Draft Environmental Impact Statement

Cayuga Project Area

United States
Department of
Agriculture

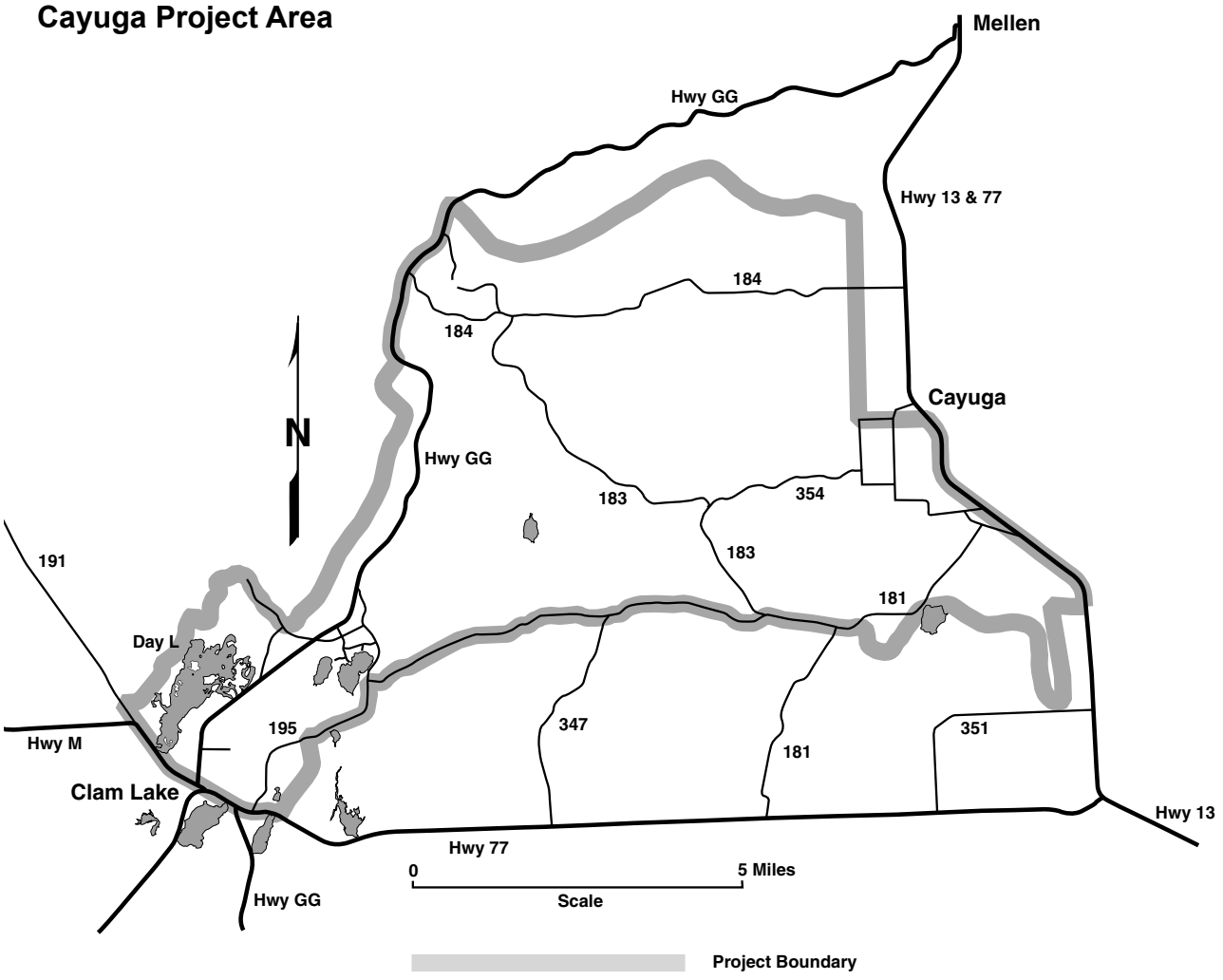
Great Divide Ranger District, Chequamegon-Nicolet National Forest

Ashland County, Wisconsin

Forest
Service

December 2002

Cayuga Project Area



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CAYUGA PROJECT
Draft Environmental Impact Statement
Ashland County, Wisconsin

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Abstract: The Great Divide Ranger District on the Chequamegon-Nicolet National Forest proposes to implement a number of forest management activities. The area affected by the proposal is located in T43N, R2W, Sections 6-7, 16-20, and 29; T43N, R3W, Sections 1-18, and 23-24; T43N, R4W, Sections 1-3, 10-23, and 27-33; T43N, R5W, Section 24; T44N, R3W, Sections 19-23 and 26-35 and T44N, R4W, Sections 23-27 and 34-36, Ashland County, Wisconsin. The project area is located within Management Prescription 1.2 (Goal Area 1) (Management Areas 181, 191, 221, and 231) and Management Prescription 2.2 (Goal Area 2) (Management Areas 192 and 172) as identified in the 1986 Chequamegon National Forest Land and Resource Management Plan. These actions are needed to improve forest age and composition, address public health and safety concerns, improve water quality, restore and improve wildlife and fish habitat, improve visual quality and control noxious weeds.

Four alternatives, including a No Action and a Proposed Action, were developed to address the needs identified above. Alternative 2 is the preferred alternative and proposes timber harvest on approximately 5,414 acres. This harvest would yield an estimated 23 million board feet (MMBF) of timber volume. Approximately 12.6 miles of new temporary roads would be constructed for the harvest and removal of timber. Approximately 6.5 miles of existing system and non-system roads would be decommissioned. Approximately 85 acres of upland openings would be restored. Brush bundles would be constructed and placed along 1000 feet of McCarthy Creek. 7 culvert crossings would be improved to reduce stream sedimentation and restore fish passage. A one-acre snowmobile parking lot would be constructed off of FR 1296, and .4 miles of snowmobile trail 8 would be relocated. Alternative 3 proposes higher levels of timber harvest and less miles of road decommissioning and Alternative 4 proposes lower amounts of timber harvest and more miles of road decommissioning than Alternative 2, the preferred alternative.

Reviewer's Obligation: Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' positions and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: **Barry Paulson, District Ranger**
P.O. Box 896, Hayward, WI 54843

Comments must be received within 45 days from the day following publication of this document in the Federal Register.

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How to Read This Document

To read this EIS more effectively, carefully study this page. Following Federal regulations, we have designed and written this EIS (1) to provide the District Ranger of the Great Divide Ranger District with sufficient information to make an informed, reasoned decision concerning the proposed Cayuga Project and (2) to inform members of the affected and interested public of this project so that they may express their opinions to the District Ranger.

This EIS follows the organization and content established by the CEQ Regulations (40 CFR 1500-1508). The EIS consists of the following chapters:

- Purpose and Need for Action
- Alternatives, Including the Proposed Action
- Affected Environment
- Environmental Consequences
- List of Preparers
- List of Agencies and Persons Consulted
- Appendices

Chapter 1 introduces the Cayuga Project. It provides a brief description of the Cayuga Project and then explains three key aspects of the project: (1) the relevant environmental issues, (2) the decisions that the Forest Supervisor must make concerning this project, and (3) the relevant laws, regulations, and consultation with which the Great Divide Ranger District of the Chequamegon-Nicolet National Forest must comply.

Chapter 2 serves as the heart of this EIS. It provides detailed descriptions of Alternative 1: No Action and Alternative 2: Preferred Alternative, Alternative 3, and Alternative 4. Most important, it includes a summary comparison of the predicted effects of these four alternatives on the human environment, providing a clear basis for choice between the four alternatives for the Forest Supervisor and the public.

Chapters 1 and 2 together serve as an Executive Summary that pull together the more detailed information found in following chapters, appendices and the project record file.

Chapter 3 briefly describes the past and current conditions of the relevant resources (issues) in the project area that would be meaningfully affected, establishing a part of the baseline used for the comparison of the predicted effects of the alternatives.

Chapter 4 presents the detailed, analytic predictions of the consequences of implementing Alternatives 1, 2, 3 and 4. These predictions include the direct, indirect, short-term, long-term, irreversible, irretrievable, and cumulative effects of implementing the alternatives.

Chapters 3 and 4 together serve as the scientific and analytic basis for comparing of the predicted effects presented in Section 4.0.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Hayward Office of the Great Divide Ranger District.

Summary

The Great Divide Ranger District on the Chequamegon-Nicolet National Forest proposes to implement a number of forest management activities, including: 5,414 acres of timber harvest and associated timber stand improvement, planting, and natural regeneration preparation; 12.6 miles of temporary road construction; 6.5 miles of road decommissioning; 113 acres of recreation site improvements; 1 acre of noxious weed control; 1.5 miles of stream and riparian area improvement; 85 acres of wildlife opening restoration; 7 road/stream crossing improvements; 0.4 mile of snowmobile trail relocation; construction of a 1 acre trail parking lot; conversion of approximately 50 acres of aspen

near the perimeter of a Research Natural Area to longer lived conifers and hardwoods; and conversion of about 310 acres of aspen along highway GG to longer lived species to improve visuals. (The acreage of aspen conversions is also included in the total acres of timber harvest identified above).

The area affected by the proposal is located in T43N, R2W, Sections 6-7, 16-20, and 29; T43N, R3W, Sections 1-18, and 23-24; T43N, R4W, Sections 1-3, 10-23, and 27-33; T43N, R5W, Section 24; T44N, R3W, Sections 19-23 and 26-35 and T44N, R4W, Sections 23-27 and 34-36, Ashland County, Wisconsin. A portion of the project area is located within Management Areas 181, 191, 221, and 231. These Management Areas fall under Forest Management Prescription 1, hereafter referred to as Goal Area 1 in this document. The remainder of the project area lies within Management Areas 192 and 172, which fall under Management Prescription 2 (Goal Area 2). (CNF Plan IV-101-102). These actions are needed to improve forest age and composition, address public health and safety concerns, improve water quality, restore and improve wildlife and fish habitat, and control noxious weeds.

The Notice of Intent (NOI) was published in the Federal Register on April 23, 2001. The NOI asked for public comment on the proposal from April 23, 2001 until June 4, 2001. In addition, the Cayuga ID team sent out 465 project information packets to interested individuals, local, state, and county agencies, tribal governments, Great Lakes Indian Fish and Wildlife Commission (GLIFWC), and landowners within and adjacent to the project area.

Those who submitted comments raised the following issues:

- Issue 1: Early Successional Management
- Issue 2: Wildlife Openings
- Issue 3: Vegetation Composition
- Issue 4: Fragmentation
- Issue 5: Roads
- Issue 6: Water Quality
- Issue 7: Noxious Weeds
- Issue 8: Soil Quality
- Issue 9: Floodplains and Wetlands
- Issue 10: Visual Quality
- Issue 11: Recreation Facilities and Trails
- Issue 12: Social and Economic

These issues led the agency to develop alternatives to the Proposed Action (Alternative 2) including:

Alternative 1: No Action. The issues above would not be addressed at this time. Ongoing permitted and approved uses on National Forest lands would continue within the project area. These include, but are not limited to firewood cutting, use of trails, fire suppression, use of recreation facilities, normal road system maintenance, and use of a gravel pit as a parking area under special use permit.

Alternative 3 emphasizes the management of early successional species and closed-canopy northern hardwood forests. Approximately 80% more acreage, than is proposed in Alternative 2, would be harvested by clearcutting to regenerate aspen and mixed stands. Approximately 30 percent more acreage would be selectively harvested to promote un-even-aged hardwood stands. Less even-aged thinning would take place. Alternative 3 would result in approximately 800 more acres of timber harvest than Alternative 2. There would be 4 more miles of temporary road construction and 1 less mile of road decommissioning. The recreation, stream, and trail improvement projects would be about the same as proposed in Alternative 2. There would be no noxious weed control

Alternative 4 places more emphasis on the forest fragmentation and vegetation composition issues. Approximately 45 percent less clearcutting for aspen regeneration and 70 percent more selective harvest for un-even-aged northern hardwood management would take place, than is proposed in Alternative 2. Approximately 70 percent less even-aged thinning would take place. Alternative 4 would result in approximately 500 less acres of timber harvest than is proposed

in Alternative 2. There would be 2 miles less temporary road construction and 5 more miles of road decommissioning. The other projects would be about the same as in Alternative 2, except that there would be 1/3 less treatment along Highway GG for visuals. The treatments that would occur would be thinnings instead of shelterwood cuts.

Major conclusions include: The table below displays what the results of implementation of each of the alternatives would be. The environmental consequences analysis showed that no significant effects would occur to any of the resources in all of the alternatives when design features and mitigating measures were followed. There would be no irretrievable or irreversible commitments of resources.

Table 2.5b. Summary comparison of effects of all alternatives on each alternative

Issue	Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Issue 1--Early Successional Management Successional Management	1. Amount of aspen cover type in Goal Area 1	6314 ac 38%	6080 ac 37%	6119 ac 37%	6179 ac 37%
	2. Amount of aspen cover type in Goal Area 2	2732 ac 20%	2320 ac 17%	2490 ac 18%	2327 ac 17%
Issue 2--Wildlife Openings	1. Percentage of upland area in managed openings within project area	0%	0.3%	0.4%	0.1%
	2. Acres of openings maintained	0	85	126	27
	3. Acres of new openings constructed	0	0	16	0
Issue 3--Vegetation Composition	1. Acres of aspen conversion to conifers or northern hardwoods through silvicultural activities.	0	646	437	540
	2. Percent of forest types in Goal Area 1: (Forest Plan DFC)				
	Aspen (35-65%)	38.5%	37.1%	37.3%	37.7%
	Conifer (10-20%)	6.5%	7.0%	7.2%	6.8%
	N. Hardwood (<49%)	27.1%	28.1%	27.6%	27.6%
	3. Percent of forest types in Goal Area 2: (Forest Plan DFC)	20.3%	17.2%	18.5%	17.3%
	Aspen (10-20%)	6.8%	7.9%	7.3%	7.6%
	Conifer (<48%)	38.0%	39.9%	39.2%	40.2%
	N. Hardwood (35-75%)				
Issue 4--Fragmentation	Acres of interior habitat (% change)	10,028 (0%)	9,613 (4.1%)	8,977 (10.4%)	9,795 (2.3%)

Issue 5--Access	Miles of roads available for public use and/or timber hauling	141.0	134.5	134.3	128.6
Issue 6--Water Quality	1. Cumulative sediment yield to affected streams above background	123 tons/ yr	0 tons/yr	0 tons/yr	0 tons/yr
	2. Miles of instream habitat improvement	0	1.5 miles	1.5 miles	1.5 miles
Issue 7— Noxious weeds	1. Number of flea beetle release sites	0	3 sites	0	3 sites
Issue 8--Soils	1. Acres with potential for compaction and rutting	0	212 acres	244 acres	118 acres
	2. Acres with potential for erosion and displacement	0	379 acres	538 acres	207 acres
Issue 9-- Floodplains and Wetlands	1. Number of sites where floodplain is restored	0	0	1 site	1 site
Issue 10--Visual Quality	1. Acres treated to improve long-term visual quality objectives.	0	392 acres	321 acres	173 acres
Issue 11- - Recreation Facilities and Trails	1. Miles of trail located on Forest Road 1296	0.4 mile	0 miles	0 miles	0 miles
	2. Number of sites within area of management activities	0	46 sites	46 sites	12 sites
Issue 12--Social and Economic	1. Amount of volume generated from timber sales	0	23.0 mmbf	28.0 mmbf	20.0 mmbf
	2. Payments to counties, at 25% of estimated timber sale receipts	$0	$95,500.	$154,600.	$89,650.

Based upon the effects of the alternatives, the responsible official will decide:

- What actions would be taken at this time
- Where the actions would occur
- What treatment methods would be used
- Which mitigation measures would be required

1.0 Chapter 1: Purpose of and Need for Action

1.1 Proposed Action

The Great Divide Ranger District of the Chequamegon-Nicolet National Forest proposes to implement various resource management projects to address both resource and public safety concerns that are consistent with existing management direction in the current Chequamegon Land and Resource Management Plan (referred to as the Forest Plan hereafter). The management activities would occur principally during 2002 through 2007.

The Cayuga Project area is located within T43N, R2W, Sections 6-7, 16-20, and 29; T43N, R3W, Sections 1-18, and 23-24; T43N, R4W, Sections 1-3, 10-23, and 27-33; T43N, R5W, Section 24; T44N, R3W, Sections 19-23 and 26-35 and T44N, R4W, Sections 23-27 and 34-36, Ashland County, Wisconsin (see maps in Appendix A). The project area is located within Forest Plan Management Prescriptions (hereafter referred to as Goal Areas) 1 and 2. There are four Management Areas (MA's) within Goal Area 1 in the Cayuga Analysis area. They include 181, 191, 221, and 231. Two MA's, including 192 and 172, are within Goal Area 2 in the Cayuga Analysis area. Management areas are contiguous parcels of land, while Management Prescriptions are the combination of goals, objectives, practices, and standards that define specific management direction for those parcels of land. (CNF Plan pp.1V-101-102 and CNF Plan map).

1.2 Need for Action

Through Congressional mandate, National Forest lands are managed to provide multiple benefits to all Americans in a sustainable way for present and future generations. The original management emphases were identified as watershed protection (Creative Act of 1891) and a continuous supply of wood products (Organic Act of 1897). Since then management for wildlife, fish, outdoor recreation, wilderness, heritage resources, grazing, wild and scenic rivers, and roads were added to the Forest Service mission. General direction for how the western side of the Chequamegon-Nicolet National Forest is to be managed is found in the 1986 Chequamegon Land and Resource Management Plan (Forest Plan). The Forest Plan divides the Chequamegon National Forest into different Management Areas (MAs) where each MA has particular objectives or a desired future condition (DFC). The DFC for Goal Areas 1 and 2 can be found in the Forest Plan, pages IV-106 through IV-126.

The Cayuga Project Area is located within Goal Area 1 (Management Areas 181, 191, 221, and 231) and Goal Area 2 (Management Areas 192, 172) as identified in the 1986 Chequamegon National Forest Land and Resource Management Plan (Forest Plan). The proposed actions in this analysis respond to the goals and objectives outlined in the Forest Plan, and help move the project area toward desired conditions described in that plan (Forest Plan, pages IV-1 through IV-126). The effects of implementation of these and alternative sets of actions will be disclosed in the Cayuga Project Draft Environmental Impact Statement (DEIS) in Chapter 4.

1.2.1 Forest Age and Composition and Silvicultural Needs (Need #1)

There is a need to move forests in the project area closer to desired future conditions as defined in the Forest Plan:

- In Goal Area 1 we need to increase the amount of young aspen to meet the Plan goal of managing 30 % of aspen in the 0-20 year age class (Forest Plan, pp. IV-114).
- In Goal Area 2 we need more uneven-aged hardwood and less even-aged hardwood forest to meet Plan multiple resource objectives (Forest Plan, pp. IV-119)
- In both Goal Areas 1 and 2, there is a need to:
    - Thin overly dense stands to enhance health, growth, and vigor (Forest Plan, pp IV 44-61).
    - Use appropriate harvest methods to best meet resource objectives (e.g., visual quality, wildlife management.) (Forest Plan, pp. IV 38-44)

1.2.2 Management of the McCarthy Lake and Cedars Research Natural Area (Need #2)

Monitoring of the McCarthy Lake and Cedars Research Natural Area (RNA) has shown that white-tailed deer are browsing cedar and preventing its regeneration. Approximately 1/2 mile outside the boundary of the RNA there are 378 acres of mature aspen. Conversion of some of these aspen stands to longer-lived species through shelterwood methods is needed to decrease the browse value to deer and reduce browsing of cedar within the RNA.

A spur off of Forest Service road (FR) 1333 accesses the RNA in the southeastern side. A review of yearly monitoring at McCarthy Lakes and Cedars Research Natural Area (RNA) indicates increasing hunting activity. This has resulted in ground disturbance and user-developed trails. Closure of this portion (approximately ¼ to ½ mile) of the spur is needed to protect the unique values and resources within the RNA (Forest Plan, p. IV-93; FSM 4063.3).

1.2.3 Control of Noxious weeds (Need #3)

There are three patches of leafy spurge, that cumulatively total less than 1 acre in size, located within the Cayuga Project Area. Leafy spurge is one of the species listed by the State of Wisconsin as a noxious plant to be controlled whenever it occurs (Municipal Law 66.96, Noxious weeds). Control of small patches of leafy spurge is needed to meet the intent of the law.

1.2.4 Fisheries and Wildlife Habitat Maintenance and Improvement (Need #4)

The quality of the trout habitat of McCarthy Creek and Brush Creek (Class II trout streams) within the Cayuga Project Area is degraded from long-term beaver activity. Approximately 354 acres of aspen exist within 300 feet of these streams. The abundance of aspen along these streams encourages beaver activity. This has resulted in flooding, the loss of streamside forest cover, increased siltation, increased stream water temperatures, and channel modification. There is a need to reduce aspen at these sites to protect water quality and coldwater fisheries habitat (Forest Plan, pp. IV-67 and 79). In addition, there is a need to conduct in stream restoration projects to reverse the impacts of past beaver activity (Forest Plan, pp. IV-69 and IV-79).

The DFC described in the Forest Plan suggests that 3-5% of Goal Area 1 and 4-6% in Goal Area 2 be managed as permanent upland openings. The existing condition within the project area is near or slightly less than 1%. Through natural succession, some openings are reverting to forest cover due to the encroachment of woody vegetation. The existing acreage will continue to decline over time if opening restoration does not occur. Therefore, there is a need to restore these openings to a non-forested condition, to retain the value of the openings (Forest Plan, pp. IV-78).

1.2.5 Watershed Restoration (Need #5)

There are seven sites identified within the Cayuga Project Area where erosion and sedimentation are a concern. The culverts at these road crossings are deteriorated or undersized. Erosion of the road alongside the culverts (piping), at the embankments, or at the surface results in stream sedimentation. The undersized culverts could fail during spring runoff or during an intense storm with heavy rains, resulting in tons of sediment washing into the streams. There is a need to improve road surfaces, control ditch and embankment erosion, and replace culverts that contribute to sedimentation or block fish passage.

1.2.6 Public Safety at Recreational Facilities and Trails (Need #6)

There is a 25-acre stand of mixed red and mature jack pine within the Day Lake Campground that has created a safety concern. There is a need to thin the stand to remove the mature jack pine and release the red pine. Safety concerns would be addressed by reducing the risk of aging trees breaking and injuring campers within the Jack Pine and Heron Circle loops.

In addition there are approximately 111 acres of red pine within the campground in the Paper Birch, Red Pine, Blueberry and Musky Bay loops that should be thinned to help improve the quality of recreational experience. There is a need to

thin this 111 acres of red pine to allow more air movement and to decrease the shading to let more sunlight filter through the forest canopy to help stimulate under story vegetation for screening between the sites.

The Clam Lake community currently has limited parking for snowmobilers who use the area trails, and who consequently park their vehicles and trailers in the community center where fire engines and rescue vehicles are housed. The parked vehicles and trailers block the garage so that emergency personnel and vehicles are unable to respond to an incident. This situation has created public health and safety concerns for community members due to the lack of trail parking. There is a need to cooperate with local interests and provide adequate and safe parking that will not block egress of emergency vehicles.

Snowmobile Trail 8 follows a portion of Forest Road 1296, cooperatively maintained by the local township, east of County Highway GG north of Clam Lake. A local landowner is constructing a year-round residence and will be plowing the road for access during the winter. There is need to construct a trail to separate recreational motorized use from highway vehicle use (Forest Plan, pp. IV-27).

1.2.7 Forest Roads (Need #7)

There are about 141 miles of road (system and non-system roads that are open and closed) within the Cayuga Project Area. These roads consist of Traffic Service Level (TSL) A roads (double-lane blacktop, i.e., State Highway 13, County Highway GG north), TSL B roads (double-lane gravel, i.e., Forest Road 184), TSL C roads (single-lane gravel roads that allow cautiously driven two-wheel drive passenger cars, i.e., Forest Road 182), and TSL D roads (single- lane, two-track logging roads that generally require four-wheel drive).

Some of the forested areas (stands) proposed for treatment do not have roads to provide access to conduct management activities. There is a need for short-term temporary road construction to access stands to harvest and haul timber volume. There is also a need to conduct maintenance of existing Forest Service roads to provide adequate access for these management activities.

Some road locations are no longer required for meeting other resource management objectives. Therefore, there is a need to decommission roads that are no longer needed on the landscape to protect resources within the project area.

1.3 Objectives of The Action

The following objectives were developed from focusing on the site-specific needs identified in Section 1.2, the desired conditions of the Forest Plan, laws, and other direction. References to Forest Plan goals are given where appropriate.

1.3.1 Objective #1: Maintain Aspen Component and Age Class Distribution (Forest Plan, pp. IV-42, 109, 114, and 119). Indicator: The alternatives will compare the existing percentage of aspen in various age classes to the desired future conditions described in the Forest Plan.

1.3.2 Objective #2: In Goal Area 2, Achieve a Desired Balance of Even and Uneven-aged Hardwood Stands. (Forest Plan, p. IV-119). Indicator: Percentage of even-aged and uneven-aged stands within Goal Area 2.

1.3.3 Objective #3: Manage A Continuous Canopy of Hardwood To Meet Wildlife Objectives Where Suitable (Forest Plan, pp. IV-124). Indicator 1: Acres of continuous, un-fragmented mature interior hardwood forest. Indicator 2: Acres of aspen converted to hardwood type to promote continuous, interior forest conditions.

1.3.4 Objective #4: Convert Stands To Promote The Development Of Long-lived Species Where Visual Quality Objectives (VQO's) Are Important (Forest Plan, pp. IV-29-IV-38). Indicator: Acres converted to meet VQO's.

1.3.5 Objective #5: Restore and Maintain Permanent Openings (Forest Plan, pp. IV-77 and IV-78). Indicator: Acres of upland openings managed for the long-term goal of grass/forbs/shrub cover type (This includes any acres of new construction, together with acres of existing openings undergoing maintenance activity.)

1.3.6 Objective #6: Restore The Vegetative Composition Of Transition Areas Between Upland and Lowland From Aspen Back To Long-Lived Conifer Types Through A Shelterwood Harvest Method and Under-planting (Forest Plan, pp. IV-22, 78, 85-87) Indicator: Acres of conversion

1.3.7 Objective #7: Provide Safe and Quality Recreation Experiences And Facilities (Forest Plan, pp. IV-27). Indicator 1: Acres within Day Lake Campground in hazardous condition. Indicator 2: Acres managed for large trees to improve site conditions within Day Lake Campground.

1.3.8 Objective #8: Modify Forest Management Practices In Adjacent Timber Types To Reduce Negative Impacts On The Conifer Swamp And Bog Within The McCarthy Lake and Cedars Research Natural Area (McCarthy Lake and Cedars RNA Establishment Record, pp.8 & 9). Indicator: Acres of conversion from aspen.

1.3.9 Objective #9: Close Motorized Access To Research Natural Areas That Do Not Contribute To Objectives Or Protection Of The Area (Forest Plan, pp. IV-93). Indicator: Motorized access points to RNA closed to public.

