management changes are proposed. The CNNF will continue its policy of complete suppression of all wildland fire starts to keep suppression costs and impacts to a minimum and protect commingled private properties. The Forests will also continue to use prescribed fire while barring wildland fire use. Within this framework, the CNNF is proposing more emphasis on the use of prescribed fire in areas where fire as a disturbance factor is desirable and can be tolerated. This receives particular attention in MAs 3, 4, 8C, 8E, 8F, and 8G. The CNNF is also proposing to place more emphasis on hazardous fuels reduction within the urban interface.

Direct and Indirect Effects

Effects on Fire Management from Vegetative Proposals

While there is no historical correlation between fire starts and forest type, forest type is a consideration when assessing the potential for fire spread, especially under very high or extreme fire danger. On the uncommon occasions where large fires have broken out (still remaining in the hundreds of acres), they have burned rapidly through small upland conifers or dead and downed conifers, while slowing down through hardwood leaf litter. This suggests that upland conifers present the greatest challenge for wildfire suppression on the Forests. MAs 4A, B, and C are typically assigned where a preponderance of upland conifer stands exist or where upland conifers hold the ecological potential to exist on the landscape. Figure 3-45 shows the number of acres assigned to these management areas by alternative. The largest increase in upland conifer acres is found in Alternatives

3 and 9, an increase of 17,000 acres over that currently assigned. There is no change in effects in the Selected Alternative based on the same total amount of Management Areas 4A, 4B, and 4C as Alternatives 5 and 7. Since the pre-positioning of fire suppression resources is based not only on fuel types and loading, but on weather and topographic conditions (i.e. fire behavior) common to the Forests, this level of potential increase in volatile fuels alone would not affect the ability of the Forests to either pre-position for wildfire or respond in a wildfire suppression situation

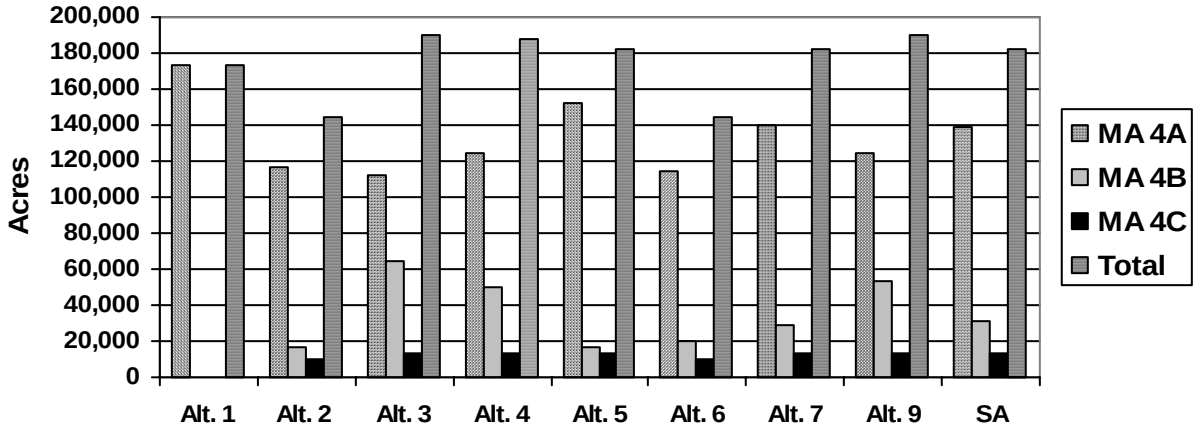

Figure 3-45. Acres Assigned to Management Area 4 by Alternative

Conifer forest types are also subject to the heaviest fuel loading from logging slash (activity fuels). With the level of softwood outputs either remaining constant or declining across all alternatives, the quantity of activity fuels is also expected to remain constant or decline over the planning period. Harvest activities still will create local concentrations of activity fuels, temporarily increasing fire risk relative to fuel type. Harvest-related activities such as chainsaw and motorized equipment use, smoking, and cooking also increase the risk of ignition within sale areas.

The amount of desired prescribed fire treatment depends on management area goals and site-specific vegetation cover type and condition. The actual acreage to be treated in a given year is difficult to predict due to many variable factors such as meteorological conditions, seasonal snow pack and rainfall, wildfire activity, and available funding. The average annual acreage burned on the Forests over the past 16 years through prescribed fire treatment is 1,263 acres. It is likely that prescribed fire use will remain within a range similar to that of the Forests' recent history in all alternatives. However, with additional emphasis placed on prescribed burning for ecosystem restoration, this annual average could increase to an estimated 1,500 acres.

Mechanized and hand treatment of hazardous fuels is expected to increase during the planning period in urban interface areas. Location of hazardous fuels reduction projects will depend on cooperative planning efforts across jurisdictions. Due to their conifer emphasis, hazardous fuels reduction projects may be more prevalent in MA 4A, B, and C.

Effects on Fire Management from Recreation/Access Proposals

Dispersed recreation and access management can affect fire suppression activities and the fire management program as a whole in both a positive and negative manner. As human use increases on the Chequamegon-Nicolet National Forests, more people will observe and report fires that otherwise might go undetected. With increased use, we can also expect an increase in the incidence of human-caused fire ignitions.