1.3.10 Objective #10: Control Leafy Spurge At Known Sites (Municipal Law 66.96, Noxious weeds). Indicator: Number of acres of leafy spurge treated within the project area.

1.3.11 Objective #11: Restore Streams To Reduce Effect Due To Beaver Activities (Forest Plan, pp. IV-79). Indicator: Miles of in stream habitat improvement.

1.3.12 Objective #12: Protect, Restore, And Improve The Quality of Watersheds (Forest Plan, pp. IV-69). Indicator 1: Number of road/stream crossings improved. Indicator 2: Number of road/stream crossings where fish passage restored. Indicator 3: Acres of floodplain or wetland restored.

1.3.13 Objective #13: Manage For Long-Lived Species Adjacent To Trout Streams To Reduce The Loss Of Cold Water Habitat (Forest Plan, pp. IV-79). Indicator: Acres of aspen type converted to long-lived species within 300 feet of Brush and McCarthy Creeks.

1.3.14 Objective #14: Design Trails And Trailheads That Minimize User Conflicts While Protecting Resources (Forest Plan, pp. IV-27). Indicator: Miles of trail located on public roads within the project area.

1.3.15 Objective #15: Identify Roads For Decommissioning That Are No Longer Needed For Resource Management Within Goal Areas 1 and 2 (Forest Plan, pp. IV-116 and 126). Indicator: Miles of decommissioned roads within each Goal Area.

1.3.16 Objective #16: Construct And Maintain Temporary Roads To Provide Access For Resource Management Activities (Forest Plan, pp. IV-97). Indicator: Miles of temporary road construction.

1.4 Scope of This Environmental Impact Statement

1.4.1 History of The Planning and Scoping Process

The Notice of Intent (NOI) was published in the Federal Register on April 23, 2001. The NOI asked for public comment on the proposal from April 23, 2001 until June 4, 2001. In addition, the Cayuga ID team sent out 465 project information packets to interested individuals, local, state, and county agencies, tribal governments, Great Lakes Indian Fish and Wildlife Commission (GLIFWC), and landowners within and adjacent to the project area. A full list of individuals, agencies, tribal governments, organizations, and landowners consulted can be found in the scoping section of the Cayuga Project File. Appendix E of this EIS lists the Agencies and persons were provided copies.

A total of 72 responses were received by the closing date for public comment. Another 35 responses were received after the closing date. The Cayuga ID team utilized all these responses, along with internal scoping, to identify the twelve issues and sixteen objectives for the proposed projects.

1.4.2 Relevant Planning Documents

The following two documents directly influence the scope of this EIS:

1986 Chequamegon Land and Resource Management Plan (Forest Plan)

Chequamegon Land and Resource Management Plan Final Environment Impact Statement (FEIS)

This EIS has been tiered to the Forest Plan and FEIS, which contain directions for management of Goal Areas 1 and 2, portions of which are located within the Cayuga Project Area. The proposed project actions are consistent with these two documents, while taking new information and science into consideration.

1.4.3 Issues Studied in Detail

The Forest Service separated the issues into two groups: **Significant issues** were defined as those directly or indirectly caused by implementing the proposed action. **Non-significant issues** were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7: "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…." A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the Issues section of the Project Record.

The Forest Service identified the following significant issues during scoping:

1.4.3.1 Issue 1-- Early Successional Management:

How will the proposed management affect the amount and proportion of early successional habitat in the affected area?

- Effects on deer herd size
- Effects on other early successional wildlife species
- Effects on understory browsing related to deer herd size
- Loss of aspen type by conversion to other types

Indicator 1: Amount of aspen cover type in Goal Area 1

Indicator 2: Amount of aspen cover type in Goal Area 2

1.4.3.2 Issue 2--Wildlife Openings:

What are the effects of creating and maintaining permanent openings?

- Impacts on neotropical migratory birds
- Impacts on Forest Management Indicator Species

Indicator 1: Percentage of wildlife openings in project area

Indicator 2: Acres of openings maintained

Indicator 3: Acres of openings constructed

1.4.3.3 Issue 3--Vegetation Composition:

How would the proposed management activities affect biodiversity?

- Landscape pattern is the relative amount and distribution of different communities.
- Landscape structure is composed of the balance of age classes and the age structure within stands (even vs. uneven-aged).
- Landscape function is the variety of habitats provided.

Indicator 1: Acres of aspen conversion to conifers or northern hardwoods

Indicator 2: Proportion of major upland forest types in Goal Area 1, (aspen, conifer, northern hardwoods)

Indicator 3: Proportion of major upland forest types in Goal Area 2, (aspen, conifer, northern hardwoods)

Management Requirement: Leave a number of snags and down trees acting as habitat for cavity nesters and other wildlife.

1.4.3.4 Issue 4--Fragmentation:

What effect will the management activities have on migratory species from edge effects and fragmentation due to a variety of management activities?

Indicator: The amount of change of interior forest acres within the Cayuga Project Area.

1.4.3.5 Issue 5--Roads:

How will the proposed management activities affect forest access and recreational opportunities on National Forest lands?

- Access
- Impacts to Threatened, Endangered, and Sensitive (TES) species

Indicator 1: Miles of roads available for public and/or timber-hauling access

Management Requirement: Mitigation measures were designed to minimize impacts to TES species (see description of mitigation measures in Appendix C).

1.4.3.6 Issue 6--Water Quality:

What effect will the management prescriptions have on water quality?

- Culvert replacement with road reshaping and/or surfacing
- Fish habitat and passage
- Timber management activities adjacent to streams

Indicator 1: Quantitative estimate of cumulative sediment yield to affected streams

Indicator 2: Miles of in stream habitat improvement

Indicator 3: Number of sites culverts would be replaced

Indicator 4: Number of sites culverts would be removed and not replaced

Management Requirement: Mitigation measures have been designed to minimize adverse affects to water quality (see Section 2.4 and Appendix C).

1.4.3.7 Issue 7—Noxious weeds:

How will the proposed management activities affect noxious weeds?

- Effect of releasing one exotic to control another
- Effect of soil disturbance on spread of noxious weeds

Indicator 1: Number of flea beetle release sites

Management Requirement: Measure leafy spurge density and flea beetle population at release site annually.

1.4.3.8 Issue 8--Soil Quality:

What impacts will the proposed management activities have on soil quality?

Indicator 1: acres with potential for compaction and rutting

Indicator 2: acres with potential for erosion and displacement

Management Requirement: Apply mitigation measures to protect the soil resource

1.4.3.9 Issue 9--Floodplains and Wetlands:

What impacts will the proposed management activities have on floodplains and wetlands?

Indicator 1: Number of sites where floodplain is restored

Management Requirement: Apply mitigation measures to protect floodplains and wetlands

1.4.3.10 Issue 10-Visual Quality:

How will the proposed actions enhance or improve visual quality along County Highway GG (north) and the shoreline of Day Lake and Spillerberg Lake?

Indicator: Acres treated to improve long-term visual quality objectives.

Management Requirement: Meet VQO's for areas designated as being Sensitivity Levels 1 and 2.

1.4.3.11 Issue 11- Recreation Facility and Trails:

What impacts will the proposed management of these recreational opportunities have on users?

- Relocating section of Snowmobile Trail off of Forest Road 1296
- Effect of conducting thinning of jack pine and red pine on campground users

Indicator 1: Miles of trail located on Forest Road 1296

Indicator 2: Number of sites within management activity areas

Management Requirement: Apply mitigation measures for timing of thinning in campground.

1.4.3.12 Issue 12- Social and Economic:

What will the benefits be to local communities from the proposed management activities?

- Percentage of receipts from timber sales returned to Ashland County
- Employment opportunities generated by opportunities on National Forest land

Indicator 1: Amount of volume generated from timber sales

Indicator 2: Estimated timber sale receipts returned to the county

1.4.4 Issues Eliminated From Further Study

The Cayuga ID Team eliminated the following issues (resources) from detailed study, as directed by CEQ Regulation §1500.1(b), 1500.2(b) and other sections, because the proposed project would cause only inconsequential effects to occur to these resources. No further information on these eliminated issues appears in this DEIS.

1.4.4.1 Forest Plan Revision

Five major EIS's are on going to implement the 1986 Chequamegon National Forest Plan. This Plan is currently undergoing revision and a variety of revision alternatives have been developed. There is a concern that implementing proposed actions now could limit the range of options for decision-making and alternative choices to revising the Forest Plan.

In the context of the entire Forest Plan revision, the ID Team analysis found goal trade-offs from Cayuga actions to be very small and the cumulative tradeoffs at the overall Forest Plan level to be negligible. The scope and scale of vegetation treatments and road access management is well within all of the goals, objectives, standards, and guidelines found in the range of all alternatives considered for Revision. Additionally, the Cayuga action alternatives were developed by considering the new information and conditions used in developing the Plan Revision alternatives. These small trade-offs will have no impact on limiting the range of options for decision-making and alternative choices to revising the Forest Plan.

Therefore, this issue is not relevant to the proposed action. No mitigation or design changes are needed, nor do additional alternatives need to be considered. Since there will be no related impacts to the revision process, there are none to disclose, and this issue is dismissed from further discussion in this EIS. Detailed rationale for this dismissal is found in the Cayuga project file.

1.4.4.2 Prime Farm, Timber, and Rangelands

There are no prime farmlands or rangelands on National Forest land within the project area. There are small acreages of private agricultural land on the eastern border of the project area near the community of Cayuga. There are also scattered parcels of private forested timberland scattered throughout the project area ranging in size from a few acres to thousand-acre parcels. (The maps in Appendix A show ownership patterns).

1.4.4.3 Minerals

There is potential for mineral development for iron, quarry stone (building), and sulfide minerals. There are no mineral leases or special use permits being administered within the project area. Requests for mineral special use permits will be evaluated on a case-by-case basis.

1.4.4.4 Wild and Scenic Rivers

There are no wild and scenic river corridors that exist within the Cayuga Project Area. In addition, there are no congressionally designated study rivers within the project area.

1.4.4.5 Special Use Authorizations

There are special use permits and easements for various uses of National Forest lands within the Cayuga Project Area. This analysis will not be evaluating any special use authorization requests. These requests will be evaluated on an individual basis.

1.4.4.6 Forest Plan Revision Inventoried Potential Wilderness Area (IPWA)

During the revision of the Chequamegon-Nicolet National Forest Plan, areas that have potential to become congressionally designated wilderness areas are being evaluated. Within the Cayuga Project Area, the Iron River Forest Plan Revision Inventoried Potential Wilderness Area (IPWA) has been identified. There are approximately 8,503 acres within the Iron River Forest Plan Revision IPWA. This area is not included in the project area analysis of direct or indirect effects as no activities are proposed within it. As stated in the original "Purpose and Need" sent out for public review, "no decisions will be made that change the undeveloped character of this area until the evaluation under the Forest Plan Revision process is completed in the reasonably foreseeable future." This area, however, is included in the analysis of the cumulative effects.

1.4.4.7 Ecological Reference Areas

There are two Ecological Reference Areas (ERA) within the Cayuga Project Area. The McCarthy Lakes and Cedar Research Natural Area (RNA) is located within one of the ERA's in the project area. A portion of the other ERA is within the Iron River IPWA. No management activities are proposed within either the ERA's or IPWA. However, cumulative effects of management activities conducted adjacent to these areas are included in the analysis of cumulative effects in Section 4.2.1.

1.4.4.8 Hunting

Hunting for game species such as white-tailed deer and ruffed grouse occurs throughout the Cayuga Project Area. Aspen can influence hunting pressure in an area. Grouse hunters particularly concentrate on larger sapling aspen because it provides a higher amount of dense cover for ruffed grouse. Many hunters tend to look for areas that have a variety of forest cover types and ages, such as hardwood cover types vs. large areas of similar cover types. Regardless of the age of aspen at a particular site, aspen management can help to provide diversity and attract more hunters. The proposed management activities would not have adverse impacts to hunters.

1.4.4.9 Population Viability Analysis

Viability of animal populations is best considered at a larger scale than at the project level. Currently the issue of population viability is being analyzed as a part of the Forest Plan Revision process. A Biological Evaluation (BE) has been prepared to analyze the effects on wildlife populations that are present within the project area (see summary of the BE in Appendix D).

1.4.4.10 Heritage Resources

The Forest Service is charged with the responsibility of managing and protecting archaeological and historic sites and

districts, i.e., places relating to our cultural heritage referred to as heritage resources. Heritage resources recorded within the Great Divide Ranger District include Native American settlements and camps, some of which are thousands of years in age. They also include house places, camps and other landscape features related to European American settlement. The Forest Plan provides heritage resource management direction on pages IV-28 and 29. Essentially, the direction states that all areas must be surveyed for heritage resources prior to any activity, which may disturb significant or potentially significant heritage resources. Ground-disturbing activities such as road construction, closures, road decommissioning, trail construction, wildlife and fish habitat improvement activities, and timber harvest activities have been reviewed for heritage resource survey needs. Mitigation measures identified in Appendix C would serve to avoid impacts to all known and discovered heritage resource sites. Therefore, this issue will not be discussed in further detail.

Documentation regarding heritage resources, and heritage resource surveys, is on file at the Glidden Office, along with the Division of Historic Preservation, State Historical Society of Wisconsin.

1.5 Decisions To Be Made

The responsible official for this proposal will be the Great Divide District Ranger of the Chequamegon-Nicolet National Forest. The decision to be made is limited to:

- What vegetation management activities would be implemented in the project area and where they would occur
- What roads to build, maintain or decommission and how access on them would be managed
- Whether to implement the fisheries and watershed restoration activities
- What mitigation measures or monitoring measures to implement to meet the Forest Plan standards and guidelines while minimizing resource damage
- Whether or not to implement the relocation of a portion of Snowmobile Trail 8 and construct a trail head to address public safety
- The District Ranger must also determine if the selected alternative would or would not be a major federal action, significantly affecting the quality of the human environment. If he determines that it would not significantly affect the quality of the human environment, he can then prepare a Record of Decision (ROD) and the project can proceed.

1.6 Applicable Regulatory Requirements, Required Coordination, Licenses, and Permits

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." The Cayuga Project must comply with the following Federal and Wisconsin state environmental laws, regulations, and coordination activities for it to proceed. The following regulations and policies are relevant to activities proposed in the Cayuga project:

1.6.1 National Forest Management Act (36 CFR 219.27)

This Act establishes guidelines for National Forest management. This project has been designed in conjunction with these guidelines, as explained below:

- Timber stands identified for harvest are suitable for timber production.
- The project would improve water quality.
- This project would meet the Forest Plan recommendations for fisheries habitat improvement.
- This project would meet the Forest Plan objectives for road densities.
- This project would prevent or seriously reduce the potential damage to stands of timber due to infestation by disease or insects.

- This project would further protect unique qualities of the McCarthy Lake and Cedar Research Natural Area.

1.6.2 Endangered Species Act of 1973, as amended 1978, 1979, 1982, and 1988 (16 U.S.C. 1531)

This Act provides direction to the Forest Service to establish objectives for habitat management and recovery through the Forest Plan for the conservation and protection of endangered and threatened species. This project is consistent with these guidelines as explained below:

- The project area would be reviewed to identify, manage, and protect essential and critical habitats to meet legal requirements and recovery objectives for Federally listed species.
- A Biological Assessment (BA) for this project would be completed to determine potential for effects on listed species, and submitted to the US Fish and Wildlife Service for review. Formal consultation would be initiated if a may affect determination were made for any listed species.
- The project analysis would identify and prescribe mitigation measures to prevent adverse modification or destruction of critical habitat and other essential habitats.

1.6.3 Executive Order 12898 (Environmental Justice)

The Environmental Justice Executive Order 12898, released by the White House in February 1994, places attention on any adverse human health and environmental effects of agency actions that may disproportionately impact minority and low-income populations. The Order simultaneously directs Federal agencies to avoid making decisions that discriminate against these communities. The disclosure of EO 12898 considerations are found in the project file (Environmental Justice section).

1.6.4 National Historic Preservation Act (16 U.S.C. 470)

This Act provides direction for Federal agencies to establish a program for preservation of historic properties. Consultation with local tribal governments pertaining to historical and culturally significant sites has been conducted.

1.6.5 Section 404 of the Clean Water Act (CWA)

The Federal Water Pollution Control Act of 1972, as amended, is commonly referred to as the Clean Water Act. This was enacted to restore and maintain the chemical, physical, and biological integrity of the Nations waters. Under Section 404, the U.S. Army Corps of Engineers has been given responsibility to regulate the discharge of dredged and fill material into waters of the United States, including wetlands (33 CFR 323.3). The State of Wisconsin also exercises control over projects impacting wetlands under Water Quality Standards for Wetlands, Chapter NR 103. There is a general exemption for silvicultural activities including harvesting for the production of forest products or upland soil and water conservation practices. Wisconsin's Forestry Best Management Practices for Water Quality are still required. Appropriate Federal and State Water Regulatory and Army Corps permits, and Trans 207 Agreements would be obtained prior to implementation of projects involving navigable waters, floodplains, or wetlands.

1.6.6 Chapter 30 (Wisconsin state statute) Permit

According to Wisconsin statute, a permit is required for the construction of a ford or installation of a culvert or bridge across a navigable perennial or intermittent stream. A permit for replacement of culverts will be obtained before implementing any in stream work.

1.7 Other Relevant Efforts

1.7.1 Forest Plan Revision

The current 1986 CNF plan is being revised in response to new information and changed conditions. This analysis has

considered the new information and conditions being used in the revision process. How proposed activities relate to the revision is disclosed in the project file (Forest Plan Revision section).

2.0 Chapter 2: Alternatives Considered

2.1 Introduction

This chapter describes and compares the alternatives considered for the Cayuga Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision- maker and the public. Some of the information used to compare the alternatives is based upon the design of each alternative, and some of the information is based upon the environmental, social and economic effects of implementing each alternative (e.g., the amount of erosion caused by summer logging vs. winter logging).

2.2 Alternative Development Process

Portions of this area have been analyzed in opportunity analyses (OA) and environmental assessments (EA). Past analyses conducted with in the project were the Clam Lake OA (1991), Halfway OA (1993), Spider OA (1991), Gates OA (1992), Morse OA (1990), and the Spruce Pine EA (1992). These OAs and EAs were all tiered to the 1986 Chequamegon National Forest Land and Resource Management Plan (Forest Plan).

The Great Divide District Ranger of the Chequamegon-Nicolet National Forest worked with the Interdisciplinary Team to identify the following criteria to design and evaluate the Cayuga Project Area.

Management Direction For The Cayuga Project Area: The Cayuga Project Area is located within Goal Areas 1 and 2 as identified within the Chequamegon Land and Resource Management Plan (Forest Plan). The Team reviewed the desired future conditions, goals, and standards and guidelines for each of the Goal Areas and identified the following direction for the project area:

- Manage 30% of aspen in the 0-20 age class within Goal Area 1 (Forest Plan IV-114)
- Improve wildlife and fish habitat (Forest Plan IV-78-80)
- Provide safe, high-quality recreational facilities and trails (Forest Plan IV-26-27)
- Improve timber growth on lands suitable and available for timber production while managing for multiple resources (e.g., visual quality, wildlife habitat, etc.) (Forest Plan IV-39-40)
- Protect the unique values and resources of the McCarthy Lakes and Cedar Research Natural Area (Forest Plan IV-92-93)
- Restore lakes and streams that have been disturbed by sedimentation (Forest Plan IV-69)
- Minimize and mitigate sedimentation to protect water quality (Forest Plan IV-69)
- Minimize and mitigate soil erosion and compaction that could decrease soil productivity (IV-69-75)
- Protect wetlands and riparian areas (Forest Plan IV-67-68)
- Emphasize optimum timber production with respect to site potential, cost efficiency, multiple use, and non-declining even-flow (Forest Plan IV-3).

2.3 Alternatives Considered in Detail

The Forest Service developed four alternatives, including the No Action and Proposed Action alternatives, in response to

issues raised by the public. Each alternative is described in terms of:

- Timber Harvest and Silvicultural Treatments
- Road Management
- Recreation Site Management
- Visual Quality Management
- Control of Noxious weeds
- Fisheries and Wildlife Habitat Maintenance and Improvement
- Watershed Restoration
- Trail Management
- Management of Lands Adjacent to McCarthy Lake and Cedars Natural Area

A comparison of the important activities and tradeoffs between each alternative is displayed in Tables 2.5a-c.

2.3.1 Alternative 1: No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. None of the proposed actions, such as timber harvests, planting, watershed restoration, recreational facility improvement, etc. would be implemented to accomplish project goals. There are ongoing permitted and approved uses on National Forest lands that would continue within the project area. These include, but aren't limited to:

- **Firewood cutting--**under the permitting regulations for the Chequamegon-Nicolet National Forest, firewood gathering by the public in designated areas would continue.
- **Transportation management--**All open inventoried and non-inventoried Forest Service roads within the project area would remain open. Existing road closure devices within the project area (e.g., berms, gates, rocks, etc.) would continue to be maintained.
- **Trail management--**Use of FR 1296 as a section of Snowmobile Trail 8 would continue. Annual maintenance would continue.
- **Parking facility--**A Special Use Permit for the continued use of the opening south of FR 1296 for a snowmobile parking area would be reissued.
- **Fire suppression--**All human- and natural-caused fires would be suppressed.
- **Recreation Facilities--**A hazard tree inspection would continue to be conducted on an annual basis. Trees that appear to be weak or rotted and are located near campsites and facilities would be removed individually.

2.3.2 Alternative 2-Agency Preferred Alternative

This alternative was designed to not only meet Forest Plan direction, but also to incorporate findings and new information (e.g. "Scientific Roundtable on Biological Diversity", Forest Plan Revision process).

Implementation of these management activities would be expected to begin within 5 years. The Alternative Treatment Map can be found in Appendix A. Mitigation measures specific to this alternative are described in Appendix C.

Timber Harvest and Silvicultural Treatments *(see Appendix J, Stand Treatment Table, for a site-specific list of treatments by compartment and stand.)*

Approximately **5,414 acres** are proposed for timber harvest under Alternative 2. (This includes all harvest activities further described below.) This harvest would yield an estimated **23.0 million board feet** (MMBF) of timber volume. Stands would be grouped into several timber sales, to be offered beginning in 2003.

Even-aged thinnings are proposed on approximately **1,941 acres**. Of this total, about **1,331 acres** of mixed northern hardwoods would be thinned to promote the development and growth of mid-tolerant species like basswood and ash. Approximately **383 acres** of conifers would be thinned to promote the health and vigor of these stands, and to address

recreation concerns. Approximately **220 acres** of aspen, and **7 acres** of paper birch, would be thinned to encourage conversion of these stands to longer-lived hardwoods or conifers.

Uneven-aged hardwood management would be implemented on approximately **2,140 acres** of northern hardwood stands through selection harvesting to develop multi-aged stands and favor shade-tolerant species like sugar maple.

The shelterwood system would be used to regenerate approximately **596 acres**. Shelterwood seed cutting is proposed on about **543 acres** to provide conditions favorable for natural or artificial regeneration. Under planting of conifers would follow on some of these sites, while natural seeding of hardwoods or conifers would be encouraged on other sites. The residual trees would provide shade needed for the establishment of the new stand. On two sites, totaling about **53 acres**, the overstory trees remaining from a previous shelterwood seed cut would be removed to provide optimal growing conditions for the recently established saplings.

Approximately **737 acres** of mature and over-mature aspen stands would be clearcut and regenerated to aspen, relying on root-sprouting to quickly re-capture these sites.

About **147** acres of post harvest treatments would occur. They are identified in the activity column of the Stand Treatment Table in Appendix J. These treatments may include mechanical site prep for regeneration, hand planting, and plantation seedling release and protection.

Road Management

Under Alternative 2, approximately **12.6 miles** of new temporary roads would be constructed for the harvest and removal of timber. Native soils would be used for the driving surface. Minor drainage improvements would be made where needed. All temporary roads constructed would be decommissioned following timber harvesting to limit motorized access.

Road maintenance work, specifically needed for this project, would be performed on approximately **22.8 miles** of existing roads needed to access timber sale areas. In many cases only portions of these roads may need actual maintenance work, such as minor surface blading or spot gravelling in low spots of the roadbed. In some cases the road maintenance would include the entire length of road needed to access the timber harvest area.

A Transportation Analysis (referred to as the roads analysis hereafter) was completed for the Cayuga Project Area in February 2002. Under Alternative 2 approximately **6.5 miles** of existing system and non-system roads would be decommissioned within the project area.

In order to protect the unique values and resources within the McCarthy Lake and Cedars RNA, a short spur off FR 1333 would be closed. Information regarding the closure would be posted at the closure to notify the public.

Recreation Site Management

Under this alternative, approximately **25 acres** of jack pine and red pine within Day Lake Campground on the Jack Pine and Heron Circle Loops would be thinned to address safety concerns. In addition, approximately **113 acres** of red pine in the Paper Birch, Red Pine, Blueberry, and Musky Bay Loops would be thinned to improve air movement and screening between campsites. Harvest activities would be restricted to winter only. (These stands are included in the total acres of conifer thinnings identified earlier in this section.)

Visual Quality Management

Along County Highway GG there are approximately **297 acres** of mature and declining aspen stands. These stands would be treated with shelterwood cuts (**220 acres**) or thinnings (**77 acres**), to begin conversion of these stands to longer-lived species. Most of these stands would be converted to northern hardwoods, while some would be converted to conifers, according to site characteristics. (These stands are included in the total acres of shelterwood cuts and thinnings listed earlier in this section.)

To improve the aesthetics along the shorelines of Day Lake, East Twin Lake, and Spillerberg Lake, some declining aspen and birch stands would be gradually converted to white pine by various methods:

About **14 acres** of aspen on the west shore of Day Lake would receive a shelterwood seed cut to stimulate existing white pine seedlings.

One aspen stand (about **15 acres**) at East Twin Lake would receive a shelterwood cut followed by under planting of

white pine. (These stands are included in the total acres of shelterwood cuts listed earlier in this section.)

Three shoreline stands at Day Lake and Spillerberg Lake, totaling about **53 acres**, would be under planted to white pine without disturbing the existing over story.

Control of Noxious weeds

A biological control (flea beetle) (*Aphthona species*) would be released to control three small patches of Leafy Spurge (*Euphorbia esula*) that together total less than **1 acre** .

Fisheries and Wildlife Habitat Maintenance and Improvement

Approximately **35 acres** of aspen would be converted to conifers within 300 feet of Brush and McCarthy Creeks. The conversion from aspen to species less palatable to beaver would be achieved through a combination of partial cutting to remove the aspen and under planting of white pine or white spruce. (These stands are included in the total acres of aspen thinnings identified earlier in this section.)

Brush bundles would be constructed and placed along approximately **1,000 feet** of McCarthy Creek to help narrow and deepen the stream channel and reduce the impacts of sediment. Removal of fine debris and tag alder would be conducted by hand cutting along approximately **1.5 miles** of McCarthy Creek to improve the flow of the stream, reduce accumulated sediment deposits, promote grass cover, and stabilize the streambanks.

Restoration of approximately **85 acres** of upland openings to a grass/forbs/shrub condition would be accomplished through hand cutting, mowing, or burning of encroaching woody vegetation depending on the characteristics of each site. Periodic maintenance and monitoring of each opening would occur.

Watershed Restoration

Under this alternative, existing culverts at **7 sites** would be replaced with culverts of larger diameter and greater length. These culverts would be installed at or slightly below streambed elevation to improve water quality and fish passage. These sites would include an unnamed tributary of Clam Lake at FR 195, and unnamed tributary to East Twin Lake at FR 195, an unnamed tributary to Brush Creek at FR 183, an unnamed tributary to Squaw Creek at FR 354, Brush Creek at FR 354, an unnamed tributary to the Bad River at FR 355, and an unnamed tributary on County Highway GG (see map in Appendix A). Each site would be designed with a 2:1 embankment ratio and rock armoring at each end of the culverts for erosion control. Additional erosion control measures would include re-vegetation of the sites with native or non-invasive seed, along with the application of weed-free mulch or straw matting and installation of silt fences that would be removed once re-vegetation occurs. In-stream work within Brush Creek and its tributaries would be completed before September 15th or after April 15th to protect trout spawning areas.

Trail Management

A parking facility for snowmobile trail users would be constructed on the south side of FR 1296. The parking lot would be approximately **1 acre** in size. In addition, relocation of approximately **.4 miles** of Snowmobile Trail 8 along a segment of County Highway GG (north) and FR 1296 to address safety concerns due to increased traffic would also be done.

Under the original proposal for this alternative, approximately **2.5 miles** of Snowmobile Trail 8 would have been rehabilitated, abandoned, and relocated. This proposed action was removed from the project analysis due to the need to immediately address public safety concerns. Those individuals who commented specifically on the proposed actions pertaining to the snowmobile trail relocation were contacted. The proposed actions for the relocation, rehabilitation and abandonment of the section of Snowmobile Trail 8 that crosses Brush Creek will be analyzed under a separate analysis.

Management of lands adjacent to the McCarthy Lake and Cedars Research Natural Area

Approximately **48 acres** of aspen within 3/4 mile of the McCarthy Lake and Cedars Research Natural Area (RNA) would be converted to hardwoods through the shelterwood method. (This stand is included in the total acres of shelterwood cuts identified earlier in this section.)

2.3.3 Alternative 3

This alternative was designed to address issues relative to the management of early successional species and management

of closed-canopy northern hardwood forests. Alternative 3 places emphasis on following the Forest Plan direction for Goal Areas 1 and 2 as described in the Forest Plan on pages IV-106 and IV-117. Elements of the Forest Plan such as the Desired Future Condition (DFC), particularly in terms of the percentage of cover types, Forest-wide standards and guidelines (S&Gs), and public comments from the tribes and general public helped shape and develop this alternative.

These management activities would be expected to occur during the 5-year period following the signing of the decision document for this project. The Alternative Treatment map can be found in Appendix A. Mitigation measures specific to this alternative are described in Appendix C.

Timber Harvest and Silvicultural Treatments *(see Appendix J, Stand Treatment Table, for a site-specific list of treatments by compartment and stand.)*

Approximately **6,176 acres** are proposed for timber harvest under Alternative 3. (This includes all harvest activities further described below.) This harvest would yield an estimated **28.0 million board feet** (MMBF) of timber volume. Stands scheduled for harvest would be grouped into several timber sales, to be sold during 2003 and 2004, with harvest expected to be completed by 2008.

Even-aged thinnings are proposed on approximately **1,627 acres**. Of this total, about **865 acres** of mixed northern hardwoods would be thinned to promote the development and growth of mid-tolerant species like basswood and ash. Approximately **383 acres** of conifers would be thinned to promote the health and vigor of these stands, and to address recreation concerns. Approximately **351 acres** of aspen, and **28 acres** of paper birch, would be thinned to encourage conversion of these stands to longer-lived hardwoods or conifers.

Uneven-aged management would be implemented on approximately **2,892 acres** of northern hardwood stands. Of this total selection harvesting would be used on about **2,836 acres** to favor shade-tolerant species like sugar maple. Improvement cutting would be used on about **56 acres** to develop multi-aged stands and increase the health, growth, and quality of the remaining trees.

The shelterwood system would be used to regenerate approximately **250 acres**. Shelterwood seed cutting is proposed on about **197 acres** to provide conditions favorable for natural or artificial regeneration. Under planting of conifers would follow on some of these sites, while natural seeding of hardwoods or conifers would be encouraged on other sites. The residual trees would provide shade needed for the establishment of the new stand. On two sites, totaling about **53 acres**, the overstory trees remaining from a previous shelterwood seed cut would be removed to provide optimal growing conditions for the recently established saplings.

Approximately **1,381 acres** of mature and over-mature aspen stands would be clearcut and regenerated to aspen, relying on root sprouting to quickly re-capture these sites.

About **242 acres** of post harvest treatments would occur. They are identified in the activity column of the Stand Treatment Table in Appendix J. These treatments may include mechanical site prep for regeneration, hand planting, and plantation seedling release and protection.

Road Management

Under Alternative 3, approximately **16.3 miles** of new temporary roads would be constructed for the harvest and removal of the timber. Native soils would be used for the driving surface. Minor drainage improvements would be made where needed. All temporary roads constructed would be decommissioned following timber harvest to render them impassable by motorized vehicles. Based upon the opportunities identified in the roads analysis, approximately **5.7 miles** of inventoried and non-inventoried roads would be decommissioned within the Cayuga Project Area.

Road maintenance work would be performed on approximately **23.3 miles** of existing roads needed to access timber sale areas within the project area. In many cases only portions of these roads may need actual maintenance work, such as minor surface blading or spot gravelling in low spots of the roadbed. In some cases the road maintenance would include the entire length of road needed to access the timber harvest area.

In order to protect the unique values and resources within the McCarthy Lake and Cedars RNA, a short spur off FR 1333 would be closed. Information regarding the closure would be posted at the closure to notify the public.

Recreation Site Management

Under this alternative, approximately **25 acres** of jack pine and red pine within Day Lake Campground on the Jack

Pine and Heron Circle Loops would be thinned to address safety concerns. In addition, approximately **113 acres** of red pine in the Paper Birch, Red Pine, Blueberry, and Musky Bay Loops would be thinned to improve air movement and screening between campsites. Harvest activities would be restricted to winter only. Mitigation measures have been identified in Appendix C for harvesting within the campground. (These stands are included in the total acres of conifer thinnings identified earlier in this section.)

Along the entrance road to Day Lake Boat Launch and Picnic Area, two stands of mature jack pine totaling approximately **26 acres** would be clearcut. Following harvest, these two stands would be planted with red pine.

Visual Quality Management

Along County Highway GG, approximately **203 acres** of mature and declining aspen stands would be treated with thinnings (**193 acres**), or shelterwood cuts (**10 acres**), to begin conversion of these stands to longer-lived species. Most of these stands would be converted to northern hardwoods, while some would be converted to conifers, according to site characteristics. (These stands are included in the total acres of shelterwood cuts and thinnings listed earlier in this section.)

To improve the aesthetics along the shorelines of Day Lake, East Twin Lake, and Spillerberg Lake, some declining aspen and birch stands would be gradually converted to white pine by various methods:

About **14 acres** on the west shore of Day Lake would receive a shelterwood seed cut to stimulate existing white pine seedlings.

About **62 acres** of aspen and paper birch (33 acres at Day, 14 acres at Spillerberg, and 15 acres at East Twin) would be converted to white pine through shelterwood cutting, followed by under planting of white pine. (These stands are included in the total acres of shelterwood cuts listed earlier in this section.)

Two shoreline stands at Day Lake, totaling about **29 acres**, would be underplanted without disturbing the existing overstory.

Control of Noxious weeds

Under this alternative, no treatment of leafy spurge along County Highway GG would be implemented.

Fisheries and Wildlife Habitat Maintenance and Improvement

The proposed projects and mitigation measures for fisheries habitat and water quality improvement would be the same as those proposed under Alternative 2.

Construction of approximately **16 acres** of openings within early successional forest types would be implemented. Mechanical methods (i.e. mowing, bulldozing, etc.) would be utilized to construct these openings. Approximately **126 acres** of existing wildlife openings would be maintained through mowing, brushing, hand cutting, or prescribed burning. Monitoring and periodic maintenance of each opening would be done.

Watershed Restoration

Under this alternative, existing culverts at **6 sites** would be replaced with culverts of larger diameter and greater length. The new culverts would be installed at or slightly below streambed elevation to improve water quality and fish passage. These sites would include an unnamed tributary of Clam Lake at FR 195, an unnamed tributary to East Twin Lake at FR 195, an unnamed tributary to Brush Creek at FR 183, an unnamed tributary to Squaw Creek at FR 354, Brush Creek at FR 354, and an unnamed tributary on County Highway GG. Each site will be designed with a 2:1 embankment ratio and rock armoring at each end of the culverts for erosion control. Additional erosion control measures would include re-vegetation of the sites with native or non-invasive seed, along with the application of weed-free mulch or straw matting and installation of silt fences that would be removed once re-vegetation occurs. In-stream work within Brush Creek and its tributaries will be completed before September 15th or after April 15th to protect trout spawning areas.

The unnamed tributary to the Bad River at FR 355 would also be restored. This would involve removing the twin corregated metal culverts and approximately 100 feet of FR 355 on either side of the stream. The road fill would be removed down to floodplain elevation for the approximate width of the floodplain. The stream channel bed and banks would be restored to a natural state, trees transplanted next to the stream where possible, the road sub-grade scarified for re-vegetation, prominent road features blended into the surrounding terrain, and access blocked with boulders,

berms, and/or slash. Where the road dead-ends, vehicle turnarounds would be provided. The stream crossing would be re-stored by removing enough embankment material to obtain the natural stream channel and floodplain width and depth. Erosion control measures for the activities would include seeding with non-invasive species of grasses, applying weed-free straw mulch, installing erosion control mat adjacent to the stream banks, and installing silt fence that could be removed once the project area is stabilized and re-vegetated. This project would result in the restoration of 1 acre the floodplain.

Trail Management

The proposed actions and mitigation measures for trail management would be the same as those proposed under **Alternative 2** (for detailed description see Section 2.4.2).

Management of lands adjacent to the McCarthy Lake and Cedars Research Natural Area

Approximately **57 acres** of aspen within 3/4 mile of the McCarthy Lake and Cedars Research Natural Area (RNA) would be converted to hardwoods by thinning. (These stands are included in the total acres of thinning identified earlier in this section.)

2.3.4 Alternative 4

This alternative was designed in response to the issues pertaining to forest fragmentation, the amount of timber harvest along County Hwy GG, and harvest activities near the McCarthy Lake and Cedars Research Natural Area (RNA).

These management activities would be expected to occur during the 5-year period following the signing of the decision document for this project. The Alternative Treatment Map can be found in Appendix A. Mitigation measures specific to this alternative are described in Appendix C.

Timber Harvest and Silvicultural Treatments *(see Appendix J, Stand Treatment Table, for a site-specific list of treatments by compartment and stand.)*

Approximately **4,880 acres** are proposed for timber harvest under Alternative 4. (This includes all harvest activities further described below.) This harvest would yield an estimated **20.0 million board feet** (MMBF) of timber volume. Stands would be grouped into several timber sales, to be sold during 2003 and 2004, with harvest expected to be completed by 2008.

Even-aged thinnings are proposed on approximately **616 acres**. Of this total, about **179 acres** of mixed northern hardwoods would be thinned to promote the development and growth of mid-tolerant species like basswood and ash. Approximately **295 acres** of conifers would be thinned to promote the health and vigor of these stands, and to address recreation concerns. Approximately **142 acres** of aspen would be thinned to encourage conversion of these stands to longer-lived hardwoods or conifers.

Uneven-aged management would be implemented on approximately **3,676 acres** of northern hardwood stands. Selection harvesting would be used on about **2,710 acres** to favor shade-tolerant species like sugar maple. Improvement cutting would be used on about **966 acres** to develop multi-aged stands and increase the health, growth, and quality of the remaining trees.

The shelterwood system would be used to regenerate approximately **164 acres**. Of this total, shelterwood seed cutting is proposed on about **111 acres** to provide conditions favorable for natural or artificial regeneration. Under planting of conifers would follow on some of these sites, while natural seeding of hardwoods or conifers would be encouraged on other sites. The residual trees would provide shade needed for the establishment of the new stand. On two sites, totaling about **53 acres**, the overstory trees remaining from a previous shelterwood seed cut would be removed to provide optimal growing conditions for the recently established saplings.

Approximately **398 acres** of mature and over-mature aspen stands would be clearcut and regenerated to aspen, relying on root-sprouting to quickly re-capture these sites.

About **133 acres** of post harvest treatments would occur. They are identified in the activity column of the Stand Treatment Table in Appendix J. These treatments may include mechanical site prep for regeneration, hand planting, and plantation seedling release and protection.

Road Management

Under Alternative 4, approximately 10.5 miles of new temporary roads would be constructed for the harvest and removal of the timber. Native soils would be used for the driving surface. Minor drainage improvements would be made where needed. All temporary roads constructed would be decommissioned following timber harvest to render them impassable by motorized vehicles. Based upon the opportunities identified in the roads analysis for the Cayuga Project Area, approximately 11.4 miles of road would be decommissioned.

Road maintenance work would be performed on approximately 19.7 miles of existing roads needed to access timber sale areas within the project area. In many cases only portions of these roads may need actual maintenance work, such as minor surface blading or spot gravelling in low spots of the roadbed. In some cases the road maintenance would include the entire length of road needed to access the timber harvest area.

In order to protect the unique values and resources within the McCarthy Lake and Cedars RNA, a short spur off FR 1333 would be closed. Information regarding the closure would be posted at the closure to notify the public.

Recreation Site Management

Under this alternative, approximately 25 acres of jack pine and red pine within Day Lake Campground on the Jack Pine Circle and Heron Circle Loops would be thinned to address safety concerns. Harvest activities would be restricted to winter only. Mitigation measures have been identified in Appendix C for harvesting within the campground. (This stand is included in the total acres of conifer thinnings identified earlier in this section.)

Along the entrance road to Day Lake Boat Launch and Picnic Area, two stands of mature jack pine totaling approximately 26 acres would be clearcut. Following harvest, these two stands would be planted with red pine.

Visual Quality Management

Along County Highway GG, approximately **236acres** of mature and declining aspen stands would be treated with thinnings **105 acres** or improvement cuts **131 acres** to begin conversion of these stands to longer-lived species. Most of these stands would be converted to northern hardwoods, while some would be converted to conifers, according to site characteristics. (These stands are included in the total acres of thinnings listed earlier in this section.)

To improve the aesthetics along the shorelines of Day Lake and East Twin Lake, some declining aspen and birch stands would be gradually converted to white pine by various methods:

About **14 acres** on the west shore of Day Lake would receive a shelterwood seed cut to stimulate existing white pine seedlings.

One aspen stand (about **15 acres**) at East Twin Lake would receive a shelterwood cut followed by under planting of white pine. (These stands are included in the total acres of shelterwood cuts listed earlier in this section.)

Three shoreline stands at Day Lake, totaling about **39 acres**, would be underplanted to white pine without disturbing the existing overstory.

Control of Noxious weeds

A biological control agent (beetle) would be released to control Leafy Spurge on three sites that cumulatively total **< 1 acre**.

Fisheries and Wildlife Habitat Maintenance and Improvement

The proposed projects and mitigation measures for fisheries habitat and water quality improvement would be the same as those proposed under Alternative 2.

The proposed activities and mitigation measures to convert aspen stands along Brush, Squaw, and McCarthy Creeks would be the same as those proposed under Alternatives 2 and 3.

Restoration of approximately **7 acres** of existing upland openings to a grass/forbs/shrub condition would be accomplished through hand-cutting, mowing, brushing or burning of the encroaching woody vegetation, depending on the characteristics of each site. An additional **20 acres** would be maintained through prescribed burning. No new wildlife openings would be constructed. Periodic monitoring and maintenance of each opening would occur.

Watershed Restoration

The proposed projects and mitigation measures would be the same as those proposed under Alternative 3.

Trail Management

The proposed actions and mitigation measures for trail management would be the same as those proposed under Alternatives 2 and 3.

2.4 Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need.

The alternatives developed and evaluated in this analysis considered public comments and methods to meet the purpose and need as described in Section 1.2. Therefore, no alternatives have been identified for elimination from detailed study. All four alternatives will be analyzed in this document.

2.5 Summary Comparison of Activities, the Predicted Achievement of the Project Objectives, and the Predicted Environmental Effects of All Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.5a. Summary Comparison of activities proposed for all alternatives

Proposed Activity	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Commercial thinning of even-aged hardwoods (acres)	0	1,331	865	179
Commercial thinning of conifers to promote health and vigor (acres)	0	383	383	295
Selection harvest for uneven-aged management to develop multi-aged hardwood stands (acres)	0	2,140	2,836	2,710
Improvement cut to move toward uneven-aged condition and increase growth and quality (acres)	0	0	56	966
Shelterwood seedtree harvest to obtain natural regeneration (acres)	0	543	197	111
Shelterwood removal of overstory to release established regeneration (acres)	0	53	53	53
Clearcut mature aspen to maintain aspen component (acres)	0	737	1,381	398

Convert aspen stands to long-lived northern hardwoods or conifers:				
- To improve visual quality along Hwy GG (acres)	0	297	203	236
- To improve visual quality along lakeshores with developed recreation facilities (acres)	0	53	76	39
- To enhance value of McCarthy Lake and Cedars RNA (acres)	0	48	57	0
- To promote continuous-canopy northern hardwoods in large hardwood blocks (acres)	0	93	44	81
- To release spruce component in mixed aspen-spruce stands (acres)	0	30	44	15
- To favor hardwood understory on optimal hardwood sites (acres)	0	52	0	89
-To promote longer-lived species along trout streams (acres)	0	35	13	22
-To restore upland-lowland transition areas to long-lived conifers	0	38	0	58
Temporary road construction for access to timber (miles)	0	12.6	16.3	10.5
Inventoried roads identified for decommissioning (miles)	0	6.5	5.7	11.4
Road maintenance of existing roads needed for access to timber (miles)	0	22.8	23.3	19.7
Thinning of red and jack pine to address public health and safety concerns and improve air flow within Day Lake Campground (acres)	0	113	113	25 (to address safety only)
Clearcut over-mature jackpine and plant red pine along road to Day Lake Boat Ramp and Picnic Area (acres)	0	0	26	26
Underplant white pine along shorelines of lakes with developed recreation facilities to enhance visual quality (acres)	0	53	29	39
Control noxious weeds (no. sites)	0	3	0	3
Place brush bundles along McCarthy Creek (linear feet)	0	1,000	1,000	1,000
Remove fine debris and tag alder along McCarthy Creek (miles)	0	1.5	1.5	1.5
Permanent upland opening maintenance (acres)	0	85	126	27
Construction of upland openings (acres)	0	0	16	0

Culvert replacement and road reshaping for watershed restoration (sites)	0	7	6	6
Culvert removal and stream channel and floodplain restoration (sites)	0	0	1	1
Construction of parking facility for snowmobilers ?	No	Yes	Yes	Yes
Relocation of a section of Snowmobile Trail 8 (miles)	0	.4	.4	.4

Table 2.5b. Summary comparison of effects of all alternatives on each alternative

Issue	Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Issue 1--Early Successional Management	1. Amount of aspen cover type in Goal Area 1	6314 ac 38.5%	6080 ac 37.1%	6119 ac 37.3%	6179 ac 37.7%
	2. Amount of aspen cover type in Goal Area 2	2732 ac 20.3%	2320 ac 17.2%	2490 ac 18.5%	2327 ac 17.3%
Issue 2--Wildlife Openings	1. Percentage of upland area in managed openings within project area	0%	0.3%	0.4%	0.1%
	2. Acres of openings maintained	0	85	126	27
	3. Acres of new openings constructed	0	0	16	0
Issue 3--Vegetation Composition	1. Acres of aspen conversion to conifers or northern hardwoods through silvicultural activities.	0	646	437	540
	2. Percent of forest types in Goal Area 1: (Forest Plan DFC)				
	Aspen (35-65%)	38.5%	37.1%	37.3%	37.7%
	Conifer (10-20%)	6.5%	7.0%	7.2%	6.8%
	N. Hardwood (<49%)	27.1%	28.1%	27.6%	27.6%
	3. Percent of forest types in Goal Area 2: (Forest Plan DFC)	20.3%	17.2%	18.5%	17.3%
	Aspen (10-20%)	6.8%	7.9%	7.3%	7.6%
	Conifer (<48%)	38.0%	39.9%	39.2%	40.2%
	N. Hardwood (35-75%)				

Issue 4--Fragmentation	Acres of interior habitat (% change)	10,028 (0%)	9,613 (4.1%)	8,977 (10.4%)	9,795 (2.3%)
Issue 5--Access	Miles of roads available for public use and/or timber hauling	141.0	134.5	134.3	128.6
Issue 6--Water Quality	1. Cumulative sediment yield to affected streams above background	123 tons/ yr	0 tons/yr	0 tons/yr	0 tons/yr
	2. Miles of instream habitat improvement	0	1.5 miles	1.5 miles	1.5 miles
Issue 7—Noxious weeds	1. Number of flea beetle release sites	0	3 sites	0	3 sites
Issue 8--Soils	1. Acres with potential for compaction and rutting	0	212 acres	244 acres	118 acres
	2. Acres with potential for erosion and displacement	0	379 acres	538 acres	207 acres
Issue 9--Floodplains and Wetlands	1. Number of sites where floodplain is restored	0	0	1 site	1 site
Issue 10--Visual Quality	1. Acres treated to improve long-term visual quality objectives.	0	392 acres	321 acres	173 acres
Issue 11-- Recreation Facilities and Trails	1. Miles of trail located on Forest Road 1296	0.4 mile	0 miles	0 miles	0 miles
	2. Number of sites within area of management activities	0	46 sites	46 sites	12 sites
Issue 12--Social and Economic	1. Amount of volume generated from timber sales	0	23.0 mmbf	28.0 mmbf	20.0 mmbf
	2. Payments to counties, at 25% of estimated timber sale receipts	$0	$95,500.	$154,600.	$89,650.

Table 2.5c. Summary comparison of achievement of project objectives all alternative

Project Objectives	Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Objective1	Aspen age class distribution in Goal Area 1:				
	1-20 years	14.7%	23.7%	29.4%	20.1%
	21-40 years	26.5%	27.5%	27.4%	27.1%
	41-60 years	18.7%	13.3%	12.0%	15.6%
	61+ years	40.1%	35.5%	31.2%	37.1%
Ojective 2	Northern Hardwoods in Goal Area 2:				
	Even-aged	12.8%	22.1%	12.9%	12.1%
	Uneven-aged	18.3%	37.1%	48.9%	48.8%
	Unmanaged	68.8%	40.8%	38.2%	39.1%
Objective 3	1. Acres of continuous, unfragmented mature interior hardwood forest	5,301	5,209	4,933	5,259
	2. Acres of aspen converted to hardwood type to promote continuous, interior forest conditions	0	93	44	81
Objective 4	Acres converted to meet Visual Quality Objectives:				
	Along Hwy GG	0	297	203	236
	Along lakeshores	0	29	76	29
	Underplant (no cut)	0	53	29	39
Objective 5	Acres of upland openings managed for long-term goal of grass/forb/ shrub cover type	0	85	142	27
Objective 6	Acres of conversion in the transition area between uplands and lowlands	0	38	0	58
Objective 7	1. Acres within Day Lake in hazardous conditions	25	0	0	0
	2. Acres managed for large trees to improve site conditions within Day Lake Campground	0	113	113	0

Objective 8	Acres of conversion from aspen adjacent to RNA	0	48	57	0
Objective 9	Motorized access points to RNA closed to the public	0	1	1	1
Objective 10	Number of acres of leafy spurge treated within project area	0	<1 acre	0	<1 acre
Objective 11	Miles of instream habitat improvement	0	1.5	1.5	1.5
Objective 12	1. Number of road/stream crossings improved	0	7 sites	7sites	7 sites
	2. Number of road/stream crossings where fish passage would be restored	0	2 sites	2 sites	2 sites
	3. Acres floodplain or wetland restoration	0	0	1 acre	1 acre
Objective 13	Acres of aspen converted to long-lived species through silvicultural activities within 300 feet of Brush and McCarthy Creek	0	35	13	22
Objective 14	Miles of trail located on town roads within the project area	1.6	1.2	1.2	1.2
Objective 15	Miles of decommissioned roads	0	6.5	5.7	11.4
Objective 16	1. Miles of temporary road construction	0	12.6	16.3	10.5
	2. Miles of maintenance of existing road for access to conduct resource management activities	0	22.8	23.3	19.7

3.0 Chapter 3: Affected Environment

Chapter 3: Affected Environment succinctly describes the existing condition of the environmental resources within the Cayuga Project area that could be affected by the four alternatives if one were implemented.

This description of the existing condition in Chapter 3, combined with the description of the activities of Alternative 1: No Action, establishes the baseline conditions against which the decision-maker and the public can compare the potential effects if Alternative 2, 3, or 4 were selected.

3.1 Project Area Location

The Cayuga project area is located northwest of Glidden, Wisconsin. The project is located entirely in Ashland County, Wisconsin. There is a total of 32,228 acres of National Forest System lands within the project area. The project area is located within T43N, R2W, Sections 6-7, 16-20, and 29; T43N, R3W, Sections 1-18, and 23-24; T43N, R4W, Sections 1-3, 10-23, and 27-33; T43N, R5W, Section 24; T44N, R3W, Sections 19-23 and 26-35 and T44N, R4W, Sections 23-27 and 34-36.

3.2 Description of Relevant Past, Present, and Reasonably Foreseeable Future Actions Not Part of the Proposed

3.2.1 Past Actions

Past actions were considered for all ownerships within and adjacent to the Cayuga Project Area. These included such actions as National Forest, Ashland County and private ownership timber sales, planting and other silvicultural activities, as well as past road construction and adjacent land development. Numerous images of the resulting landscape, along with stand history information, are located in the project file and were considered in this chapter. The most influential actions, which took place in the past 100 years or so, were extensive pine logging and slash fires prior to the turn of the century, followed by hemlock and hardwood logging and slash fires after the turn of the century until the mid 1930s. These post logging slash fires have resulted in a change of the composition in some areas from historically hemlock-hardwood dominated sites to stands that are now dominated by aspen-birch-fir or stands of even-aged, second growth northern hardwoods. Hemlock is much reduced compared to its former abundance. There is no evidence of past intensive logging in the lowland conifer forests, although it is likely that loggers harvested the best quality trees (particularly northern white cedar) from these areas.