Alternatives that perpetuate motorized dispersed recreation or that specifically increase the level of motorized recreation and travel across the Forests would introduce more opportunities for human-caused fire starts. Unlimited ATV access to a large land base (the Chequamegon) in Alternative 1 would present the greatest risk for fire starts, both from miscellaneous matches and from sparks or equipment failure. It also would present the greatest challenge for fire suppression, should fires start in remote areas. The remaining alternatives would decrease fire risk by prohibiting cross-country (off-road/off-trail) ATV use. Alternative 4, the most restrictive in terms of motorized dispersed recreation, would minimize the potential for human-caused fires in remote areas. The level of introduced risk can be correlated to the miles of ATV connectors and trails, displayed by alternative in Figure 3-46.

In the Selected Alternative there is an increase in the maximum amount of ATV trails and routes compared to Alternatives 3, 4, 5, 6, and 7, thus increasing the level of introduced fire risk. (Trails and connectors are referred to collectively as “trails” in the FEIS and Final Plan.)

With Forest policy prohibiting prescribed fire or prescribed wildfire within Wilderness areas, Wilderness management prescriptions are not conducive to the management of natural fuels. All alternatives maintain existing Wilderness areas (44,000 acres), creating a condition of “no change” in the ability to conduct fire management programs. Current fire management practices would continue in non-Wilderness management areas, with special attention given to a “light hand on the land” approach in MAs 5B, 6, 8E, 8F, and 8G.

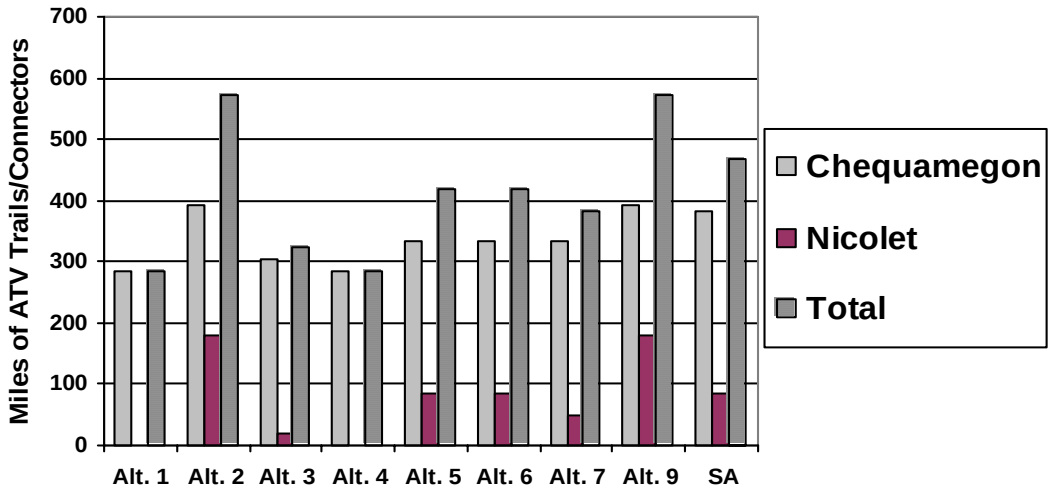

Figure 3-46. Miles of ATV Trails and Connectors by Alternative

Cumulative Effects

None of the alternatives limit the amount of hazardous fuels reduction that can occur. Hazardous fuels reduction opportunities and activities are dictated more so by the extent of urban interface than by the nature of other forest management activities. However, a lack of management activity can contribute to fuel buildup. For instance, fire management activities are prohibited in Wilderness areas and, over time, adjacent lands are subject to greater wildland fire risks.

None of the alternatives increase the amount of softwood timber outputs over the first decade. Stand replacing crown fires have not been part of the Forests' history during the past 70 years. Given the absence of this type of fire regime, the Forests are not likely to experience a proliferation in intense fires simply due to a potential long-term increase in old-aged conifers.

Alternatives 2-9 and the Selected Alternative propose Wilderness study areas (MA 5B) ranging from 6,300 acres to 56,100 acres. The Standards and Guidelines for MA 5B do not preclude fire or fuels management. Should the Wilderness study areas receive formal Wilderness designation in the future, each acre of Wilderness would translate into an acre removed from active fire management (i.e. hazardous fuels reduction and prescribed fire application). Each new Wilderness designation would also limit the Forests' ability to conduct swift and efficient fire suppression in the corresponding acreage.

The long-term effects from motorized access are difficult to predict. The amount of ATV trails and connectors would not exceed 574 miles for the first decade of the 2004 Forest Plan. This could potentially add 180 miles of trail to the Nicolet Forest (except in Alternative 1), while at the same time eliminating off-road/off-trail ATV use on the Chequamegon Forest (except in Alternative 1). This alone does not equate to a predictable increase in human-caused fires, but avenues for access to the Forests, especially those allowing for combustion-based equipment, introduce fire risk. This risk would be introduced to the Nicolet, which has been essentially closed to ATVs under the 1986 Forest Plan.

In the Selected Alternative there is no change in effects from Alternative 5. Like the other alternatives, the Selected Alternative does not limit the amount of hazardous fuels reduction that can occur or propose an increase in the amount of softwood timber outputs over the first decade. However, there is an increase in the maximum amount of ATV trails and routes in the Selected Alternative, thus increasing the level of introduced fire risk compared to Alternative 5.