USX Corporation owns approximately 6,000 acres of Forest Crop Law Land directly adjacent to the project boundary. According to the forester for this company, there have been some recent harvest activities in the past 3 to 4 years. Most harvest activities were implemented during the winter due to soil concerns. USX Corporation is managing these blocks of land primarily for long-term yield of northern hardwoods, and some aspen. There were several timber sales that have recently been completed adjacent to the project area south of FR 182.

In March 1999, a decision to approve forest-wide watershed improvement projects was signed by Forest Supervisor Lynn Roberts. This decision included the improvement of four stream crossings along FR 184. These include Edies and three tributaries to the Iron River. In July of 2000 the culverts were replaced and road reshaped.

3.2.2 Present Actions

There are presently no active timber sales on National Forest lands within the project area however, there is one active timber sale adjacent to the project area south of FR 182. There are no known actions presently occurring on private lands that would result in a change of the existing condition of the composition or structure of the forested habitats within the analysis area.

3.2.3 Reasonably Foreseeable Future Acts

Reasonably foreseeable silvicultural activities on National Forest lands within the project area were limited to ten years into the future. While it is likely that such activities would take place in the analysis area beyond that point, it is unreasonable to predict their specific locations with much certainty. It is not considered feasible to predict alternative silvicultural prescriptions such as clearcutting the hardwoods and planting to conifer. It would be feasible, however, to predict that the silvicultural prescriptions proposed at this time for the harvested stands would be followed through into the next cutting cycle (selection, and improvement cuttings and thinnings).

3.3 Description of Relevant Affected Resources That Are Issues

3.3.1 Early Successional Management (Issue 1)

The Forest Plan direction for vegetation within Goal Area (GA) 1 emphasizes management of aspen for timber production and wildlife habitat. There are approximately 6,314 acres of aspen within GA 1. In GA 2 there are approximately 2,732 acres of aspen (see Figure 3.3.1a). Approximately 46% of the aspen stands within the project area are greater than 50 years of age with an average site index of 65 (see Photo 3.3.1a).

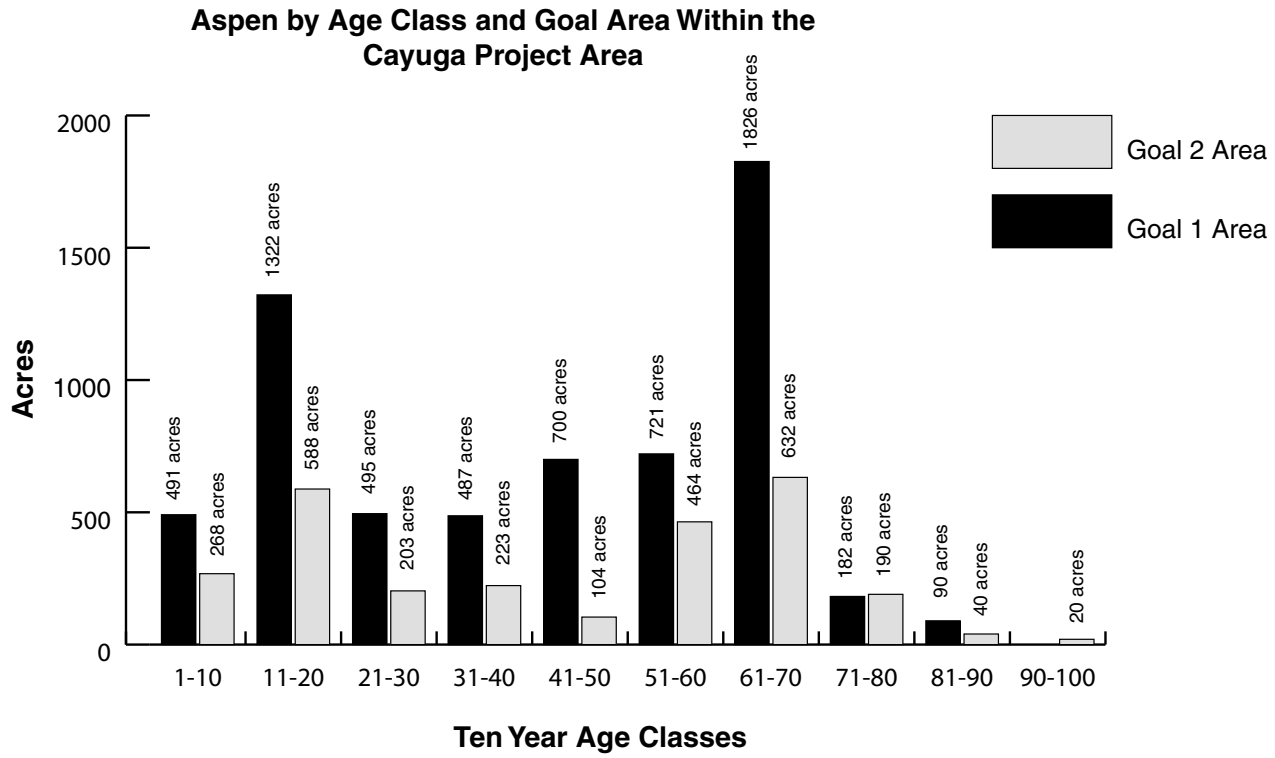


Figure 3.3.1a: Aspen age class distribution within the Cayuga Project Area

The Iron River Forest Plan Revision Inventoried Potential Wilderness Area (IPWA) contains approximately 8,503 acres, or 26% of the total Cayuga Project Area. Of these acres, approximately 3,064 acres are in the aspen forest type (see Figure 3.3.1b). As stated in the original "Purpose and Need" that was sent out for public review, "no decisions will be made that change the undeveloped character of this area until the evaluation under the Forest Plan Revision process is completed in the reasonably foreseeable future." Although there are no proposed management activities within the IPWA, the area is included in the analysis of cumulative effects.

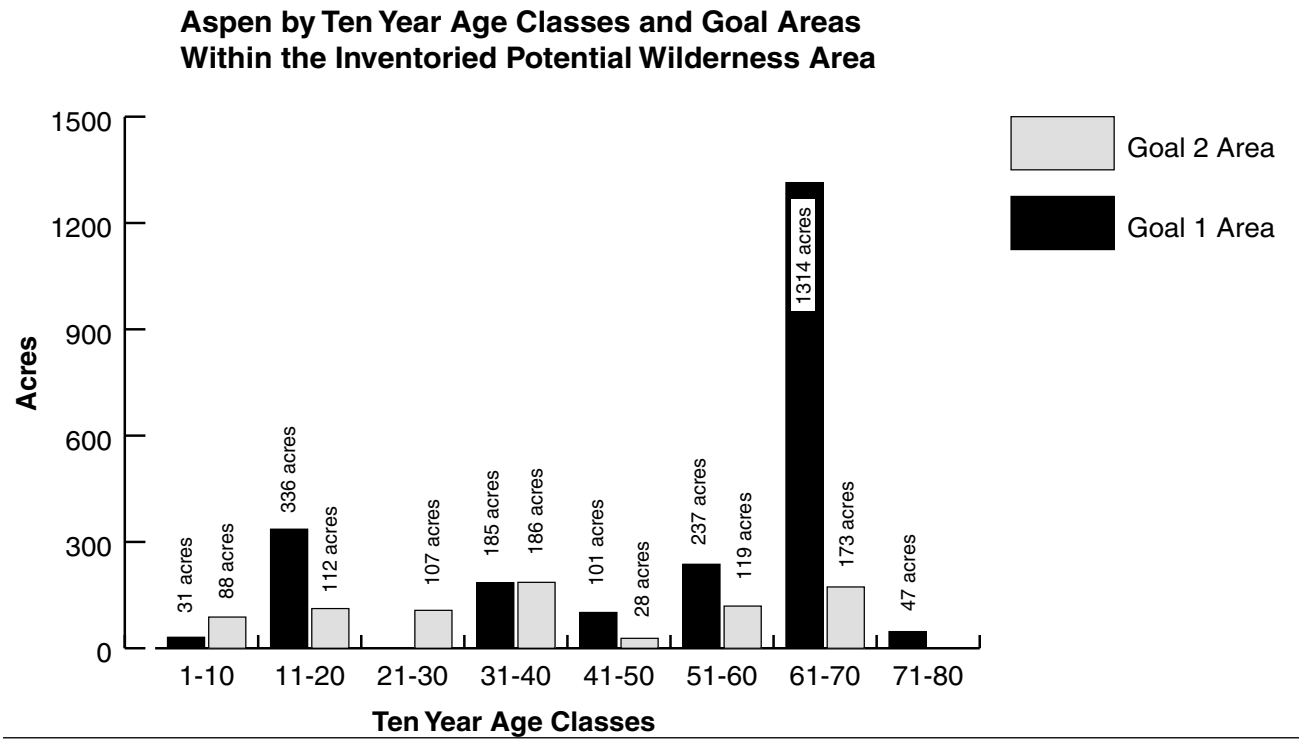


Figure 3.3.1b: Aspen age class distribution within the Iron River Forest Plan Revision IPWA

Photo 3.3.1a: Mature aspen stand within the Cayuga Project Area. Approximately 46% of the aspen stands within the project area are greater than 50 years of age with an average site index of 65.

The project area lies within WDNR Deer Management Unit 6. This unit has an over-winter population goal of 12 deer per square mile; estimated numbers over the past 10 years have ranged from 14 to 32 deer per square mile, with the lower numbers resulting from two consecutive harsh winters.

There is substantial habitat within the project area for ruffed grouse and woodcock because of the acreage of aspen and lowland shrubs. A survey route located in the project area has been run for both species for a number of years. This past year's survey recorded 26 grouse drums in ten four-minute stops; the woodcock survey recorded three birds in a total of ten stops. Young-age aspen and other shrub/early successional habitats within the project area also provide nesting and foraging areas for a variety of non-game birds species, including black-billed cuckoo, indigo bunting, alder flycatcher, and chestnut-sided warbler.

A portion of the project area is within the designated elk "core range" as described in the Management Plan and Environmental Assessment for the Clam Lake Herd (WDNR; approved 6/28/2000). As part of the elk reintroduction effort, both a core range and a buffer range were established. The core range, which includes approximately half the project area, is centered on the release area and on the Navy's Extremely Low Frequency (ELF) site, and includes

primarily National Forest ownership. The buffer range, which includes the remainder of the project area, surrounds the core range and includes a mix of federal, private, and county lands, and is intended to provide additional space for herd expansion. Currently all of the known elk concentration sites are south and southwest of the project area, although there have been scattered sightings of individual animals within the project area. The elk tend to concentrate activity in areas of aspen browse, especially in winter and early spring.

3.3.2 Wildlife Openings (Issue 2)

Currently there are approximately 231 acres within the project area typed as upland openings (approximately 0.7% of the project area). This includes some shrub type, generally areas that have not yet recovered from early logging and fire, including one 37-acre stand. Within this total, there are some areas that were created fairly recently, for a variety of purposes. Some sites were created specifically as managed openings, with wildlife habitat in mind, while others were cleared for such purposes as recreation sites or administrative sites associated with the Navy ELF project, and have been maintained for these purposes. There are other upland open areas that are generally termed "relict openings," which are remnants of earlier human activity, such as homesteads, camps, or logging activity, or in some cases are due to natural origin. These relict openings have often been maintained in the past to remove encroaching vegetation. Some openings in the project area have stayed open without maintenance for several decades, due to natural factors such as frost action, browsing, and sod competition.

Upland openings were traditionally thought of as a deer management tool, however they perhaps should be thought of as another part of biological diversity, with a large community of species utilizing them. These openings offer a variety of food resources and structural diversity generally not found in mature forest types, including dense sod cover, shrub patches, and fruit producing shrubs and brambles. Use by a wide variety of species has been documented. Most of the wildlife species using small upland openings tend to be generalist species, including edge species, with no species dependent on them. The project area openings are too small to attract true grassland bird species.

3.3.3 Vegetation Composition (Issue 3)

Vegetative cover within the project area (see map in Appendix A for existing forest types) is predominantly composed of these forest types: (**uplands**) mixed northern hardwoods (19%), aspen (18%), sugar maple (8%), aspen-spruce-fir (10%), red pine (3%), white spruce (2%); (**lowlands**) mixed swamp conifer (12%), lowland black spruce (5%), black ash (5%), lowland opening (7%). Of the 32,239 acres of National Forest lands within this project area, 20,725 acres (64%) are composed of upland forest while 8,905 acres (28%) are lowland forest and 2,499 acres (8%) are non-forest (upland and lowland opening).

Although the forest types are labeled with tree species names there can be a great variety of species within these forest types. The aspen forest type, for example, can have from 100% to less than 50% aspen as a component of the stand. Other species could include red maple, sugar maple, oak, balsam fir, white spruce, red pine or jack pine.

There are no accurate records of what occurred in the Cayuga Project Area during the logging era of the late 1800s and early 1900s. However, the age and composition of the existing forests suggest that many of the forests on the uplands were either clearcut or had the highest quality trees removed during this time. Old railroad grades and spurs still evident today suggest that the area was railroad-logged.

Past timber harvest includes extensive pine logging and slash fires prior to the turn of the century. This was followed by hemlock and hardwood logging slash fires after the turn of the century until the mid 1930s. Post-logging slash fires have changed the composition of some areas from sites historically dominated by hemlock-hardwood to stands that are dominated by aspen-birch-fir or small stands of even-aged second growth northern hardwoods. Hemlock is much reduced compared to its former abundance.

There is no evidence of past intensive logging in the lowland conifer forests, although it is likely that they were entered by loggers and the best quality trees, particularly cedar, were removed.

The more recent harvest activities show the project area has been actively managed for timber production. Records indicate 45 timber sales were sold within the project area as far back as 1973. There were timber sales that go back farther than this date; however, that information is somewhat limited.

There are 60 year old stands of jack pine and red pine located within the Day Lake Campground and along the entrance

to the Day Lake Boat Launch and Picnic Area. Most of the red pine stands were planted. The Civilian Conservation Corps (CCC) established many of these plantations and almost all have been commercially thinned within the last 20 years. Red pine is a long-lived species. After 200 years, red pine still has a constant rate of basal area increase (see Photo 3.3.3a)

Photo 3.3.3a: There are 60 year old stands of jack pine and red pine located within the Day Lake Campground and along the entrance to the Day Lake Boat Launch and Picnic Area. Most of the red pine stands were planted. The Civilian Conservation Corps (CCC) established many of these plantations and almost all have been commercially thinned within the last 20 years. Red pine is a long-lived species. After 200 years, red pine still has a constant rate of basal area increase.

Jack pine is an inherently short-lived species, does not respond favorably to thinning and is difficult to maintain as intact stands much past 50 years. Jack pine cones hold viable seed for several years. Plantation establishment is facilitated when burning creates a seedbed. Direct seeding is an option which, when combined with mechanical soil disturbance or prescribed fire, could assure that these favorable sites remain in jack pine cover. Jack pine has adapted to fire by releasing seeds in response to the heat. The trees themselves however, are fire intolerant and even light under-burning would likely kill mature stands.

The white spruce cover type is predominantly spruce with a component of aspen, paper birch, balsam fir and red maple. Most of this type on the district is plantation origin and fairly pure spruce. Maintenance of the white spruce type requires even-aged management (including clearcut). Treatment is usually suggested when high stocking levels slow tree growth, trees have reached maturity, or insect/disease problems warrant salvage (see Photo 3.3.3b).

Photo 3.3.3b: The white spruce cover type is predominantly spruce with a component of aspen, paper birch, balsam fir and red maple. Most of this type on the district is plantation origin and fairly pure spruce. Maintenance of the white spruce type requires even-aged management (including clearcut). Treatment is usually suggested when high stocking levels slow tree growth, trees have reached maturity, or insect/disease problems warrant salvage.

Hardwood forests represent the dominant forest type within the project area and include mixed hardwoods, northern hardwoods and hardwood-hemlock stands. Hardwood species tend to have strong root systems. The major species that caracterize this group are red maple, sugar maple, yellow birch and basswood (see Photo 3.3.3c).

Photo 3.3.3c: Hardwood forests represent the dominant forest type within the project area and include mixed hardwoods, northern hardwoods and hardwood-hemlock stands. Hardwood species tend to have strong root systems. The major species that characterize this group are red maple, sugar maple, yellow birch and basswood

Vegetation composition, stand age and structural features, are important influences, on wildlife species occurring in the area. Many of the species known to inhabit the Great Divide Ranger District can be found within the Cayuga project area, due to its relatively large geographic coverage, and due to the variety of forest and non-forest types it contains. Species found within particular stands and communities vary due to, among other things, differences in food resources and habitat conditions. Some species might forage on insects found in hardwood foliage, or in the rich humus layer, while others forage on the seeds produced by mature conifer trees. Species associated with early successional forests were discussed earlier in section 3.3.1; some other examples of habitat associations follow.

Conifer forests attract various needle-eating caterpillars, which in turn attract a variety of birds ranging from warblers to thrushes. The seeds produced by cone-bearing trees attract bird species such as crossbills, as well as rodents such as red squirrels and meadow voles. Deer will browse on various conifer seedlings, and are attracted to the protection offered by dense lowland conifer forests in harsh winters. Mature conifer forests that have been killed by beaver flooding, fire, or other disturbance will quickly be found by the black-backed woodpecker, which feeds on insects in the decaying trunks.

The diversity of species found in mature hardwood forests can vary greatly depending on the overall structure of the stand. In general, bird species diversity increases with habitat complexity, especially vertical stratification or layering. Many of the hardwood stands within the project area are even-aged, with a dense canopy and relatively sparse understory. Stands with features such as canopy gaps, dense understory, and dead and dying trees can support substantially more bird species than even-age stands. Other species groups respond in a similar way to an increase in structural features. Abundant woody debris in particular is a good indication of habitat quality for pine marten within mature hardwood stands.

There is a variety of wetland vegetation types within the project area which support a diversity of species, from the bitterns and muskrat of shallow marsh and sedge meadows, to the beaver, mink, water shrew, and yellow warbler of riparian areas, to the bog lemming and four-toed salamander of sphagnum bogs.

A total of five stands within three different compartments that have been surveyed for breeding birds in the last decade, giving an idea of the variety of species found within the project area. Species observed have included blue-headed vireo, Connecticut warbler, hermit thrush, sedge wren, gray jay, scarlet tanager, blackburnian warbler, and sandhill crane. The large number of “boreal” type bird species observed is an indication of the significant areas of lowland and upland conifer.

3.3.4 Fragmentation (Issue 4)

Fragmentation within the project area is confined primarily to differences in forest types and ages. The project area is essentially forested with only small areas being in a permanent open condition, such as upland openings and road clearings. This type of fragmentation is generally thought to be less of an impact to animal populations than that

which occurs when forested areas are permanently converted to agricultural or urban areas. This fragmentation occurs primarily from management of early successional types by clearcutting. The southern portion of the project area has been subject to more of this activity than the northern portion, and could therefore be considered more fragmented by this definition.

A GIS analysis of the project area compared amounts of edge and areas of interior forest, by alternative. The existing condition includes approximately 457 miles of "edge," defined as the border between mature forest and regenerating forest stands, upland openings, lowland openings, improved roads, and private ownership boundaries. The existing condition includes approximately 10,272 acres of "interior" habitat (what remains after all edges are given a 100-meter buffer). This total includes 5,301 acres of interior mature hardwood.

3.3.5 Roads (Issue 5)

Roads bordering the Cayuga Project Area include: Forest Road (FR) 182 & 195, State Highway 13, County Highway GG and M, and State Highway 77. FR 183 and 184 traverse the project area from north to south and east to west respectively (see map in Appendix A.).

There are approximately 141.0 miles of system and non-system roads within the project area including those roads that border the project area (see Table 3.3.5a). This represents a road density of approximately 2.80 miles of road per square mile. Only 50% of the boundary road lengths were used for road density calculations.

Table 3.3.5a: Forest System Roads in Project Area

Traffic Service Level	Miles	Road Characteristics	Remarks
A	13	Double-Lane Blacktop	All TSL A road miles on boundary of project area
B	12	Double-Lane Gravel	Some TSL B road miles on boundary of project area
C	24	Single-Lane Crowned/Ditched	Some TSL C road miles on boundary of project area
D	92	Single-Lane, Two-Track Slight Crown/Flat Native material/gravel	TSL D roads are the primary roads within the project area

Photo 3.3.5a: Display of a System Forest Service TSL B road within the project area

Figure 3.3.5b: A functioning low service (TSL D) road in the Cayuga area. This road provides public access with minimal resource effects.

Except for County Highway GG and State Highway 13 and 77, most of the roads in the project area are gravel or native surface. Many of these are low-standard roads that receive intermittent use. However, some of the greatest use and greatest public use impacts to the roads within the project area, occur during the fall months due to hunting seasons and gathering of forest products (i.e., Christmas trees, boughs, twigs, and firewood).

Photo 3.3.5c: Poorly functioning, low service level (TSL D) roads in the Cayuga area show a need for repair.

The project area is currently home to parts of two wolf pack territories. As of fall 2001, the following packs and wolf numbers were determined from tracking, howling, and radio-telemetry surveys: Torch River Pack (five or more wolves plus pups); and Brush Creek Pack (eight wolves detected in previous record with pup production suspected). Relatively low road densities in portions of the project area favor wolves and other large predators.

3.3.6 Water Quality (Issue 6)

The Cayuga Project area is located within three 5th level watersheds. These watersheds are the Upper Bad River, Marengo River, and West Fork Chippewa River. The eastern two-thirds of the analysis area are part of the Upper Bad

River watershed, which drains into Lake Superior. The western one-third of the analysis area is part of the Marengo River watershed, which also drains into Lake Superior via the Bad River. Finally, the extreme southwestern one-sixth of the analysis area is within the West Fork Chippewa River watershed, which eventually drains into the Upper Mississippi River.

The Upper Bad River watershed includes the Iron River and its tributary streams, including Edies, Brush, and Squaw Creeks. There is also Hardscrabble, a tributary to Hardscrabble, Gravelly Brook, and several unnamed tributaries that flow through the analysis area and empty into the Bad River on the eastern edge of the project area boundary. The water quality of all these streams is generally good, with the exception of some sedimentation problems caused from frequent culvert washouts and road surface erosion. In July of 2000 culvert replacements along Forest Road 184 corrected some of the sedimentation problems. There are additional road sedimentation sites off Forest Road (FR) 183, 354, and 355 that need to be addressed. Brush Creek has water temperature problems that have limited its ability to support trout and other cold-water community species. With adequate riparian area habitat improvement and beaver management, portions of Brush Creek have the potential to be healthy cold-water communities.

The Marengo River watershed includes Camp Six, McCarthy, and Spider Creeks and the headwaters of the Brunsweiler River. The only known water quality problems in this watershed are unnaturally high water temperatures and sedimentation of McCarthy Creek, a stream fed by surface and groundwater. The water temperature problems are caused mainly by beaver, which dam up the streams. The sedimentation problems are caused by road surface erosion. These problems have limited its ability to support trout and other cold-water community species. With adequate riparian area habitat improvement and beaver management, portions of the McCarthy Creek system have the potential to be healthy cold-water communities.

The West Fork Chippewa River watershed includes the Day Lake Flowage, Mud Lake, East Twin and West Twin lakes, Dead Horse Slough, and Cranberry Lake. The only known water quality concerns in this watershed are mercury concerns in Day Lake and sediment deposition into a couple of unnamed tributary streams. Day Lake is a 625-acre flowage located on the West Fork Chippewa River. It is a darkly stained lake with a maximum depth of 20 feet, and was originally constructed in 1970 at the site of an earlier logging dam. The muskellunge population is characterized as high density but slow growing. There is a category 2 mercury advisory for muskellunge over 28 inches in size in Day Lake. The numbers are high enough that populations of other fish species are being suppressed. The current management goal is to reduce the muskellunge population in order to increase populations of prey species.

East and West Twin Lakes are located just east of Day Lake. West Twin is 51 acres, with a maximum depth of 17 feet and medium stained water. Fish species include largemouth bass and pan fish, with the bass showing good growth. East Twin is 110 acres, with a maximum depth of 15 feet and very clear water. Fish species include musky, largemouth bass, and pan fish. A recommendation was made in 1983 to discontinue stocking of muskellunge and to start stocking bass instead.

The Chequamegon-Nicolet National Forest has conducted an Aquatic Ecological Classification and Inventory for the streams within the forest boundary. The ecological units, called valley types, are based on stream bank full width, alkalinity, maximum water temperature, and aquatic biota. The streams within the Cayuga project area are healthy resilient systems that meet Clean Water Act standards. The majority of the streams in the project area are relatively small soft-water streams with warm or cool water. There are several stretches of trout water in the project area, but this habitat is limited and marginal in quality. The Iron River and its tributaries make up the primary watershed in the area. The Iron River itself starts near McCarthy Lake and flows into the Bad River. The upper parts of the river are influenced by the lake flow and by beaver, resulting in a Class III trout designation. The lower part of the river receives more groundwater and is considered a marginal Class II trout stream. This lower part of the river contains more fish species than the upper part, probably due to its larger size and the influence of the Bad River.

Tributaries of Iron River include Edies Creek, Brush Creek, and Squaw Creek. All are narrow streams of moderate alkalinity. Brush Creek is system as a Class II trout stream, but it is marginal trout water, with little groundwater influence.

McCarthy Creek is considered a Class II trout stream. This stream supports brook trout in addition to non-game forage fish species. The carrying capacity of McCarthy Creek is less than it could be for trout due to habitat changes primarily caused by beaver activity. The lower portion of the stream is more productive since it is influenced more by groundwater.

McCarthy Lake and Cedars Research Natural Area (RNA) are designated to protect a wilderness-condition shallow, soft-water drainage lake; three warm, slow, soft water streams; a large ericad bog; and a large, high quality cedar swamp.

Monitoring

Water quality data including temperature, alkalinity, pH, color, and width has continued to be collected for most of the streams within the Chequamegon-Nicolet National Forest since the Aquatic Classification and Inventory first began. This water quality data has enabled the Classification System to be refined and serves as monitoring data that can be used to detect changes over time.

A road/stream crossing inventory was conducted on the Chequamegon-Nicolet National Forest in 1997 and 1998. The purpose of the inventory was to obtain information to help with prioritizing watershed restoration projects. During the survey, each road/stream crossing was investigated to determine the general extent of erosion and sedimentation. A number of observations were made at each site including the road surface material, slope, length, drainage, culvert size and condition, evidence of road surface erosion, evidence of culvert failures or washouts, and condition of the embankments. Based on these observations each site was rated according to the apparent erosion and sedimentation that was occurring as either major, moderate, minor, and none. These ratings are one tool used to prioritize and schedule stream crossing replacement or restoration projects. Approximately 10 percent of the road/stream crossings within the Forest boundary were identified to be in need of some sort of improvement to minimize sedimentation of streams or lakes. This sedimentation is still far below the allowable thresholds by Clean Water Act standards.

Monitoring of a variety of streams, which have under gone culvert replacement and/or stream channel restoration has taken place over several years and is planned to continue into the future. Data collected includes surveys of the stream channel profiles and cross-sections, water chemistry data, discharge levels, and fish species information. The data collected may be used for a variety of purposes including effectiveness monitoring, monitoring of changes over time, and comparisons of restored to un-restored stream system dynamics, to name a few.

The use and effectiveness of Best Management Practices (BMP's) for Water Quality were monitored by interdisciplinary and interagency teams across all land ownerships in Wisconsin, including the National Forest, during the years of 1995, 1996, 1997, and 2002. The field evaluations for monitoring conducted from 1995 to 1997, indicated that ninety-nine percent of the time no adverse impact to water quality occurred when a BMP was applied correctly where needed. They also indicated that the one percent of time that there was an impact, it was minor (WDNR 1999). Two sales on the Great Divide Ranger District that were monitored in 2002 were found to have followed BMPs and had no adverse effect on water quality. One of these sales was adjacent to a navigable perennial stream and the other adjacent to a small lake.

Timber sales outside of the national forest on private, state, county, and industrial lands were also monitored during this time frame. Internal water quality monitoring of timber sales has also occurred over the years as part of Forest Plan Effectiveness monitoring, as well as for District Timber Sale and Sale Administrator reviews. The majority of Forestry BMP monitoring relates to roads, skid trails, and landings.

Lake monitoring has also taken place across the Chequamegon-Nicolet National Forest. It has consisting primarily of dissolved oxygen and temperature profiles, pH and alkalinity levels, clarity, color, and fish species present. This information is useful for fish management, as a recreational pressure index, and for general comparisons of water quality trends over time. No negative trends have been identified to date. The WDNR has identified select lakes as having higher than normal mercury levels. In these cases, fish consumption advisories are issued for the affected lakes.

3.3.7 Noxious Weed Species (Issue 7)

Currently there are nine documented noxious weed sites located within the Cayuga project area representing six different species, all of which are associated with open, disturbed sites. Several of these sites have multiple species associated with them. Of the six known species, only one (reed canary grass) poses a threat to undisturbed natural communities found within the project area (see Table 3.3.7a). Several other known noxious weeds from the project area, including leafy spurge and spotted knapweed, could be ecologically invasive in native communities found elsewhere on the National Forest including open barrens and pine savanna.

Table 3.3.7a:Summary of noxious weed species within the Cayuga Project Area

Plant Species	District Locations	Acres	Project Area Locations	Acres
Leafy Spurge	5 (all roadside)	1.5	4 (all roadside)	1
Spotted knapweed	13 (roadside & gravel pit)	16.3	2 (roadside & gravel pit)	0.3
St. John's-wort	8 (roadside & gravel pit)	3.4	4 (roadside & gravel pit)	1.4
Common tansy	7 (roadside & gravel pit)	2.25	1 (roadside)	1.0
Canada thistle	3 (gravel pit)	0.1	1 (gravel pit)	0.1
Reed canary-grass	1 (C204, S19)	0.2	1 (C204, S19)	0.2

Leafy spurge is native to Eurasia and was transported to the U.S. in the early 1800s (see Photo 3.3.7a). It can tolerate a wide range of habitats ranging from damp to very dry soils and occurs in disturbed as well as undisturbed areas. Leafy spurge displaces native plants resulting in a reduction in plant diversity and cover. There are several small infestations of leafy spurge, totaling <1 acre located off County Highway GG (see maps in Appendix A).

Photo 3.3.7a: Leafy Spurge has greenish-yellow flowers. It can tolerate a wide range of habitats ranging from damp to very dry soils and occurs in disturbed as well as undisturbed areas. Leafy spurge displaces native plants resulting in a reduction in plant diversity and cover. There are several small infestations of leafy spurge, totaling <1 acre located off County Highway GG (Mortensen, 2000).

3.3.8 Soils (Issue 8)

Summary

Ecological units at the landtype association level and below, best delineate the affected environment for soil resource issues. The soil resource within the project area is currently of high quality, with no evidence of reduced productivity from past events or activities. Impacts to the existing soil resource from the proposed activities in Alternatives 2-4 will be estimated based on the potential to cause: 1) erosion and displacement; 2) compaction and rutting; and 3) reduced productivity.

Glacial Geology and Soils

The glacial geology and soil resources of the Chequamegon-Nicolet NF are characterized within a hierarchical, ecological classification framework (Ecomap, 1993), which allows delineation of geographic areas with similar landform and association of soils. This system sets the context of the landforms, soil resources and potential natural vegetation of a project area, across land ownerships and within multiple scales. The Cayuga project area is within three Landtype Associations (LTAs) on the Great Divide Ranger District. At a landscape scale, LTAs are ecological units delineated based on similar patterns of glacial landforms, topography, soil complexes and associated patterns of vegetation and succession, within climatic regions.

Glacial deposits provided the parent material for the soils in northern Wisconsin. The integrated effects of climate and living organisms (plants and animals) on these parent materials, as conditioned by the slope and aspect components of topography over the last 10,000 years, has led to the development of the existing soil resource of the project area.

The inherent productivity of the soil in the project area has also evolved with disturbance. Windstorm, fire, drought, flood and erosion, occurred at various spatial and temporal scales, associated with climate and related plant community fluctuations and along with human disturbance, have affected soil physical, chemical, and biological properties. A succession of forest species, a random disruption, and a subsequent re-establishment of this succession by natural perturbations were the pattern before the advent of humans as a dominant ecological factor (Ahlgren and Ahlgren, 1983, p33). Natural disturbance patterns are described in the Forest's Terrestrial Ecological Unit Inventory LTA characterizations.

Ecological Unit Descriptions

The project area is comprised of land within three LTAs. LTAs are further subdivided into Ecological Landtypes (ELTs) and Ecological Landtype Phases (ELTPs) to map and define similar ecological conditions relating to soil moisture, nutrients, drainage, slope and other chemical and biological characteristics. Full LTA, ELT, and ELTP descriptions and maps are available at the Great Divide District offices. Brief LTA and ELT descriptions are outlined in the paragraphs below. ELTPs are identified for each stand in the Stand Treatment Table in Appendix J.

Forest Habitat Types of Northern Wisconsin (Kotar et al 2002) have been correlated to ecological units at the LTA, ELT and ELTP levels of the hierarchy, for the Chequamegon-Nicolet NF land base. Habitat types provide information on potential natural vegetation and successional pathways for forest plant communities, including ground flora and shrubs. Abbreviations are commonly used to indicate names of component species for a given habitat type. Acer-Tsuga/Maianthemum or ATM has the complete scientific name of Acer saccharum – Tsuga Canadensis/Maianthemum canadense and the common name of Sugar Maple- Hemlock/Wild Lily of the Valley. Habitat types for individual stands have been identified in the Stand TreatmentTable of Appendix J.

LTA Jc05, Valhalla/Marenisco (McDonald) Moraine, occurs on about 40 percent of the project area. Landscape pattern is primarily steep hummocky hills that have no specific orientation. ELTs GcV, Glacial Till Rolling (Valders), and McV, End Moraine Till (Valders), are included in this LTA. They make up the parent material consisting of coarse ground and end moraine glacial till. Surface soil textures range from fine sandy loam to loam on the red ground moraine, to loamy sand on the end moraine. Slopes range from 0 to 30 percent with steeper slopes on the end moraines. The soils are moderately-well to well drained. The till soils are very fertile and support the ATD vegetative habitat type. The end moraines have less fertile soils with ATM and AVVb habitat types.

LTA Xa01, Glidden Drumlin, occurs on about 50 percent of the project area. Landscape pattern is primarily cigar-shaped

drumlin hills surrounded by washed till and outwash from old glacial drainage ways. Many wetlands (bogs, swamps, and wet mineral soils) can be found in the LTA as well.

The cigar-shaped hills are part of the ELT GcC, Glacial Till Rolling (Cary) and are oriented in a northeast to southwest direction. Slopes range from 0 to 5 percent on the tops of the drumlins and 5 to 15 percent on the side slopes. Soil textures are generally a fine sandy loam, loam to sandy loam surface over sandy to loamy sand glacial till. Drainages are predominately well drained on slopes greater than 5 percent and moderately well drained on the flatter sites. The drumlins are very fertile with ATD and AOCa vegetative habitat types.

The old glacial drainage-ways and wetlands are part of the ELT G/0, Ground Moraine Washed Till and Outwash Complex. This ELT is comprised of hummocky hills of water-worked till and outwash soils. Many depressions occupied by wetlands occur within this landform. Slopes range from 0 to 10 percent. Soil textures are sandy loam or loamy sand overlying loamy sand washed till or outwash sands and gravels. Soil textures range from well to moderately well drained on the uplands to moderately well to poorly drained in the depressions. ATM is the most common habitat type on this ELT.

LTA Xa03, Chequamegon Washed Till & Outwash (old glacial drainage ways), occurs on about 10 percent of the project area. ELT's G/0 and GcV are found within this LTA and are described above. Generally, the landform is a rolling collapsed moraine and outwash plain complex with loamy soils over loamy sand debris-flow (water worked till) or outwash sediments. Slopes range from 0 to 15 percent, and drainages from well to very poorly. While vegetative habitat types range from PArV to AOCa, ATM and PArVAa are the most common.

Current Conditions

Existing information used to assess the current condition and trends of the soil resource within the project area, in addition to those listed in section 3.2.4 above, includes:

Chequamegon-Nicolet NF Ecological Classification and Inventory mapping, interpretations and characterizations for the LTA, ELT and ELTP scales (includes soil/landform/potential vegetation information) of the National Hierarchy of Ecological Units;

The Chequamegon land-base detailed soil resource inventory;

Ecological reference area data collection plots (1979-1980);

Detailed soil descriptions that serve as the basis for map unit characterizations and interpretations have been made at more that 2000 representative field locations within the Chequamegon-Nicolet land-base by Forest Service, NRCS and University soil scientists, as part of the National Cooperative Soil Survey program and the FS Ecological Classification and Inventory program. Representative sites within this project area that are proposed to have ground disturbing activities, have been field checked by a soil scientist

Landtypes where soil quality may have been impaired by historical activities have been re-vegetated naturally or through tree planting. Ground cover and organic matter accumulation has halted erosion and nutrient levels have been restored over the last 70-100 years. Old woods roads and railroad beds have grown up and adversely compacted soil is not evident. In many cases the old road locations are used in the existing transportation system.

Field monitoring of the soil impact indicators (listed in section 1.4.3.8) for the Cayuga project area has shown no long-term impairment of the soil resource from recent activities. Current conditions for key soil properties affecting ecosystem health such as porosity, organic matter content and nutrient availability are representative of the natural range soil conditions inherent to the Chequamegon-Nicolet National Forest (USDA Forest Service, 1998, p6). There are healthy population of soil microorganisms such as bacteria and fungi in the forest litter and soil surface layers.

Storage of carbon in vegetation and the soil was reduced on these land types after exploitive harvesting, wildfires, and conversion to agriculture or brush land. Grigal and Ohmann (1992, p937) found most terrestrial carbon in the Lake States is stored in the upper meter of mineral soil (55%) and the forest floor (9%). These values are very similar to those estimated for carbon storage in the average U.S. forest, with 59% in the mineral soil and 9% in the forest floor (Birdsey and Heath, 1997, p 81). Thus, the physical soil resource is an important factor in the global, regional and landscape scale carbon budget. Carbon in the atmosphere is currently increasing primarily from fossil fuel burning and terrestrial ecosystem land use changes. The major terrestrial source is believed to be destruction of tropical ecosystems through land clearing. While more study of the global carbon cycle is needed, recent studies show the non-tropical terrestrial

ecosystem roughly in carbon balance. Some analysts suggest that forest ecosystems in the temperate regions may be a sink rather than a source (Armentano and Ralston, 1980, Schimel et al 1994). This is attributed to increasing total forest biomass, soil carbon and forest floor carbon-sequestering litter. USDA Forest Service timber inventories for the past 4 decades indicate a continuous increase in net timber volume on federal lands (growth in biomass exceeds removal). Birdsey and Heath (1997, p82) also note that U.S. forests have been a significant carbon sink since 1952, and that additional carbon will be sequestered through 2040, but at a slower rate.

USDA- Natural Resource Conservation Service 1995 summary report of National Resources Inventory for the years 1982-1992 indicates an increasing trend in forested lands in the United States, Lake States and Wisconsin primarily due to conversion from pastureland and cropland to forest. A substantial volume of harvested timber stores large amounts of carbon in long-lived solid wood and wood fiber products, adding another terrestrial carbon sink to the temperate region.

Soil Resource Impact Indicators

Ground disturbing activities are proposed in Alternatives 2-4 that have potential to impact the soil resource. The extent, intensity and duration of impacts to soil quality will be estimated using two main indicators.

- Soil erosion and displacement potential
- Soil compaction and rutting potential

Estimates of potential impacts will be based on:

- applicable research;
- site-specific soil properties;
- design features and mitigation measures proposed;
- past monitoring of the same type of activities on similar soils;
- professional judgement of a soil scientist and other resource specialists.

3.3.9 Floodplains and Wetlands (Issue 9)

There are a total of about 11,209 acres of wetland occurring on National Forest lands within the Cayuga project area. This accounts for approximately 35% of the project area. Wetlands include lowland black spruce, cedar, tamarack, mixed swamp conifer, black ash, mixed lowland hardwoods, and treeless wetland types. Most of these wetlands are located in the southern third of the project area.

3.3.10 Visual Quality (Issue 10)

There are a number of scenic lakes and highways within the Cayuga Project area. According to the Forest Plan, there are areas designated as sensitive areas for visual quality. The following recreation areas, lakes and highways are within Sensitivity Level 1 areas according to the Forest Plan: East Twin Lake, Day Lake, County Highway GG (north), Highway 77 (Scenic By-way), County Highway M, and Highway 13, Day Lake Campground, East Twin Lake Campground, and Day Lake Picnic Area and Boat Launch (see Photo 3.3.10). Lakes and highways within an area designated Sensitivity Level 2 in the project area are Forest Roads 181 and 191.

Photo 3.3.10: Day Lake is one of several areas designated as sensitive for visual quality.

The stands proposed for treatment along County Highway GG (north) have a mixture of aspen and hardwoods with 15 to 30 year old balsam fir and white spruce screening along portions of the road. The aspen within these stands are about 60-years old. Because older aspen is prone to wind damage it is likely that windstorms in the future would cause substantial blowdown in these stands. Treatment now would ease the eventual transition to other species. Because the terrain is fairly flat and densely forested, anyone viewing the stand from the road typically only sees the foreground (0- ¼ - ½ mile).

3.3.11 Recreation Facilities and Trails (Issue 11)

Within the Cayuga Project area there are two campgrounds (Day Lake and East Twin Lake), three boat landings (Day Lake, East Twin Lake, and Spillerberg Lake), three picnic areas (Day Lake, East Twin Lake, Spillerberg Lake), and two swim beaches (Day Lake Boat Launch and Picnic Area and Day Lake Campground). Under the Forest Plan, these recreational sites are designated as Sensitivity Level 1. Public use at the two campgrounds with boat landings is moderate during the summer. The swim beach and picnic area at Day Lake Boat Launch and Picnic Area also receives moderate use during the summer. Public use at Spillerberg Lake is low. The low to moderate use appears to be mainly related to the location of the facilities. The lakes and streams in the area have brown water rather than the clear water, which is most desired by visitors. The facilities are removed from areas of population such as Milwaukee, Chicago, St. Paul, and Minneapolis.

Photo 3.3.11a: Over-mature jack pine in the Jack Pine Circle of the Day Lake Campground. These stands of jack pine are mature and are approaching an age where deterioration will begin.

Day Lake Campground is located one half mile north of Clam Lake, WI on the east shore of the Day Lake flowage. The campground spreads across three timber types, with the stands having largely been established as pine plantations during the CCC era. A small part of the campground (4 sites in the Jack Pine Circle and 4 sites in the Paper Birch Circle) is in a paper birch and white pine stand (Compartment 124, stand 18) adjacent to Day Lake. The Jack Pine Circle and a play area are located in a 29 acre, 62 year old jack pine stand (Compartment 124, stand 21). The rest of the campground is located in 57 year old red pine stands (Compartment 124, stands 19 and 20).

Due to age, the jack pine has become susceptible to environmental stressors. Approaching overmaturity, the trees are at risk for insect attack and disease, as well as breakage from ice storms and high winds. This creates a potentially hazardous situation for campers. There is a need to reduce the potential risk and focus management on long-lived species to avoid perpetuating this situation. In addition, the campsites in stand 21 are excessively shaded. Basal area for the stand immediately adjacent to the campsites is about 160 square feet. This creates a closed-in feeling in the campsites. It also limits air movement, which is desirable to blow bugs away and keep the campsites dry. There is a need to create a more spacious feeling and to improve air flow in the campsites

In addition, there are approximately 26 acres (compartment 124 and stands 53 and 57) of jack pine along the entrance into the Day Lake Boat Landing and Picnic Area. These stands of jack pine are mature and are approaching an age where deterioration will begin. The growth of the jack pine is slowly decreasing.

Photo 3.2.11b: Over-mature jack pine stands at Day Lake Picnic Area. These stands of jack pine are mature and are approaching an age where deterioration will begin. The growth of the jack pine is slowly decreasing.

The red pine in stand 19 has been thinned several times, but the thinnings were considerably lighter adjacent to the campsites. While shading is not as extreme as in stand 21, it is enough to encourage moss growth on the blacktop in the Paper Birch Circle, an indication of moisture levels high enough to lead to premature deterioration of campground facilities. Again, there is a need to improve airflow in the campsites.

The red pine in the remainder of stand 19 and in stand 20 continues to be managed for big tree aesthetics, as well as for valuable pine timber. To encourage diameter growth these stands have been thinned approximately every 10 years. They were last thinned in 1988 and have grown sufficiently to warrant thinning at this time

Photo 3.3.11c: Red pine in the Day Lake Campground continues to be managed for big tree aesthetics, as well as for valuable pine timber. To encourage diameter growth these stands have been thinned approximately every 10 years. They were last thinned in 1988 and have grown sufficiently to warrant thinning at this time.

The snowmobile trails that cross the Cayuga area receive heavy winter use. Snowmobile Trails 8 and 25 cross the Cayuga area in east-west and north-south directions. These two trails are important links in the Wisconsin Department of Natural Resources (WDNR) funded trail system. Snowmobile Trail 21 in the southeast corner of the project area is also funded by WDNR. This trail links Cayuga and Marengo with Glidden and Butternut. These trails appear to have some of the highest use rates on the Great Divide Ranger District.

Portions of Snowmobile Trails 8 and 25 are incorporated in the Dead Horse Run Motorcycle and ATV trail. This trail system receives low to moderate ATV and motorcycle use. The Township of Gordon has designated and signed township/Forest Roads 182, 183, 195, and 354 as ATV routes. In addition, ATVs are used on many old two-track roads within the National Forest for hunting and recreational riding.

There is one hunter-walking trail on the west side of Day Lake. This trail passes through young stands of aspen. It is fairly narrow and has not been mowed for several years. The use of this trail appears to be fairly low.

3.3.12 Social and Economic (Issue 12)

The Cayuga Project Area is located entirely within Ashland County. Two of the primary sources for income in Ashland County are the wood products industry and the tourism industry. Many individuals and small businesses are involved in timber harvesting operations that harvest wood from federal, state, county, private and industrial lands in this county. There are also several small sawmills and wood processing plants in surrounding communities. Plentiful lakes and a large amount of public lands are draws for many tourists, both in the summer for camping, fishing, boating, hiking, etc. and in the fall/winter for hunting, snowmobiling and skiing.

A collaborative study was conducted with the Wisconsin DNR Bureau of Forestry and the University of Wisconsin-Madison/Extension (Marcoullier and Mace, 1999) to examine recreation and timber production in Wisconsin's forests by looking at extent, importance, performance and compatibility of these two uses. The study employed recreational use surveys, analysis of timber inventory data and regional economic modeling.

The study found that, "In the past, local residents, interested stakeholder groups and industry representatives have disagreed on the best use of forest resources. Traditionally, many have viewed the simultaneous use of forests for extraction and recreation as being mutually exclusive. In this report, we put forward evidence that supports a more compatible coexistence" (Marcoullier and Mace, p.i).

"In general, results of this study suggest that timber production and recreational use of forests were relatively compatible. This was more apt to be the case with hunters and motorized recreationists than with the broad category of

"quiet" forest recreationists. Furthermore, recreationists generally felt that balanced use (for both timber and recreation) was an important component of local economic conditions for communities in forested regions and that forest land uses should account for these localized effects on rural populations" (Marcoullier and Mace, p. ii).

"Timber industry represents an important economic engine for the region and when combined with tourism, makes up a large part of this resource-dependent economy [of NW Wisconsin]" (Marcoullier and Mace, p.10). In Northwest Wisconsin almost 18% of the regional output is somehow tied to wood products and tourism sensitive businesses (Marcoullier and Mace, p.20). Annual timber removals from Federal forest land in NW Wisconsin in 1996 dollars was $5.279 million dollars (Marcoullier and Mace, p.13)."

3.4 Description of Relevant Non-Affected Factors

The Cayuga Project area could be affected by fire or blowdown, two naturally occuring conditions. It is not possible to predict where or when these types of incidents could occur on the landscape, therefore they will not be analyzed in this DEIS.

Fire

Lighting-caused fires occasionally occur within the project area. According to the district fire program manager (personal conversation, Lenny Kempf, 2002), only one fire was caused by a lighting strike within the past 5 years. Human-caused fires within the project area are also rare; none have occurred there in the past 5 years.

Blowdown

In the past three years, blowdowns have occurred within the project area. The district will evaluate each area that has downed timber after a natural occurrence. If sale units are affected, the district will also evaluate the need for salvage operations within these units at that time.

4.0 Chapter 4: Environmental Consequences

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment forms the **scientific and analytic** basis for the summary comparisons presented in Chapter 2. Chapter 4 presents the predicted effects of Alternatives 1, 2, 3, and 4, focuses on the objectives of the project, and the issues listed in Section 1.3 and 1.4.3. Specialist Reports, which provide a detailed discussion of the analysis for each resource, were prepared and filed in the Cayuga Project file. These reports are available upon request. Any direct, indirect, and cumulative effects for each issue and resource were summarized from the Specialist Reports and disclosed in Sections 4.2.

4.1 Predicted Attainment of Project Objectives of All Alternatives

4.1.1 Objective #1-Maintain Aspen Component and Age Class Distribution

Alternative 1: No Action

Under Alternative 1, Objective #1 would be met relative to maintaining the aspen component within the range of the Forest Plan Desired Future Condition (DFC). However, it would not meet Objective #1 in terms of maintaining the 1-20 year aspen age class at the 30% level within Goal Area (GA) 1. Following implementation, the percentage of aspen on the landscape within GA 1, would remain at the existing condition level of approximately 38% (see Table 4.1.1a). The aspen component in the 1-20 year age class would decrease by 50%, (see Table 4.1.1b).

Alternative 2

Under this alternative, Objective # 1 would be met relative to maintaining the aspen component within the range of the Forest Plan DFC. However, it would not meet Objective #1 in terms of maintaining the 1-20 year aspen age class at the 30% level within Goal Area 1. Following implementation, the percentage of the aspen component on the landscape within Goal Area 1 would be at a level of 37%. If Alternative 2 were implemented, the amount of aspen in the 1 to 20 year age class would decrease by 5% (see Tables 4.1.1a and 4.1.1b).

Alternative 3
If Alternative 3 were implemented, the percentage of the aspen component remaining on the landscape in Goal Area 1 would be the same as Alternative #2 and the 1-20 age class distribution would be maintained at the Existing Condition level of 29% (see Tables 4.1.1a and 4.1.1b).
Alternative 4
If Alternative 4 were implemented, the percentage of the aspen component remaining on the landscape in Goal Area 1 would be the same as described under Alternative 2 and 3. However, the percentage of aspen in the 1-20 year age class would decrease by 9% from the Existing Condition level (see Tables 4.1.1a and 4.1.1b).

Table 4.1.1a: Effects of Alternative implementation on the aspen component within the project area

Goal Area	Forest Desired Future Cond. Percent	Forest-wide Existing Cond. Percent	Project Area Existing Cond. Percent	Alternative 1 Aspen Remaining		Alternative 2 Aspen Remaining		Alternative 3 Aspen Remaining		Alternative 4 Aspen Remaining	
				Total percent	Total Acres	Total percent	Total Acres	Total percent	Total Acres	Total percent	Total Acres
1	35-65%	38%	38%	38 %	6,314 Acres	37%	6,080 Acres	37%	6,119 Acres	37%	6,179 Acres
2	10-20%	21%	21%	20 %	2,732 Acres	17%	2,320 Acres	18%	2,490 Acres	17%	2,327 Acres

Table 4.1.1b: Comparison of aspen in the 1-20 year age class for the project area by alternative

Goal Area	Forest Desired Future Condition (%)	Project Area Existing Condition (%)	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
			%	acres	%	acres	%	acres	%	acres
1	30%	29%	15%	926	24%	1,438 acres	29%	1,802 acres	20%	1,245 acres
2	N/A	31%	18%	501	31%	726 acres	40%	1,006 acres	25%	580 acres

4.1.2 Objective #2- Maintain Three Or More Age Classes of Hardwood Forests Through Uneven-aged Management In Goal Area 2

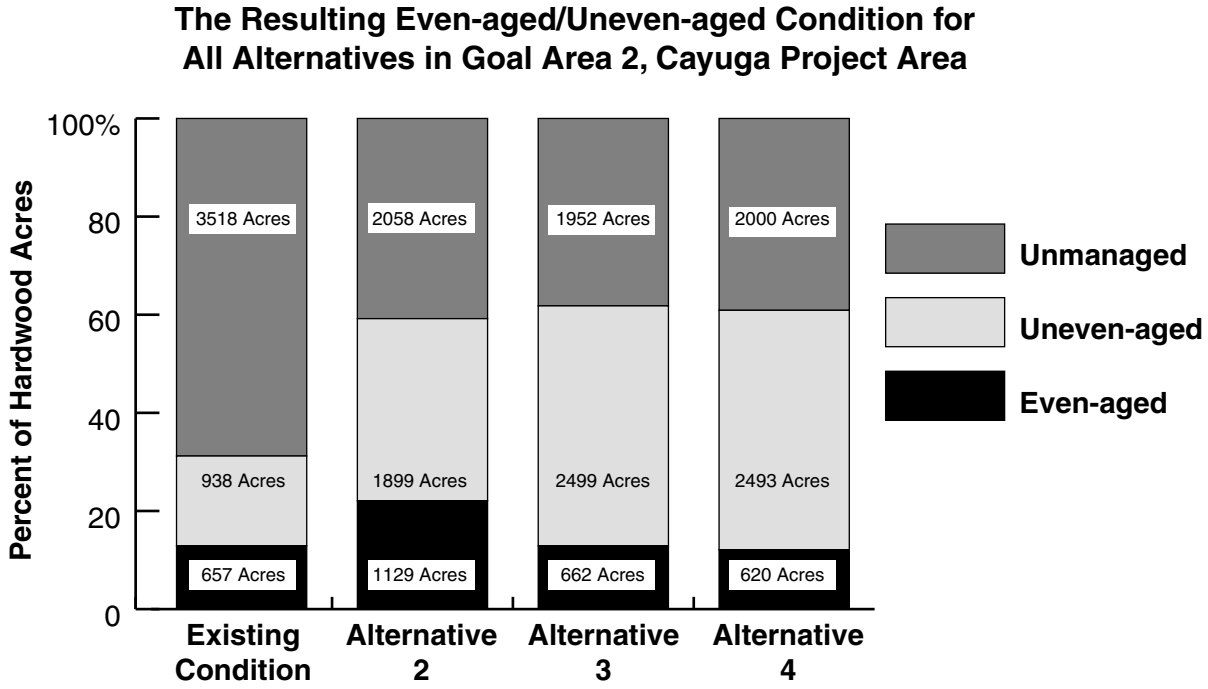
Alternative 1: No Action
If Alternative 1 were selected the age class distribution of hardwoods in GA 2 would remain the same. The amount of hardwood stands that are uneven-aged within GA 2 is 18% (see Table 4.1.2a and Figure 4.1.2a). Leaving these hardwood stands in their current state would not move them toward the desired future condition (DFC) prescribed in the Forest Plan.
Alternative 2
If Alternative 2 were implemented, the age class distribution of hardwoods in GA 2 would be moved toward the desired future condition prescribed in the Forest Plan. As a result of uneven-aged and even-aged hardwood treatments, the uneven-aged hardwood component would be 37% (see Table 4.1.2a and Figure 4.1.2a)
Alternative 3
If Alternative 3 were selected, the age class distribution of hardwoods in GA 2 would also move toward the desired future condition prescribed in the Forest Plan. As a result of uneven-aged and even-aged hardwood treatments, the uneven-aged hardwood component would be 49% (see Table 4.1.2a and Figure 4.1.2a).
Alternative 4
If Alternative 4 were selected the age class distribution of hardwoods in GA 2 would be the same as Alternative 3. As a result of uneven-aged and even-aged hardwood treatments, the uneven-aged hardwood component would be 49% (see Table 4.1.2a and Figure 4.1.2a).

Table 4.1.2a: Comparison Of Uneven-Aged Hardwoods In Goal Area 2 By Alternative

Forest Desired Future Condition Percent Uneven-aged	Project Area Existing Condition Percent	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		Percent Uneven-aged condition	Acres of Uneven-aged condition	Percent Uneven-aged condition	Acres of Uneven-aged condition	Percent Uneven-aged condition	Acres of Uneven-aged condition	Percent Uneven-aged condition	Acres of Uneven-aged condition
30-65 %	18 %	18	938 acres	37 %	1,899 acres	49 %	2,499 acres	49 %	2,493 acres

Figure 4.1.2a: Even-aged and uneven-aged conditions for all alternatives

Note: 1/ Acres listed as unmanaged in this figure have not been harvested since being acquired by the Forest



Service and no harvesting is proposed.

4.1.3 Objective #3-Management of Large Blocks of Hardwoods

Alternative 1: No Action

If Alternative 1 were implemented, stands identified for management as large blocks of hardwoods would not be treated to encourage interior forest conditions. Existing areas of interior forest would remain in their current condition.

Alternative 2

If Alternative 2 were implemented, approximately 61 acres of aspen would be converted to hardwood within larger areas of existing hardwood types. This would promote continuous blocks of interior forest conditions (see Table 4.1.3a). This would result in 5,209 acres of interior hardwood conditions. This amount represents a temporary reduction from the existing condition, since some clearcutting would still occur adjacent to, or within, areas of smaller interior hardwood blocks. However, existing large blocks of northern hardwood would be preserved and enhanced. In addition, existing young-age stands of aspen within hardwood blocks would gradually mature, resulting in a long-term increase in the amount of interior hardwood habitat.

Alternative 3

If Alternative 3 were implemented, the proposed vegetative management to promote continuous interior forest conditions in hardwoods would not be met through aspen conversion (see Table 4.1.3a). Other activities to

promote hardwood conditions would occur. This would result in 4,933 acres of interior hardwood conditions.

Alternative 4

If Alternative 4 were selected approximately 93 acres of aspen would be converted to hardwood within larger areas of existing hardwood types. This would promote continuous blocks of interior forest conditions (see Table 4.1.3a). This would result in approximately 5,259 acres of interior forest conditions. This amount represents a temporary reduction from the existing condition, since some clearcutting would still occur adjacent to or within areas of smaller interior hardwood blocks. However, existing large blocks of northern hardwood would be preserved and enhanced. In addition, existing young-age stands of aspen within hardwood blocks would gradually mature, resulting in a long-term increase in the amount of interior hardwood habitat.

Table 4.1.3a: Comparison of predicted effects on landscape pattern per alternative

Acres	**Alt. 1**	Alt. 2	Alt. 3	Alt. 4
Acres interior habitat (hardwood type)	5,301	5,209	4,933	5,259
Average interior patch size-acres	29	28.8	27.7	28.7
Acres of aspen converted through partial cuts	0	61	0	93

4.1.4 Objective #4- Convert Stands To Promote The Development Of Long-lived Species Where Visual Quality Objectives Are Important

Alternative 1: No Action

If Alternative 1 were implemented, the visual quality objectives along County Highway GG (north) and the shorelines of Day Lake and Spillerberg Lake would continue to be met through natural succession.

Alternative 2

If Alternative 2 were implemented, approximately 339 acres of mature aspen would be treated to meet the long-term visual quality objectives along County Highway GG (north), Day Lake and East Twin Lake. Treatment of the mature aspen would enhance visual quality by converting towards longer-lived species. Under planting of approximately 53 acres of white pine would be implemented to improve visual quality along the shorelines of Day Lake and Spillerberg Lake. Within Day Lake Campground visual quality would decline for about a one-year period immediately following harvest, but would return to acceptable levels after that.

Alternative 3

If Alternative 3 were implemented, approximately 292 acres of mature aspen would be treated to meet the long-term visual quality objectives along County Highway GG (north), Day, Spillerberg and East Twin Lake. Treatment of the mature aspen would enhance visual quality by converting towards longer-lived species. In addition, about 29 acres of white pine would be underplanted in two shore land stands adjacent to Day Lake. The effects on visual quality within Day Lake Campground would be similar to alternative 2.

Alternative 4

If Alternative 4 were implemented, approximately 134 acres of mature aspen would be treated to meet the visual quality objectives along County Highway GG (north), Day Lake, and East Twin Lake. Treatment of the mature aspen would enhance visual quality by converting towards longer-lived species. In addition, about 39 acres of white pine would be underplanted on three shoreline stands at Day Lake. The effects on visual quality within Day Lake Campground would be similar to alternative 2.

4.1.5 Objective #5- Restore and Maintain Permanent Openings

Alternative 1: No Action

If Alternative 1 were implemented, there would be no construction or maintenance of upland openings within the Cayuga Project area. The amount of upland openings within the project area would gradually reduced

through natural succession.

Alternative 2

If Alternative 2 were implemented, approximately 85 acres of existing upland openings would be maintained for long-term grass/forb/shrub cover type. Maintenance of these openings would not increase the amount of upland openings. Maintenance of openings, along with gradual conversions, would eventually result in an upland opening acreage of about 0.3%. No new openings would be constructed (see Table 4.1.5a).

Alternative 3

If Alternative 3 were implemented, approximately 126 acres of existing upland openings would be maintained for long-term grass/forb/shrub cover type. Maintenance of openings, along with gradual conversions, would eventually result in an upland opening acreage of about 0.4%. Approximately 16 acres of new openings would be constructed. Maintenance and construction of upland openings would not increase the amount of upland openings (see Table 4.1.5a).

Alternative 4

If Alternative 4 were implemented, approximately 27 acres of existing upland openings would be maintained for long-term grass/forb/shrub cover type. Maintenance of these openings would not increase the amount openings. Maintenance of openings, along with gradual conversions, would eventually result in an upland opening acreage of about 0.1%. No new openings would be constructed (see Table 4.1.5a).

Table 4.1.5a: Acres of upland openings per alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of maintenance (Percentage of managed openings within project area)	0 acres (0%)	85 acres (0.3%)	126 acres (0.4%)	27 acres (.1%)
Acres of new construction	0	0	16 acres	0

4.1.6 Objective #6: Restore The Vegetative Composition Of Transition Areas From Aspen Back To Long-Lived Conifer Types Through A Shelterwood Seed tree Harvest Method and Under planting

Alternative 1: No Action and Alternative 3

If Alternative 1 or 3 were selected the proposed under planting and harvest methods to convert aspen in transition areas toward long-lived hardwoods and conifers would not be implemented.

Alternatives 2 and 4

If Alternative 2 or 4 were implemented, approximately 38 acres of aspen in transition areas would be harvested through shelterwood seedtree methods to move stands towards upland hardwoods (see Table 4.1.6a). Under planting of conifers in concert with the harvest treatment would also be implemented. The combination of the under planting and treatment of aspen would result in a mixed stand of hardwoods and conifers.

Table 4.1.6a: Acres of aspen conversion per alternative

	Alt. 1	Alt. 2	Alt. 3	Alt.4
Acres of aspen conversion	0	38	0	38

4.1.7 Objective #7- Provide Safe Quality Recreation Experiences And Facilities

Alternative 1: No Action

If Alternative 1 were selected, no management of the mature red pine and jack pine would occur within Day

Lake Campground, and the safety objectives would not be met.

Alternatives 2 and 3

If Alternative 2 or 3 were selected, 25 acres of jack pine would be thinned in the Day Lake Campground to address safety issues. An additional 88 acres of red pine would be thinned to enhance recreational experiences.

Alternative 4

If Alternative 4 were selected, 25 acres of jack pine would be thinned in Day Lake Campground to address safety issues.

4.1.8 Objective #8- Modify Forest Management Practices In Adjacent Timber Types To Reduce Negative Impacts On The Conifer Swamp And Bog Within The McCarthy Lake and Cedars Research Natural Area

Alternative 1: No Action

If Alternative 1 were selected, no aspen adjacent to the McCarthy Lake and Cedars Research Natural Area (RNA) would be converted. In addition, the proposed under planting of approximately 25 acres of hemlock adjacent to FR 183 and the RNA would not be accomplished.

Alternatives 2, 3, and 4

If Alternatives 2, 3, or 4 were selected, approximately 76 acres of aspen adjacent to the McCarthy Lake and Cedar RNA would be converted toward long-lived species through shelterwood seedtree harvest methods. Approximately 25 acres of hemlock would be underplanted adjacent to FR 183 and the RNA.

4.1.9 Objective #9- Close Motorized Access To Research Natural Areas (RNA) That Do Not Contribute To Objectives Or Protection Of The Area

Alternative 1: No Action

If Alternative 1 were implemented, the spur road off of FR 1333, which accesses the McCarthy Lake and Cedars RNA, would not be closed to public motorized access.

Alternatives 2, 3, and 4

If Alternatives 2, 3, or 4 were selected the spur road off FR 1333 would be closed to public motorized vehicle use.

4.1.10 Objective #10- Control Leafy Spurge

Alternatives 1: No Action and Alternative 3

If Alternatives 1 or 3 were selected, the proposed action to release a biological control agent on three leafy spurge sites that cumulatively total less than 1 acre in size would not be implemented.

Alternatives 2 and 4

If Alternative 2 or 4 were selected, a biological control agent would be released on three leafy spurge sites that cumulatively total less than 1 acre.

4.1.11 Objective #11- Restore Streams To Conditions Prior To Beaver Activities

Alternative 1: No Action

If Alternative 1 were selected stream restoration activities would not occur on McCarthy Creek, Brush Creek, or other streams within the project area.

Alternatives 2, 3, and 4

If Alternatives 2, 3, or 4 were selected, brush piles would be placed along 1,000 feet of McCarthy Creek to help flush away sediment, stabilize sediment into newly created streambanks, and help narrow and deepen the stream channel. In addition, fine debris and tag alder would be selectively removed along 1.5 miles of McCarthy Creek to assist in the restoration of the health of this stream.

4.1.12 Objective #12- Protect, Restore, And Improve The Quality of Watersheds

Alternative 1: No Action

If Alternative 1 were selected the proposed replacement of existing culverts to improve water quality and fish passage would not be implemented.

Alternative 2

If Alternative 2 were selected, existing culverts at 7 sites would be replaced to improve water quality and fish passage. This would include the replacement of twin culverts located within an unnamed tributary of the Bad River and FR 355.

Alternatives 3 and 4

If Alternative 3 or 4 were selected, existing culverts at 6 sites would be replaced to improve water quality and

fish passage. In addition, twin corrugated metal culverts would be removed from an unnamed tributary to the Bad River to restore it to the original floodplain.

4.1.13 Objective #13- Manage For Long-Lived Species Adjacent To Trout Streams To Reduce The Loss Of Cold Water Habitat

Alternative 1: No Action
If Alternative 1 were selected, the aspen proposed for conversion to long-lived hardwoods within the stream corridor of McCarthy Creek or Brush Creek would not occur.
Alternative 2
If Alternative 2 were implemented, approximately 56 acres of aspen would be harvested to convert towards long-lived hardwood species within the stream corridor of McCarthy Creek and Brush Creek.
Alternative 3
If Alternative 3 were implemented, approximately 52 acres of aspen would be harvested and converted towards long-lived species within the stream corridor of McCarthy and Brush Creeks.
Alternative 4
If Alternative 4 were implemented approximately 35 acres of aspen would be harvested and converted towards long-lived species within the stream corridor of McCarthy and Brush Creeks.

4.1.14 Objective #14- Design Trails And Trailheads That Minimize User Conflicts While Protecting Resources

Alternative 1: No Action
If Alternative 1 were selected, Snowmobile Trail 8 would remain on a plowed road (Forest Road 1296). A special use authorization would continue to be issued for the use of an existing sand pit for snowmobile parking.
Alternatives 2, 3, and 4
If Alternative 2, 3, or 4 were selected 0.4 miles of Snowmobile Trail 8 would be re-routed off of FR 1296 onto National Forest lands. A 1-acre parking area for snowmobile and ATV users would be constructed off FR 1296 for easy trail access. This would eliminate mixed vehicle traffic on FR 1296.

4.1.15 Objective #15- Identify Roads For Decommissioning That Are No Longer Needed On Landscape For Resource Management Within Goal Areas 1 and 2

Alternative 1: No Action
If Alternative 1 were selected, the total road densities would not change. The current Forest Plan direction for system roads only is 3.6miles/square mile. The existing road densities for system roads in Goal Area (GA) 1 is 2.2 miles/square mile and 1.8 miles/square mile in GA 2. The road density for system and non-system roads within the project area would remain at 2.8 miles/square mile.
Alternative 2
If Alternative 2 were implemented, approximately 6.5 miles of system and non-system roads would be decommissioned.
Alternative 3
If Alternative 3 were implemented, approximately 5.7 miles of system and non-system roads would be decommissioned.
Alternative 4
If Alternative 4 were implemented, approximately 11.4 miles of system and non-system roads would be decommissioned.

4.1.16 Objective #16- Construct Temporary Roads And Maintain Existing Roads To Provide Access For Resource Management Activities

Alternative 1: No Action
The Alternative 1 were selected no construction or maintenance of temporary roads to provide access to conduct management activities would not occur.
Alternative 2
If Alternative 2 were implemented, approximately 12.2 miles of temporary roads would be constructed to conduct timber management activities. Approximately 22.80 miles of road maintenance work on existing roads would occur.
Alternative 3
If Alternative 3 were implemented, approximately 16.3 miles of temporary roads would be constructed to conduct timber management activities. Approximately 23.3 miles of road maintenance work on existing roads

would occur.

Alternative 4

If Alternative 4 were implemented, approximately 10.5 miles of temporary roads would be constructed to conduct timber management activities. Approximately 19.70 miles of road maintenance work on existing roads would occur.

4.2 Predicted Effects on Relevant Affected Resources of All Alternatives

4.2.1 Predicted Effects of Early Successional Management (Issue 1)

Alternative 1: No Action

Thirty-eight percent (38%) of Goal Area 1 within the project area is dominated by the aspen component (all age classes). Twenty-one percent (21%) of Goal Area 2 within the project area, is dominated by aspen (see Table 4.1.1a in Section 4.1.1). The Forest Plan Desired Future Condition for the amount of aspen on the landscape ranges from 35%-65% in Goal Area 1 and 10%-20% in Goal Area 2. The percent of aspen, as a component on the landscape, would not change appreciably over the life of this project under the No Action alternative.

If Alternative 1 were selected, the proposed timber harvests designed to maintain aspen in the 1-20 year age class would not be implemented. The Forest Plan desired future condition (DFC) prescribes maintaining 30% of the aspen component within Goal Area 1 in the 1-20 year age class, (Forest Plan, pp. IV-114). There is no Forest Plan standard for aspen in the 1-20 year age class in Goal Area 2 Without harvest treatments, the amount of aspen in the 1-20 year age class would decline from the existing level of 29% in Goal Area 1 and 31% in Goal Area 2, to 15% and 18% respectively, over a 5-year period. As stands age naturally, the amount of aspen in the 1-20 year age class would move away from the DFC prescribed for Goal Area 1. An indirect effect of Alternative 1 would be a decrease of aspen in the 1-20 year age class by approximately 50% from the existing condition in Goal Area 1 (see Table 4.1.1b in Section 4.1.1.)

There would also be an indirect effect on the older stands of aspen under Alternative 1. Approximately 46% of the aspen stands within the entire project area are greater than 50 years of age with an average site index of 65 (see Figure 3.3.1a, Section 3.3.1). This is beyond the recommended rotation age (Forest Plan, pp. IV –42, Perala, 1977). The amount of aspen greater than 50-years of age in Goal Area 1 is approximately 2,819 acres. The amount of aspen greater than 50 years of age is due to a number of factors including limited access to some stands, forty-acre regeneration cut limitations and other resource concerns that limited their availability for timber harvest and regeneration.

An indirect effect of not treating mature aspen through harvesting during the life of this analysis would be that the older aspen stands would become more decadent. Those stands older than 50 years of age would have stable mortality rates for the next five years, at which point decay pathogens would start to become a concern. After age 50, these aspen stands would begin to deteriorate. Once these stands reach the range of 60 to 80 years of age, the level of deterioration would increase rapidly. Many of the aspen trees would eventually die and succession to more shade tolerant species would begin (Katovich, McDougall and Chavez, 1998). An indirect effect would be that natural succession would move these stands toward a mixed hardwood type with smaller amounts of shade tolerant conifers. Stands with a considerable component of other species would gradually convert to the longer lived species as the short lived aspen continues to die out of the stands. Even stands that are now primarily aspen would begin to regenerate other species such as red maple as mortality of aspen begins to occur. Through natural processes, mortality of aspen would likely be spread out over time. The aspen component would be substantially reduced from the plant community, as adjacent vegetation would occupy canopy space.

Table 4.2.1a displays the amount of aspen acreage remaining in the 50-year plus age class (over the five year life of the project) after either no action (Alternative 1), or following regeneration and conversion activities proposed in Alternatives 2, 3 and 4.

Table 4.2.1a: Aspen acres remaining in the 50 year plus age class over the five year life of the project.

Goal Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	3,248	2,693	2,384	2,920
2	1,347	710	600	863

The Iron River IPWA totals approximately 8,503 acres or 26 % of the total Cayuga Project Area where no activities are proposed pending completion of the Forest Plan Revision. As stated in Section 1.4.4.6, none of the alternatives propose management activities within the Iron River IPWA. The cumulative effects of not managing the mature aspen in this area will be disclosed under the cumulative effects for this issue (see Section 4.2.1.5).

Since none of the project-related clearcut harvests or other early-successional management would be implemented under Alternative 1, there would not be any direct effects, such as disturbance or displacement, on the wildlife or fish resource. The dying and deteriorating aspen trees would contribute to structural diversity as snags, cavity trees, and dead and down logs. This would provide an increase of habitat features for cavity nesters, such as the pileated woodpecker, barred owl, black-capped chickadee, and flying squirrel. Small burrowing mammals and amphibians would benefit from increased downed woody material. There could be development of canopy gaps as large aspen fell over, creating increased understory development preferred by some Neotropical migratory birds (NTMB), including shrub nesters and foliage gleaners.

There are several Management Indicator Species (MIS) that could benefit in the short term through the selection of Alternative 1. The pileated woodpecker, a cavity excavator that requires large trees and snags for nest and roost sites, could benefit from an increase in dead and dying aspen. Although this species seems to prefer mature hardwood and conifer forests, it can also be seen in mature mixed aspen woods. Pileated woodpeckers usually excavate new nest cavities every year. Therefore, preferred habitat consists of forest stands with more than occasional snag trees. Dead and dying trees also provide good foraging sites for these insect eaters.

Another MIS species that would benefit in the short term is the brown creeper. This bird is a bark gleaner that forages for insects on large hardwood and conifer trees, and nests in holes and in cavities under loose bark. Large dead or dying trees provide suitable sites for both foraging and nesting. The brown creeper would most likely be found in mixed forest stands, rather than pure aspen.

The barred owl, another MIS species, utilizes large unbroken hardwood forests, including aspen. It nests in large abandoned tree cavities or stick nests. Like the pileated woodpecker, this bird benefits from large diameter dead and dying trees.

The long-term indirect effects on wildlife and fisheries habitat under this alternative will not be discussed here, since the selection of this alternative would not govern actions into the future (greater than ten years from now). Within the short term, there would not be noticeable effects on the amount of browse available for deer and elk. There would also not be noticeable effects on deer populations, although other non-project related factors could easily cause yearly population fluctuations.

The effects of aspen management on the Forest landscape will be discussed in Section 4.2.3, Vegetation Composition.

Alternative 2

Thirty-eight percent (38%) of Goal Area 1 within the project area is dominated by the aspen component (all age classes). Twenty-one percent (21%) of Goal Area 2 within the project area, is dominated by aspen (see Table 4.1.1a). The Forest Plan DFC for the amount of aspen on the landscape ranges from 35%-65% in Goal Area 1 and 10%-20% in Goal Area 2. Following implementation of Alternative 2, 37% of Goal Area 1, and 17% of Goal Area 2 would be dominated by aspen.

Approximately 646 acres of aspen would be converted (see Table 4.2.1b) to long-lived species to address a variety of resource concerns such as long term visual quality objectives and management for long-lived species adjacent to trout streams. Approximately 234 acres of aspen would be converted in Goal Area 1 and 412 acres would be converted in Goal Area 2 (see Table 4.2.1b). These conversions would be implemented to meet a variety of resource objectives (see Section 1.3, Objectives #2, #3, #4, #7, #8, and #13.). Those conversions would be facilitated through various methods, which include:

- shelterwood, commercial thinning and improvement harvest techniques
- natural conversion to hardwoods or conifer
- shelterwood harvesting with under planting to conifers

- under planting of conifers with no harvesting

A direct effect of converting stands from aspen to other types would be a reduction of the aspen component with a corresponding increase in the acreage in other forest types, such as hardwoods and conifers. Following implementation, the amount of aspen on the landscape would be within the Forest Plan DFC in both Goal Areas.

Twenty-nine percent (29%) of the aspen in Goal Area 1 is currently in the 1-20 year age class. Thirty-one percent (31%) of the aspen in Goal Area 2 is currently in the 1-20 year age class. The Forest Plan desired future condition (DFC) prescribes maintaining 30% of the aspen component within Goal Area 1 in the 1-20 year age class across the Forest, (Forest Plan, pp. IV-114). There is no Forest Plan standard for aspen in the 1-20 year age class in Goal Area 2

If Alternative 2 were implemented, 737 acres of aspen would be harvested through regeneration cuts to maintain aspen in the 1-20 year age class in Goal Areas 1 and 2. The age of the aspen component, following implementation, is displayed to reflect the aging of all aspen at the end of a 5 year period. For instance, aspen stands currently in a 15-20 year age class will be in the 20-25 year age class at the end of a 5 year period. As a result of the implementation of Alternative 2 the percentage of aspen in the 1-20 year age class in the project area would decline by 5% from the existing condition in Goal Area 1. The percentage of aspen in the 1-20 year age class over a 5-year period would be 24% in GA 1 and 31% in GA 2.

Approximately 31% of the aspen in Goal Area 1 across the entire Chequamegon side of the Forest is currently within the 1-20 year age class. Forest-wide, some of these stands will also move into an older age class by the end of a 5 year period. In addition, future proposals across the Forest will likely identify opportunities to manage aspen to contribute to compositional goals, but those projects have not been identified at this point in time.

Table 4.2.1b: Comparison of regeneration and conversion acres by alternative

Acres	Alternative 2			Alternative 3			Alternative 4		
	Goal Area 1	Goal Area 2	Total Acres	Goal Area 1	Goal Area 2	Total Acres	Goal Area 1	Goal Area 2	Total Acres
Regen Acres	512	225	737	876	505	1,381	319	79	398
Conversion acres	234	412	646	195	242	437	135	405	540

Clearcut harvest treatments designed to regenerate aspen would be conducted in specific aspen stands under Alternative 2. The indirect effects of clear-cutting aspen would be strong and vigorous regeneration of aspen through suckering. Some nutrient loss would occur from the removal of the tree bole, however the majority of the nutrient rich biomass consisting of the root system, branches, and leaves would be left on site.

The amount of aspen remaining in the 50-year old and greater age class would be approximately 2,693 acres in Goal Area 1, and approximately 710 acres in Goal Area 2 (Table 4.2.1a). As described previously, some of these stands are inaccessible due to wetlands, access across private lands or due to their adjacency to other harvest units. Approximately 1,598 acres of aspen 50 years of age or older in Goal Area 1 are located within the Forest Plan Revision Inventoried Potential Wilderness Area. The effects of not harvesting older stands of aspen are the same as those described under Alternative 1 (Chapter 4.2.1.1).

If Alternative 2 were implemented, the direct effects of the proposed aspen management activities could cause actual disruption of some wildlife populations, or of activities such as nesting. These effects would vary depending on the season that the clearcutting occurred at any site. Since there is substantial disturbance involved with early successional harvest activities, such as clearcutting, (mechanized vehicle use, felling and moving of trees) there is always the potential for mortality of individual animals by these activities. This would be a possibility mainly with small, relatively immobile animals such as amphibians, nestling birds, or mammalian young. Most animals, including adults of most species, would simply vacate an area during such disturbance. In addition to direct mortality, disturbance during the nesting or birthing season could cause indirect mortality if nests or young were abandoned due to the disturbance. As mentioned, these

effects would vary by season. Harvesting that occurred during winter would not have substantial direct effects as defined here. With the application of mitigation measures (see Appendix C) to address wildlife and fisheries concerns, the effects would be minimized.

The change in stand structure resulting from early successional management can be an important benefit for many wildlife species. The dense cover provided by regenerating stands provides important habitat for game species such as ruffed grouse, woodcock, and snowshoe hare. There are also a number of non-game species that inhabit young, brushy forests. These types of forest can result in a high species diversity of songbirds, including species of management concern such as golden-winged warbler, Eastern towhee, and brown thrasher.

Another important effect of early successional management is the increase in woody and herbaceous forage. The rapid regeneration of aspen, shrubs, and other hardwood species results in a large volume of woody browse. The increased sunlight also results in a flush of herbaceous growth, compared to what is available in a mature, closed canopy stand. Species that benefit from these changes include deer, elk, and beaver. The increased sunlight can also greatly increase the production of soft mast (berries) such as raspberry, blueberry, and cherry species. Species that benefit from these changes include black bear, small mammals, and many songbirds. The effects of aspen management on the forest landscape will be discussed in Section 4.2.3, Vegetation Composition.

Alternative 3

Thirty-eight percent (38%) of Goal Area 1 within the project area is dominated by the aspen component (all age classes). Twenty-one percent (21%) of Goal Area 2 within the project area is dominated by aspen, (see Table 4.1.1a). The Forest Plan DFC for the amount of aspen on the landscape ranges from 35%-65% in Goal Area 1 and 10%-20% in Goal Area 2. Following implementation of Alternative 3, 37% of Goal Area 1, and 18% of Goal Area 2 would be dominated by aspen.

With implementation of Alternative 3, approximately 195 acres of aspen would be converted in Goal Area 1 and 242 acres would be converted in Goal Area 2. (see Table 4.2.1b). These conversions would be implemented to meet a variety of resource objectives (see Section 1.3, Objectives #2, #3, #4, #7, #8, and #13.). Those conversions would be facilitated through various methods, which include:

- shelterwood, commercial thinning and improvement harvest techniques
- natural conversion to hardwoods or conifer
- shelterwood harvesting with under planting to conifers
- under planting of conifers with no harvesting

A direct effect of converting stands from aspen to other types would be a reduction of the aspen component with a corresponding increase in the acreage in other forest types, such as hardwoods and conifers. Following implementation, the amount of aspen on the landscape would be within the Forest Plan DFC in both Goal Areas.

If Alternative 3 were implemented, approximately 1,381 acres of aspen would be regenerated through timber harvest, an increase of 47% over the level of aspen harvest proposed in Alternative 2. This increase is due to higher levels of aspen harvest and lower levels of aspen conversion to long-lived species.

The Forest Plan desired future condition (DFC) prescribes maintaining 30% of the aspen component within Goal Area 1 in the 1-20 year age class, (Forest Plan, pp. IV-114). There is no Forest Plan standard for aspen in the 1-20 year age class in Goal Area 2. If Alternative 3 were implemented, the percentage of aspen in the 1-20 year age class within Goal Area 1 over a 5-year period, would remain the same as the current, existing condition level (29%). The percentage of aspen in the 1-20 year age class in Goal Area 2 would increase from 31% to 40% (see Table 4.1.1b, Section 4.1.1).

Clearcut harvests to regenerate aspen would predominantly be conducted in aspen stands under Alternative 3. The indirect effects of clear cutting aspen would be strong and vigorous regeneration of aspen through suckering. Some nutrient loss would occur from the removal of the tree bole, however the majority of the nutrient rich biomass consisting of the root system, branches, and leaves would be left on site. The direct effects of clearcutting jack pine would be the removal of overmature, decadent trees and disturbance of the site for eventual hand planting of red pine. Some jack pine would also regenerate naturally, however, mechanical site-preparation would create a improved seedbed for the red pine seedlings. Subsequent follow-up Timber Stand Improvement (TSI) would help eliminate competition and to aid in establishment the longer-lived red pine.

The amount of aspen remaining in the 50-year old plus age class would be approximately 2,384 acres in Goal Area 1 and 600 acres in Goal Area 2 (see Table 4.2.1a). The discussion of accessibility to those stands is described in Alternative 2 and apply here as well. The indirect effects of not harvesting or converting these stands would be the same as those described under Alternatives 1 and 2.

If Alternative 3 were implemented, the result would be greater direct effects on individual animals and populations due to increased disturbance and habitat changes as compared to Alternative 2. Effects described under Alternative 2 from structural changes would be substantially increased, to the benefit of some species and to the detriment of others. One difference would be increased habitat created for species such as golden-winged warbler, ruffed grouse, and woodcock, but there would be decreased habitat for species such as pine marten, pileated woodpecker, and brown creeper. There would be larger areas of increased forage, benefiting species such as elk, deer, and beaver.

If Alternative 3 were selected, a number of stands would be proposed for harvest in isolated wetland areas (nine stands, or approximately 191 acres). Access to these stands would involve temporary, frozen winter roads rather than permanent road construction, however this type of access still requires some clearing of corridors in wetland areas, much of it in the lowland conifer type. This would represent some habitat loss and disturbance beyond the upland areas affected by harvest. The actual acreage directly affected would be minimal; however there could be additional indirect effects on habitat in these situations. The availability of browse adjacent to winter cover (lowland conifer) would represent a beneficial situation for deer. If deer were drawn to the sites, there could be additional browsing pressure on the adjacent stands.

This alternative was developed in part to address concerns over a regional decline in the aspen type, due to the value of this type for some wildlife species. Clearcutting of these stands, in addition to the long-term effect of perpetuating more of the aspen type within the project area, would have the direct effect of producing the early successional shrub/sapling/forb habitat considered crucial to many wildlife species as described earlier in this document.

The effects of aspen management on the forest landscape will be discussed in Section 4.2.3, Vegetation Composition.

Alternative 4

Thirty-eight percent (38%) of Goal Area 1 within the project area is dominated by the aspen component (all age classes). Twenty-one percent (21%) of Goal Area 2 within the project area is dominated by aspen, (see Table 4.1.1a). The Forest Plan DFC for the amount of aspen on the landscape ranges from 35%-65% in Goal Area 1 and 10%-20% in Goal Area 2 Following implementation of Alternative 4, 37% of Goal Area 1, and 17% of Goal Area 2 would be dominated by aspen.

Approximately 135 acres of aspen would be converted in Goal Area 1 and 405 acres would be converted in Goal Area 2 (see Table 4.2.1b). These conversions would be implemented to meet a variety of resource objectives (see Section 1.3, Objectives #2, #3, #4, #7, #8, and #13.).. Those conversions would be facilitated through various methods which include:

- shelterwood, commercial thinning and improvement harvest techniques
- natural conversion to hardwoods or conifer
- shelterwood harvesting with under planting to conifers
- under planting of conifers with no harvesting

A direct effect of converting stands from aspen to other types would be a reduction of the aspen component with a corresponding increase in the acreage in other forest types, such as hardwoods and conifers. Following implementation, the amount of aspen on the landscape would be within the Forest Plan DFC in both Goal Areas.

If Alternative 4 were implemented, approximately 398 acres of aspen would be harvested through regeneration cuts (see Table 4.2.1b). The Forest Plan desired future condition (DFC) prescribes maintaining 30% of the aspen component within Goal Area 1 in the 1-20 year age class, (Forest Plan, pp. IV-114). There is no Forest Plan standard for aspen in the 1-20 year age class in Goal Area 2. If Alternative 4 were implemented, the percentage of aspen in the 1-20 year age class within Goal Area 1 over a 5-year period would be 20%; a decrease of approximately 9% from the existing condition level. The percentage of aspen in the 1-20 year age class in Goal Area 2 would be 25% (see Table 4.1.1b, Section 4.1.1).

Clearcut harvest treatments would predominantly be conducted in aspen stands under Alternative 4. The indirect effects of clear cutting aspen would be the strong and vigorous regeneration through suckering of the stand back to aspen. Some

nutrient loss would occur from the removal of the tree bole, however the majority of the nutrient rich biomass consisting of the root system, branches, and leaves would be left on site. The indirect effects of clearcutting the jack pine would be to remove overmature decadent trees for hand planting the site to red pine. Some jack pine would be regenerated naturally, however, mechanical site-prep would create a sufficient seedbed for the red pine seedlings and subsequent follow-up Timber Stand Improvement (TSI) would help eliminate competition and help establish the red pine

After treatment, the amount of aspen remaining in the 50-year old plus age class would be approximately 2,920 acres within GA 1 and 863 acres in GA 2 (see Table 4.2.1a). The discussion regarding accessibility to some of these stands described in Alternative 2 applies to this Alternative as well. The indirect effects of not harvesting or converting these stands would be the same as those described under Alternatives 1, 2 and 3.

The amount of clearcut harvest proposed in Alternative 4 (approximately 398 acres) is less than the amount proproposed under action Alternatives 2 and 3 (approximately 737 and 1,381 acres respectively). Under this alternative, there would be fewer direct effects on individual animals and populations from disturbance and habitat changes. Effects that were described under Alternative 2 for structural changes would be substantially reduced in Alternative 4. This would benefit some populations and would represent a gradual loss of habitat for other species, as the aspen gradually matured, or was actively managed to convert to other species. There would be less open, shrub, and sapling habitat created for certain NTMB's and game birds, but there would be more mature and over-mature habitat for other species, favoring bark foragers and cavity nesters, as well as species requiring quantities of large woody debris, such as pine marten, amphibians, and small mammals. Forage, in the form of herbaceous cover, woody twigs, and soft mast would be available in reduced quantities compared to Alternative 2 and especially Alternative 3, potentially affecting habitat quality for species such as elk, bear, grouse, and some songbirds and small mammals.

Cumulative Effects

All Alternatives

If the Forest Plan Revision Inventoried Potential Wilderness Area (IPWA) located within the Project Area were recommended for wilderness designation through the Forest Plan Revision, and later designated by Congress as Wilderness, it would be reasonably foreseeable to conclude there would be an eventual reduction in the aspen forest type in this area. The most notable decline would be in those aspen stands in the 50 plus age class (see Figure 3.2.1b). As a result, aspen would be less dominate on the landscape over time.

Past activities in and near the project area have resulted in a fairly patchy landscape, with areas of young-age aspen interspersed throughout most of the area. The proposed activities, when combined with past, future, and other present activities, would basically represent a continuation of the existing condition over the short term, with some exceptions. Alternative 1 could be considered a departure from current management. It would represent a decision to not implement the proposed activities at this time. Other proposals could be made and implemented at some point in the near or long term. Within a ten-year period however, there could be some changes evident in continued maturing of some aspen stands, with increased mortality and succession to other more shade tolerant species. Alternative 4 could also be considered a departure from current management, representing a stronger trend towards less edge, less early successional management, and more interior forest.

There have been concerns expressed about trends of early successional species as well as mature, interior forest species, with national, regional, and local trends being part of the discussion. In terms of regional trends, the Northeast U.S. has perhaps seen greater and more long-term declines in early successional species. This is likely due to the fact that the Northeast has been in a longer process of forest maturation and abandonment of agricultural fields. There are also declining trends in the Lake States, both in terms of habitat and populations. For example, since 1935, the area of aspen/birch in Wisconsin has declined by as much as 40% (Lorimer, 2001). To some extent however, these recent declines can be interpreted as a recovery of regional forests from an unprecedented level of disturbance in the late 1800's and early 1900's. Declines during the last 50 years may have occurred after a 100-300 year expansion of suitable habitat following European exploration and settlement (Hunter et al., 2001).

Cumulative effects of Alternatives 2, 3, and 4 over the long term would represent a continuation of these trends towards less early successional forest, more mature, shade tolerant forest types, and less fragmentation. This would be less pronounced with Alternative 3, however even in this alternative, there are some stands proposed for eventual conversion to longer-lived species. There could be some subsequent declines in wildlife species using early successional habitats, however it is unlikely that any species would be at risk of extirpation from this scenario, assuming some level of even-

age management in the future, combined with continued natural disturbance. It is also unlikely that populations of most early successional wildlife species would drop to levels found prior to the period of European settlement.

The Sunken Moose Project (Washburn Ranger District) and the Hoffman-Sailor Project (Park Falls/Medford Ranger District) are both proposing early successional regeneration cuts. The Sunken Moose Project would maintain the aspen component within Goal Area 1 at its existing condition and the Hoffman-Sailor Project would increase the aspen component within Goal Area 1 from its existing condition. Cumulatively from a forest-wide perspective the aspen component would be either maintained or slightly increasing within Goal Area 1, as a result of implementing these three projects.

4.2.2 Predicted Effects of Wildlife Openings (Issue 2)

Alternative 1: No Action

If Alternative 1 were selected, the project related maintenance or construction of upland openings would not be implemented. Over the short term, there would be little change in project area openings due the lack of maintenance. Many of the sites could eventually return to forest cover, but that change would generally not happen within a 10-year period. An exception could be openings that haven't been maintained recently, or were small and partially forested to begin with. Some of these could become more or less forested in a short additional period of time. Most openings however would remain in a similar condition without maintenance, over the short term. Some openings in the project area have stayed open without maintenance for several decades, due to natural factors such as frost action, browsing, and sod competition.

Even though Alternative 1 would not involve any opening maintenance over the short term, it would not represent a long-term commitment to a similar approach as future project analysis could consider maintenance of openings. Since there would be only an incremental change in amount of upland opening acreage under this alternative, there would not be noticeable short-term effects on fish and wildlife species, including Management Indicator Species (MIS).

Alternative 2

If Alternative 2 were implemented, maintenance of approximately 85 acres of existing openings would be implemented. Maintenance would concentrate on openings within early successional habitats, primarily the aspen type, as well as maintenance of administrative and recreation sites. In spite of this maintenance, there would still be a gradual reduction in acreage of upland openings. Assuming openings not proposed for maintenance under this project were abandoned, openings could eventually make up only 0.3% of the project area. Some people feel that even this amount is not a natural part of the landscape, however literature is cited in the specialist report that indicates openings in some form were likely in existence prior to European settlement. Upland openings provide a wide variety of food sources, due to the abundant sunlight available, including grasses, forbs, and fruit producing shrubs and trees. Use has been documented by a wide variety of species; animals using openings are typically generalist species, including edge species. Openings in the project area are not large enough to attract true grassland species.

Indirect effects of opening maintenance can include edge effects on adjacent stands, with even small openings having the potential for effects beyond the immediate site. For more description of edge effects, see Section 4.2.4, Predicted Effects on Fragmentation (Issue 4).

Alternative 3

If Alternative 3 were implemented, approximately 126 acres of upland openings would be maintained. Approximately 16 acres of additional openings would be constructed. This alternative would stress upland opening habitat more than the other alternatives, since the current percentage of this type in the project area is well below that called for in the current Forest Plan.

In spite of the construction and maintenance proposed, Alternative 3 would still result in a decrease in acreage typed as open, to approximately 0.4% of the total project area. There would be some additional direct effects on wildlife, including some MIS, by the construction of openings. The sites used for construction would be young-age aspen. The conversion of this type to a grassy opening could affect any wildlife inhabiting the areas, due to equipment use and ground disturbance. These effects would be minimized by implementing construction later in summer, after the nesting season. There would be indirect effects due to the type conversion, with a small decrease in habitat for the common

yellowthroat, ruffed grouse, and other shrub/early successional species, and a slight increase in habitat for the thirteen-lined ground squirrel, and the suite of species using more open grassy areas. Habitat for the white-tailed deer would be essentially unchanged since both upland openings and young aspen are preferred habitats for this species.

Other indirect effects would be similar to that as described for Alternative 2, since there would not be a substantial change in overall percentage of upland openings within the project area.

Alternative 4

If Alternative 4 were implemented, maintenance of approximately 27 acres of upland openings would occur. There would be no new construction of openings. Openings that are part of administrative sites (recreation areas, ELF sites) would be maintained, generally by mowing. In addition, there are five existing openings proposed for maintenance by prescribed fire (a disturbance agent that would have typically helped to maintain natural openings). Assuming the openings not maintained would revert to forest cover, this would result in a long-term upland opening percentage of 0.1% for the project area.

There would be few short-term effects from this alternative, however long-term effects would include a reduction in grass/forb habitat for thirteen-lined ground squirrel; a temporary increase in shrub habitat for common yellowthroat and ruffed grouse; and a reduction in potential indirect effects on species of adjacent forests, including pine warbler and blackburnian warbler. Over the long term there could be a slight decrease in foraging habitat for deer, however the loss of such a relatively small amount of habitat over a 32,000 acre project area would not have any appreciable effect.

Cumulative Effects

All Alternatives

Cumulative effects to wildlife and fisheries habitat due to this activity would be minor. This is due to the small amount of area affected, and the overall reduction of this cover type over the years. Even in Alternative 3, there would be a further reduction in percentage of upland opening acreage in addition to what has occurred in the recent past. In addition, Alternatives 2 and 4 would not involve maintenance within larger blocks of interior habitat, to further reduce potential effects of fragmentation and edge. For more information on cumulative effects, see the section in the specialist report on cumulative effects, vegetation management.

4.2.3 Predicted Effects on Vegetation Composition (Issue 3)

Alternative 1: No Action

If Alternative 1 were selected, the proposed management activities would not be implemented. An indirect effect of not conducting management activities would result in very little, to no change, in the age class distribution in the northern hardwoods in both Goal Areas 1 and 2. In many of the northern hardwood stands, this would result in growth being equal to mortality. Therefore, there would be no net growth. Without treatment, stands would not be expected to convert from another forest type to northern hardwoods in the next 10 years, although some aspen stands with large amounts of hardwood trees would eventually convert to hardwood dominated stands over the longer term (beyond 10 years).

Many of the hardwood stands (including northern hardwoods and mixed hardwood types) have components of aspen and white birch. Because of age (50 + years), drought, and heavy defoliation during the late 1980's, some of the aspen and white birch have died over the last five years and additional trees would die due to their age. An indirect effect of not treating these stands would be the creation of snag trees and coarse woody debris on the forest floor, which would benefit certain wildlife species. It would also create gaps in the tree canopy that would allow light to penetrate to the forest floor and stimulate brush and tree regeneration in the under story. The effect would be short term, as the gaps would be closed by the growth of adjacent trees.

If Alternative 1 were selected, those stands with low amounts of aspen and white birch would experience little mortality in the short term. With no harvesting, high growth rates on better quality, future crop trees would be lost, as growth would be spread out over more trees. A direct effect of not managing these stands would be the heavy shading of the understory vegetation, which would limit regeneration and development of the vertical vegetation structure. A long term effect would be that the canopy would be opened due to the mortality of individual trees. In addition, these dead and dying trees would result in more snag and den trees and more large woody debris on the forest floor.

There would essentially be a continuation of the existing condition in terms of landscape pattern if Alternative 1 were chosen. This is represented by a fairly even distribution of younger-age and regenerating patches of aspen in the southern portion of the project area, interspersed with areas of northern hardwood, lowland conifer, and small areas of other types, with a fairly high amount of edge. The areas of regenerating aspen could eventually mature and merge into blocks of interior forest, but not within the short term (under 10 years). Substantial areas of interior forest habitat are confined to the area north of FR 184, and several other smaller areas, such as the area northwest of Spillerberg Lake, and within the Iron River IPWA (see Table 4.2.3a and maps in Appendix A). These would be maintained under Alternative 1, unless affected by natural disturbance. Wind continues to be an important factor within and near the project area, with several extensive areas of wind throw just from the past several years. Insect and disease agents also continue to be a factor in landscape pattern development, with mortality evident in the project area from spruce budworm. Beaver activity could affect additional areas of riparian or lowland forest by flooding.

The dense canopy and more or less even-age condition provides habitat for various species that prefer mature closed-canopy forests, such as many Neotropical Migrant Birds and pine marten. Many wildlife species would benefit from the lack of disturbance resulting from Alternative 1. The relatively low level of structural diversity could be limiting for some species. Natural canopy gaps would occur as individual trees blew down in windstorms or they collapsed due to natural mortality. This would create some diversity in stand structure. However, overall the stands would mature slowly, with little change over a ten-year period. Pileated woodpecker, brown creeper, and barred owl could benefit indirectly from Alternative 1 as the stands gradually matured, and more snags, cavity trees, and dying trees developed. Since the changes within the stands would be minimal however, habitat conditions would not be very different from the existing condition (see summary of effects to MIS in the specialist reports).

Alternative 2

If Alternative 2 were implemented, northern hardwood stands proposed for treatment would be treated to move toward a balanced amount of age classes and structure within the project area. Harvest activities would be conducted on approximately 1,331 acres of northern hardwoods through even-aged methods and 2,140 acres of northern hardwoods through uneven-aged methods (see Table 4.2.3a).

In uneven-aged management, the direct effect of selection harvesting would be to develop and maintain stands of trees over a large land area that contain a range of tree sizes or age classes from seedlings to larger diameter sawtimber size trees. Many of the short-lived species such as paper birch and aspen would be removed before they are lost to natural mortality. Many of the shorter-lived tree species would be removed before they die. Harvest activities would improve growth and quality on residual trees and would reduce the probability of insect and disease losses because healthier trees would be left to grow. Some existing and potential snag and cavity trees would be left to provide structural habitat for wildlife species. Species diversity would be encouraged through harvesting to create canopy gaps that would allow enough sunlight to reach the forest floor to promote regeneration less shade tolerant species, such as green ash, basswood and red oak. These gaps would be similar to those naturally occurring in older, unmanaged stands and would generally not exceed 66 feet in diameter. This type of treatment would maintain the continuous forest canopy.

Table 4.2.3a: Summary of timber harvest activity by acres for each alternative

Harvest Activity	Alternative 2	Alternative 3	Alternative 4
Even-aged Thinning			
Northern Hardwood	1,331	865	179
Conifer	383	383	295
Aspen	220	351	142
Paper Birch	7	28	0
Total	1,941	1,627	616
Uneven-aged Management			
Selection	2,140	2,836	2,710
Improvement	0	56	966
Total	2,140	2,892	3,676
Shelterwood			
Seed Cut	543	197	111
Overstory Removal	53	53	53
Total	596	250	164

Clearcut			
Aspen	**737**	**1,381**	**398**
Conifer	**0**	**26**	**26**
Total	**737**	**1,407**	**424**
Grand Total	**5,414**	**6,176**	**4,880**

Under Alternative 2, approximately 646 acres of aspen would be converted to other species, through a variety of techniques. Those include shelterwood, thinnings, and improvement harvesting with natural conversion to hardwoods or conifers, shelterwood harvesting with under planting to conifers, or straight under planting of conifers with no harvesting. A direct effect of the aspen conversions within the project area would be a decrease of aspen acres with an increase of acreage in other forest types. Table 4.1.1b displays, by alternative, the changes in the percentage of aspen as a component on the landscape and the remaining aspen acreage within the Goal Areas following any conversions within the project area.

If Alternative 2 were implemented, Alternative Management Area (AMA) prescriptions would be applied to stands roughly corresponding to the area north of Forest Road 184 (see Appendix A). The AMA prescriptions would be applied to approximately 998 acres of northern hardwood stands. These prescriptions differ from standard prescriptions and are listed in Appendix C1 under Mitigation Measures T1.

As a result of these practices there would be a continuous canopy of interior forest habitat. This would benefit Neotropical birds and other wildlife. Species diversity of the overstory would be increased. Timber volumes of about 850 cubic feet per acre would be harvested at 15-year intervals. The residual stand would be fully stocked. Logging would be conducted during winter months to minimize soil disturbance. The small canopy gaps created by the removal of mature trees would allow natural regeneration to become established (Management Options for Northern Hardwoods, Project Paper for Silviculturist Certification, Jerry VanCleve).

Photo 4.2.3a Hardwood thinnings remove selected trees to achieve a variety of goals.

The practice of hardwood thinnings, improvement cutting, and selection harvesting were considered together as selection cutting to evaluate the effects to wildlife species. Alternatives 2, 3, and 4 (also referred to as the action alternatives) will be discussed together under this section since effects do not vary substantially between them. The acreage affected varies by approximately 10% between Alternatives 2 and 3, but there are few site-specific differences. One main difference between Alternative 4 and the other alternatives is the use of improvement harvest for 966 acres (compared to 56 acres in Alternative 3 and none in Alternative 2). Improvement cutting is a type of selective harvest with the goal of promoting uneven-age conditions. It was proposed in Alternative 4 as a way of further reducing the eventual regeneration harvest that could result from even-age management. For this project analysis however, the effects of improvement cutting as opposed to other selection cutting would be essentially the same.

One of the factors included in the larger issue of vegetation composition is the effect on biodiversity due to the management of large hardwood blocks. This is strongly correlated with the level of clearcutting and other early successional management, which is covered in the following sections of the effects analysis: Section 4.2.1 and Section 4.2.4. A detailed description of effects on animal populations from hardwood selection cutting can be found in the

specialist report.

Direct effects of selection cutting are reduced compared to clearcutting or other even-age management, since only a portion of the trees would be removed from a stand. Indirect effects are also greatly reduced compared to clearcutting, since a partial tree canopy is maintained, along with a distribution of various tree sizes. Since there is less change in vegetation structure resulting from the activity, there is less change in wildlife communities compared to clearcut areas. In terms of bird communities, harvested stands typically retain much of the mature forest bird community, in addition to providing habitat for those using the shrub/sapling layer (Thompson et al. 1995).

If Alternative 2 were implemented, there could be a loss of some structural complexity from selection cutting, due to a loss of at least some poorer quality trees, including cavity trees and potential snags. However there can also be improvements in some aspects of structural diversity, primarily from the creation of gaps, and the establishment of a more diverse shrub layer. Several studies are cited in the specialist report, documenting the improvements in bird species diversity in stands with these structural features. A study by Goodburn and Lorimer (1997) is cited, that found "even-age forests are often notable for the concentration of foliage in the main canopy layer and lack of vertical stratification, a trait that can depress biological diversity".

Table 4.2.3b: Landscape pattern analysis by alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Total acres interior habitat	10,272	9,817	9,157	10,047
Avg. interior block size	63.4	59.5	54.2	61.6
Total miles of edge	456.6	455.5	463.4	455.3

One of the main effects of implementation of all three action alternatives would be an increase in the amount of early successional patches, resulting in increased amount of edge within portions of the project area (see Table 4.2.3b) and maps in Appendix A), although a GIS analysis indicates the project area total would increase for Alternative 3 only. Alternatives 2 and 4 would concentrate the proposed clearcuts within the southern 1/3 of the project area. Alternative 2 would involve more acreage of clearcutting than Alternative 4, and would result in some reduction in area of interior habitat due to the placement of some of the harvest areas. Alternative 4, in addition to involving the least amount of clearcutting, would avoid placement of clearcut units within larger areas of contiguous hardwood blocks, and therefore would not result in a substantial decrease of interior habitat compared to Alternative 1. Alternative 3 would have the greatest effect on the existing pattern, since it involves the greatest acreage of clearcutting. In addition, this alternative would include the placement of harvest units throughout a greater portion of the project area, including the area north of FR 184 that is currently dominated by relatively continuous hardwoods. None of the action alternatives would result in harvest activities within the Iron River IPWA, therefore there would be no project-related changes to landscape pattern within that area.

Photo 4.2.3b Shelterwood cuts create open stands that are conducive to establishment of young trees.

Most of the proposed clearcuts in the action alternatives would be of fairly similar size, ranging from approximately 5 acres to 40 acres. There would be several exceptions in Alternatives 2 and 4 however, with several larger clearcuts being proposed, to reduce edge and to produce slightly larger areas of contiguous habitat. Alternatives 2 and 4 propose a 60 acre and 95 acre clearcut; Alternative 4 also proposes a 47 acre and 60 acre clearcut.

The various types of hardwood partial removal harvest proposed in these alternatives would not have substantial short-term effects on landscape pattern. The harvest would

involve small regularly spaced canopy gaps, which would grow back into a closed canopy within a fairly short period of time. Components of long-lived upland conifer within the hardwood stands would be essentially unaltered, since these types are generally reserved from cutting. There would be some long-term differences between the alternatives however, since both Alternatives 2 and 3 propose much more even-age hardwood management than Alternative 4. The short-term effects of even-age thinning are similar to uneven-age selection and improvement cutting, however eventually an even-age management would involve a regeneration cut, which would create patches of young forest on the landscape, together with associated edge. The long-term management and regeneration of these stands will not be determined by this project analysis and decision however.

The majority of the conifer planting proposed under these alternatives would be under planting of long-lived conifers (primarily white pine), aimed at restoring some of the conifer component lost due to cutting and burning around the turn of the century. This under planting would help provide more within-stand conifer, as well as management for conifers in wetland transition areas. There would be approximately 26 additional acres of red pine planted following a jack pine clearcut under Alternatives 3 and 4. The stand that would be replaced by plantation red pine also has plantation-origins rather than a natural-origin stand. See the table 4.2.3b, for comparisons of interior habitat acres, average interior block size, and total miles of edge, byalternative.

Alternative 3

If Alternative 3 were selected, approximately 1,244 acres of northern hardwoods would be treated through even-aged methods and 2,892 acres of northern hardwoods would be treated through uneven-aged methods (see Table 4.1.2a). The effects of conducting the proposed management activities for hardwood management would be the same as described in Section 4.2.3.2, Alternative 2

Under Alternative 3, no treatment of northern hardwoods within the AMA would occur.

The effects to wildlife species were discussed in Section 4.2.3.2. A more detailed discussion of effects to wildlife can be found in the specialists report.

Under Alternative 3, approximately 437 acres of aspen would be converted to other species, through shelterwood, thinnings, and improvement harvesting with natural conversion to hardwoods or conifers, shelterwood harvesting with under planting to conifers, or straight under planting of conifers with no harvesting. The effects of converting these aspen acres would be the same as those described in Section 4.2.3.2.

Alternative 4

If Alternative 4 were selected, approximately 321 acres of hardwood would be harvested through even-aged treatment methods, and approximately 3,676 acres of hardwoods would be treated through uneven-aged treatment methods (see Table 4.1.2a). The effects of conducting the proposed management activities for hardwood management would be the same as described in Section 4.2.3.2, Alternative 2.

Alternative 4 would apply the same type of management prescriptions listed in Appendix C1 under mitigation measures T7, in the Alternative Management Area (AMA). The AMA prescriptions would be applied to approximately 1,213 acres northern hardwood stands. The effects of this type of hardwood management would be the same as described in Section 4.2.3.2.

The effects to wildlife species were discussed in Section 4.2.3.2. A more detailed discussion of effects to wildlife can be found in the specialists report.

Under Alternative 4, approximately 540 acres of aspen would be converted to other species, through shelterwood, thinnings, and improvement harvesting with natural conversion to hardwoods or conifers, shelterwood harvesting with under planting to conifers, or straight under planting of conifers with no harvesting. The effects of converting these aspen acres would be the same as those described in Section 4.2.3.2.

Cumulative Effects

All Alternatives

The contemporary landscape pattern would be a result of the interaction between natural and human forces (Dunn and Stearns, 1993). As mentioned previously, natural forces continue to affect the project area. At the same time, there

have been numerous management activities similar to those proposed in the recent past, and would likely continue to be similar activities in the future, although the overall balance is difficult to predict. The cumulative effects of these activities, combined with the proposed project activities, would continue to have a substantial effect on the landscape pattern within the project area. Management of vegetation would likely result in a higher percentage of early successional species, a higher percentage of young-age forest, less structural diversity, and a less complex landscape pattern than that found during pre-settlement.

There is some potential for change in the current trend. In addition to the proposed aspen clearcutting, there are some aspen stands in all alternatives that would be actively or passively converted to longer-lived species. This would gradually reduce the amount of early-successional management in the project area, and could therefore gradually reduce the amount of edge and overall patchiness. There are some portions of the project area that currently have fairly continuous close-canopy hardwood conditions. The most notable is the area of hardwoods north of FR 184, where recent management has purposely encouraged this condition. With the exception of Alternative 3, all alternatives would maintain this condition. This large area of hardwood management would be complemented, at least in the short term, by the Iron River IPWA to the south, and by a large area of corporate lands to the north that are managed primarily for hardwoods. All alternatives propose activities that would help to restore some aspects of landscape pattern that have been lost, including increasing long-lived conifer types, and providing for some representation of old-growth communities (a designated Ecological Reference Area (ERA), is included within the project area and would be protected from management activities until a decision is reached about a permanent designation).

4.2.4 Predicted Effects of Fragmentation (Issue 4)

Alternative 1: No Action

If Alternative 1 were selected, there would be no direct effects from this alternative on fragmentation, since no project-related activity would occur. There could be indirect effects from reduction of existing edge, combined with the lack of new edge. Existing edge effects (from recent clearcuts) would be gradually reduced as the stands matured, and the edges with adjacent stands became less distinct, although at least one study indicated that edge effects on forest songbird assemblages may persist up to 35-40 years after an aspen stand is clearcut, or at least until the aspen is 14m tall (Mason, 1992). There could also be a gradual reduction in edge created by upland openings, since some of the openings would continue to revert to forest or shrub cover if there was no maintenance.

Alternative 2

If Alternative 2 were selected proposed timber management activities that were described in Section 4.2.1.2 would be implemented. The effects of managing for 1-20 year aspen would be the same as disclosed under Section 4.2.1.2.

The wildlife specialist report provides detail on the dynamics of fragmentation that can affect wildlife populations, and Neotropical migratory birds (NTMB's) in particular, including brood parasitism and increased predation. These processes can result in both loss of adults and loss of nestlings or decreased nest productivity. Studies are cited that describe effects of parasitism and predation on bird populations. Parasitism appears to be less of a concern in the extensively forested Chequamegon-Nicolet National Forest, with both low incidences of cowbirds and low parasitism rates being reported. Predation is likely a more important effect, with several studies cited that show greater predation rates and lower nest success close to clearcut edges. Ground nesting birds appear to be the most vulnerable.

Most clearcut units proposed in Alternative 2 are 40 acres in size or smaller, in concert with Forest Service direction. There can be exceptions to this restriction however, by Regional Forester approval, to meet specific management goals. Alternative 2 proposes two blocks of aspen harvest larger than 40 acres: Compartment 157, stands 7 and 8 (60 acres total); and Compartment 158, stand 1, and Compartment 161, stand 14 (95 acres total). These two larger blocks of aspen would be harvested as single units rather than being broken into smaller units, to meet two goals. First, overall habitat fragmentation would be reduced in the local area, since the amount of edge produced by one large unit is less than that produced by several smaller units. In addition, these larger units would also help represent a greater variation in overall patch size on the landscape, which would be closer to the situation caused by natural disturbance patterns. Both of these concerns would address recommendations of the Scientific Roundtable on Biological Diversity (Crow et al., 1994).

Alternatives 2-4 would involve varying levels of upland opening maintenance, however all of these alternatives would also involve the gradual conversion of some existing openings. Alternative 3 proposes the construction of 16 acres of

small upland openings, together with the highest level of maintenance. Even in this alternative however, the long-term result would be fewer acres of upland openings on the landscape, eventually reducing edge.

Alternative 3

Alternative 3 proposes the greatest amount of clearcutting and opening maintenance, as well as some opening construction, and would therefore create the greatest degree of fragmentation within the project area. There are some areas of relatively continuous northern hardwood that would be affected by harvest of aspen stands, due to the emphasis on aspen in this alternative. There would also be some large areas of lowland conifer fragmented by the clearcutting of aspen "islands".

Another specific difference in the design of this alternative is that there would be no areas of aspen managed in larger blocks; there would be no clearcutting of any units larger than 40 acres. In terms of the project area as a whole, there would be fairly minor changes in total edge produced as a result of this change, but there would be local differences by splitting aspen blocks into smaller clearcut units.

Alternative 4

Alternative 4 proposes the least amount of clearcutting. The objective of the alternative is to more closely follow new information concerning sustainable ecosystem management, using sources such as the Scientific Roundtable on Bidiversity Report, public comment, and information used in the Forest Plan revision effort. The alternative reduces fragmentation and habitat patchiness compared to Alternatives 2 and 3 by reducing aspen clearcutting, particularly within or near large hardwood blocks, or where adjacent to large wetland areas.

This alternative would manage two additional large blocks of aspen (over 40 acres) through clearcutting, one in Compartment 161 involving 47 acres, and one in Compartment 127 involving 60 acres. Effects and reasoning concerning large block management were discussed earlier under Effects of Alternative 2.

Cumulative Effects (All Alternatives)

Past activities in and near the project area have resulted in a relatively high level of heterogeneity (variety) in forest types and ages in the southern portion of the project area, resulting in temporary fragmentation and edge effects. The northern portion of the project area has been managed with more emphasis on northern hardwoods, resulting in fewer areas of young forest types, and less temporary fragmentation. There have been relatively few areas of permanent edge created within the project area (edge caused by long-term maintenance of open areas, such as roads or upland openings).

Proposed project area activities would maintain these conditions to a certain degree, and could even increase fragmentation and edge in the short term. Analysis using GIS has shown that all alternatives would result in a slight increase in edge, and a slight decrease in interior habitat compared to the no action alternative. This would be primarily due to proposed clearcutting of aspen and aspen/fir stands. Over the long term however, assuming similar management occurred, there could be a gradual reduction in edge and fragmentation. Edge within the project area, and within the Forest as a whole, is created by features such as early successional management, roads, upland openings, private in-holdings, and open wetlands. Only the first three features are within Forest Service control; open areas in private ownership, and open wetland types, can be assumed to stay fairly constant. If current trends continue in the project area over the long term, particularly within the northern portion, there would be fewer areas of aspen management, lower road densities, and fewer upland openings, resulting in less edge and fragmentation. Alternative 3 produces more temporary edge than the other alternatives, however even Alternative 3 involves reductions in road densities and upland openings, and gradual conversion of some aspen stands.

Studies are cited in the wildlife specialist report that show the potential for effects from fragmentation and associated concerns even in extensively forested areas such as northern Wisconsin. Studies are less clear however on whether these effects are actually causing reduced populations or productivity. Results from various bird surveys are described, including both the Nicolet and Chequamegon Breeding Bird Surveys. Analyses of population trends show both significant increases and decreases for various species, but with no common patterns of habitat associations shown for the declining species. Habitats of declining species include hardwood forest, conifer forest, and both mature and regenerating forest.

A study by Robinson et al. (1995) analyzed fragmentation at a regional scale, comparing predation and parasitism rates in areas with varying percentages of forest cover. Both nest predation and cowbird parasitism declined with increasing levels of forest cover, even though local effects could still be detected. From a regional perspective, they felt that the extensive forests of northern Wisconsin, the Missouri Ozarks, and south-central Indiana could provide a surplus of birds to maintain populations in more fragmented forest areas.

In summary, project area activities will continue to create and maintain some edge and fragmentation. In the long term however there is the potential for reduction of fragmentation within the project area. Studies show continued concern for effects of fragmentation, however results do not show clear connections between temporary fragmentation in heavily forested areas and consistent declines in wildlife species.

Table 4.2.4.3a: Comparison of interior habitat by forest type for each alternative (mature forest stands only)

Forest type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Aspen/birch/balsam fir	2141	1887	1603	1988
Northern/swamp hardwood	5301	5209	4933	5259
Jack pine	11	11	11	11
Red pine	45	44	44	45
White spruce	94	93	93	93
Lowland conifer	2296	2228	2168	2273
Other	139	139	122	122
Total Acres	**10028**	**9613**	**8977**	**9795**

Note: In performing the GIS analysis to determine edge and areas of interior habitat, the following features were considered to create edge, and therefore to produce edge effects:

- All sapling and poorly stocked pole size stands (size/density class 0,1,2,3,4)
- All non-forest vegetation types: type 97 (lowland shrub), type 99 (upland open)
- All traffic service level roads A, B, and C
- All adjacent privately owned parcels, regardless of current forest cover

In order to determine areas of interior habitat, all edge producing types were buffered by 100 meters; the areas remaining were considered to be interior habitat.

4.2.5 Predicted Effects on Roads (Issue 5)

Alternative 1: No Action

If Alternative 1 were selected, the existing roads within the Cayuga Project Area would be maintained in their present condition. The total road mileage for the project area would remain at approximately 141 miles of system and non-system roads. This results in an average road density of 2.8miles/sq. mile.

The Forest Plan direction for Management Area 1.1 prescribes a density of open system roads at a maximum level of 3.6 miles of road per square mile. There are currently 2.2 miles of open system road per square mile within the Management Area 1.1 portion of the project area.

The Forest Plan direction for Management Area 2.2 prescribes a maximum density of 2.0 miles of open system road per square mile. Under Alternative 1, there would be 1.8 miles of open system road per square mile. The density of open system roads within the project area is within the levels described in the Forest Plan desired future condition.

Under this alternative there would be no new temporary road construction. Road maintenance would occur primarily on traffic service level (TSL) C and higher roads to maintain the existing condition. Some low standard roads (below TSL C) would experience minor additional rutting and pothole development through continued public use. This would make it more difficult for passenger cars to drive on them and may increase opportunities for people who desire to drive 4-wheel drive vehicles on roads in a lower standard condition.

The types of activities discussed in the wildlife specialist report relative to access management include: construction of new temporary roads; maintenance of existing roads; decommissioning of existing roads that are no longer needed or desired; relocation of Snowmobile Trail 8; and watershed restoration activities.

The opportunities identified for closures and decommissioning of system and non-system roads in the Roads Analysis would not be implemented under Alternative 1. Maintenance of existing road closure devices (i.e. berms, gates, rocks, etc.) would continue. There could be some routine maintenance of existing roads through grading and spot graveling. The level of public motorized access would remain the same.

The closure of the spur road off of Forest Road 1333 that provides access into the McCarthy Lake and Cedars Research Natural Area (RNA) would not occur. All terrain vehicles (ATV's) and four-wheel drive vehicles could potentially access the interior of the RNA and create user-developed trails.

If Alternative 1 were implemented, there would be no project related activity in terms of access management.

Alternative 2

If Alternative 2 were implemented, the amount of temporary road construction and maintenance of existing roads maintenance would primarily be related to the level of timber harvest proposed (see Table 4.2.3a). This alternative would involve 12.6 miles of temporary road construction and 22.8 miles of road maintenance. Alternative 2 includes the decommissioning of 6.5 miles of road no longer needed on the landscape.

The wildlife specialist report (project file) describes various effects of road construction, involving both direct disturbance and indirect effects from factors such as fragmentation and increased human access. The effects of road construction as proposed in the project area are reduced however, since only low-standard, temporary roads are proposed for construction in Alternative 2. These roads would be decommissioned following timber sale needs.

If Alternative 2 were implemented, a minor portion of the road maintenance activities would result in similar effects as road construction when a corridor previously grown over and not driveable becomes a road usable by at least a four-wheel drive vehicle. Generally roads that were not previously being used by the public would be closed following maintenance, to prevent an increase in public vehicle use. In addition to protecting wildlife populations, this would protect the investment in the road maintenance.

The addition of new temporary road corridors, and the improvement of others, would be offset somewhat by the decommissioning of other existing roads that are no longer considered necessary for project area management. The act of decommissioning a road would involve more than just placing a berm or other closure at the entrance to the road. It would involve activities such as restoring contours, removing culverts, and replanting vegetation over sections of the road corridor. As a result, there could be some short-term impacts from ground disturbance and equipment use, but the long-term result would be the removal of both the public use and the physical corridor from the landscape, and an overall reduction in road densities in the project area.

A Biological Evaluation has been completed to assess project impacts on species listed as sensitive; a Biological Assessment will be completed at the time of the Final EIS to assess project impacts on federally listed species. Both of these documents consider potential effects from access management, as well as effects from other project activities. These analysis documented potential effects on the following species summarized here with proposed mitigation measures pertaining to access:

- Gray wolf (federally endangered)
- Northern goshawk (Regional Forester Sensitive Species)
- Spruce grouse (Regional Forester Sensitive Species)
- Calypso orchid, Ram's head lady's-slipper, White adder's mouth (Regional Forester Sensitive Species); considered together as "lowland conifer plant species".

The current Wisconsin Wolf Management Plan (1999) lists Access Management as one of the wolf management strategies, under Habitat Management (Wolf Management Plan, pp. 22). Studies are cited that suggest wolves exist primarily in areas with less than, or up to, one mile of open improved road per square mile of land area, although the expanding wolf population in recent years indicates tolerance for higher densities ("improved road" in this case is similar to Forest Service traffic service level A, B, and C level roads). Currently the density of this type of road in the Cayuga

project area is 1.14 miles per square mile.

Currently the project area is heavily used by two separate wolf packs that have exhibited stable populations. No additional "improved" roads are proposed for construction, although there are project area proposals for temporary road construction. All temporary roads would be decommissioned at the conclusion of activities for which they are authorized. In addition, the proposal to decommission a number of roads would result in a long-term decrease in overall road densities within the project area. Therefore, access management within the project area is predicted to have no adverse long-term effects on the wolf.

There is one known active goshawk territory within the project area at this time. The project proposal includes road maintenance on an existing poor quality road (currently usable only by ATV's) that is in the immediate vicinity of the nest. Mitigation measures in Appendix C would ensure no adverse impacts to nesting goshawk would occur.

There are several known locations of spruce grouse in the project area from recent years. One of the factors affecting spruce grouse populations is incidental hunting mortality. Any expansion of road networks can increase accidental shooting by increasing public hunting use of an area. Proposed temporary road construction could have short-term impacts if there was increased public use and hunting. All temporary roads would be decommissioned following use for timber harvest. In addition, decommissioning of some project area roads would gradually reduce the road density and public vehicle access within the project area.

Potential habitat exists for a number of Regional and Forest listed plant species within cool, shaded swamp conifer stands in the project area. These areas of potential habitat could be affected primarily through the construction of temporary roads to access timber harvest areas. Effects would result from direct disturbance from vegetation removal, ground disturbance, and possibly from increased deer herbivory. Recommended mitigation is to survey all proposed temporary road locations that would pass through potential habitat, prior to any disturbance. If any listed plant species are found, road location and/or design should be modified to protect the plant sites.

More information on effects of access and road density can also be found in the Biological Evaluation in Appendix D.

If Alternative 2 were implemented, no detrimental erosion or sedimentation would be expected to occur from temporary road construction and maintenance on the project sites due to existing site conditions and the implementation of mitigating measures (see Appendix C).

Alternative 3

Alternative 3 would require the most temporary road construction in lowland sites. The predicted effects of alternative 3 are similar to those described under Alternative 2 (see Section 4.3.5.2), however specific quantities of construction, maintenance, and decommissioning vary by alternative. This alternative would involve 16.3 miles of temporary road construction and 23.3 miles of road maintenance. Alternative 3 includes the decommissioning of 5.7 miles of road no longer needed on the landscape.

Alternative 4

The predicted effects of Alternative 4 are similar to those described under Alternative 2 (see Section 4.3.5.2.), however specific quantities of construction, maintenance, and decommissioning vary by alternative. This alternative would involve 10.5 miles of temporary road construction and 19.7 miles of road maintenance. Alternative 4 includes the decommissioning of 11.4 miles of road no longer needed on the landscape.

Cumulative Effects

All Alternatives

The proposed access management activities, when combined with other past, present, and future activities, would result in a gradual reduction of road densities in the project area, and approximately the same density of motorized trails. Road densities would increase for short time periods, as temporary roads are constructed for sale activity, but they would be decommissioned after use. It is not likely that there would be any other need for permanent road construction for other activities in the foreseeable future, with the exception of special use permits to access private land. The implementation of road decommissioning would therefore gradually decrease the amount of road corridors, and the amount of public motor vehicle use. This could have the effect of decreasing impacts on wildlife populations sensitive to human disturbance, as described in the direct and indirect effects analysis.

4.2.6 Predicted Effects on Water Quality (Issue 6)

Summary

Five types of resources were identified as having the potential to be impacted by Cayuga alternative actions from a water quality standpoint. They include lakes, streams, riparian areas, floodplains, and wetlands.

No detrimental erosion or sedimentation would be expected to occur from stand treatment, temporary road construction, culvert replacements, stream habitat improvement, trail relocation, or parking area construction, because of the location of the projects, project design features, and mitigation measures identified. The majority of the activities proposed are not near enough to water resources identified above, to pose a threat to water quality. Treatments in all alternatives that are in the vicinity of streams, lakes, riparian areas, wetlands, or floodplains would be designed and conducted in ways that are sensitive to fish habitat, stream and lake quality, and would follow Best Management Practices for water and wetland quality, as well as Forest Plan standards and guidelines for wildlife, fish, soil and water resources.

Introduction

The water quality of lakes and streams could be negatively affected as a result of forest management activities if sedimentation were to occur.

Erosion is the process by which soil particles are detached and transported. Erosion resulting from natural causes is referred to as geologic erosion, while that caused by human activities is commonly known as accelerated erosion (Hewlett and Nutter 1969). Erosion can be caused from water, wind, and gravity. In Wisconsin, water is the most common erosive agent, particularly in forested areas. When eroded material is transported and then deposited by water or wind, it is referred to as sediment and the process as sedimentation. Sediment yield is the amount of sediment transported from an area, usually from a watershed via a stream.

Accelerated erosion and sediment yield from timber harvest areas are typically minimal because good ground cover is maintained by residual vegetation and logging slash and because areas where soil is exposed tend to rapidly re-vegetate. Exceptions to this general rule include roads, skid trails, landings, and recreational trails (Hewlett and Nutter 1969).

Sediment yields in Wisconsin range from a high of 100-500 tons/sq mi/yr to a low of less than 10 tons/sq mi/yr (Hindall 1976; Hindall 1972; Hindall and Flint 1970). The highest sediment yields occur in the hilly terrain with mixed forest and agriculture in the southwestern part of the state and the red clay region near Lake Superior. The lowest yields occur in the forested areas of northern Wisconsin including the Chequamegon-Nicolet NF. These low yields occur for three reasons. First, erosion and sediment yield from timber harvest areas is usually low because ground cover is often provided by residual vegetation, logging slash and rapid re-growth of vegetation (Verry 1972; Spangenberg and McLennan 1983). Second, timber harvest and other forest management activities typically only impact a small portion of the area in any given year. For example, on the Chequamegon-Nicolet NF, timber harvest has occurred on 1.6 percent of the land each year over the last decade (U.S.D.A. Forest Service 1998). Third, even when erosion does occur, it frequently is not delivered to streams because of the low relief and undulating terrain (Verry 1972).

Sediment is recognized as the most important water pollutant in the United States in terms of total quantity (Oschwald 1972; Ritchie 1972), miles of stream affected (US EPA 1990), and adverse effects on aquatic communities (Judy et. al. 1984). Surface erosion from roads can introduce fine sediment to streams. Fine sediment is a particular water quality problem in streams because it can reduce: (1) available habitat by filling pools; (2) survival of fish eggs and fry; and (3) survival, composition and abundance of aquatic invertebrates (Waters 1995; Cordone and Kelly 1961). Sedimentation can also affect channel morphology by increasing width/depth ratio and reducing sinuosity (Rosgen 1994). Sand sediments in particular are associated with increased width and reduced depth (Heede 1980).

Section 208 of the 1977 Clean Water Act required states to develop plans and procedures to control non-point sources of pollution, including silvicultural sources, to the extent feasible. Additionally, Section 319 of the 1987 Clean Water Act requires each state to develop and implement a program to reduce non-point source pollution to the “maximum extent practicable.” The act requires that best management practices (BMPs) be used to control non-point sources of water pollution.

Most Forest Service policy regarding water quality is contained in Forest Service Manuals 2532 (Water Quality Management) and 2522 (Watershed Improvement). The primary objective for water quality management is to protect, and where necessary, improve the quality of the water resource consistent with the purposes of the National Forests

and national water quality goals. The policy includes promoting and applying approved Best Management Practices to all management activities as the method for control of non-point sources of water pollution and for compliance with state and national water quality goals; establishing goals and objectives for managing the quality of the water resource in land and resource management plans; and producing water of a quality suitable for the beneficial uses identified in the land and resources management planning process. Forest Service policy also calls for restoring degraded watershed conditions; improving soil and water quality; and implementing watershed improvement projects when feasible.

The current Land and Resource Management Plans for the Chequamegon-Nicolet National Forest, 1986, include standards and guidelines that are intended to serve as best management practices for the protection of water quality in compliance with the Clean Water Act. During the mid-1990s, the Forests also participated in the development of "Wisconsin's Forestry Best Management Practices for Water Quality" (WDNR 1995) and support their use to minimize sediment and other non-point sources of water pollutants. The use and effectiveness of Best Management Practices (BMP's) for Water Quality were monitored by interdisciplinary and interagency teams across all land ownerships in Wisconsin, including the National Forest, during the years of 1995, 1996, 1997, and 2002. The field evaluations for monitoring conducted from 1995 to 1997, indicated that ninety-nine percent of the time no adverse impact to water quality occurred when a BMP was applied correctly where needed. They also indicated that the one percent of time that there was an impact, it was minor (WDNR PUB-FR-145-99). The sales on the Great Divide Ranger District that were monitored were found to have followed BMPs and had no adverse effect on water quality.

This water resource effects analysis utilized all available Aquatic Ecological Classification and Inventory, water resource inventory information, current research, and professional judgment of resource specialists. The effects of the alternatives proposed for this project area were assessed on a site-specific basis and mitigation measures were recommended to ensure the quality of the water resources within and adjacent to the analysis area are maintained. Additionally, many stands were deferred early in the analysis due to a variety of reasons, one of which related to their location relative to various water resources. In many cases, stand boundaries were adjusted to exclude wetlands, streams, lakes, and ponds from the treatment area. Many stands were deferred because access would involve complicated wetland or stream crossings. Each stand has been looked at closely on the ground. Lakes, streams, ponds, riparian areas, and wetlands within and adjacent to proposed treatment areas have been identified.

Treatment areas with boundaries within 200 feet of the water resources listed above were considered in this analysis. The water resources within the project area were also looked at from a watershed scale to assess potential cumulative effects. Portions of three 5th level watersheds encompass the Cayuga project area and were described in section 3.3.6. The potential for short and long-term effects was also addressed. Long-term effects are those expected to last longer than 1 year after treatment or mitigation is completed, while those expected to last less than 1 year were considered short-term. Boundary distances and long verses short term effects criteria were chosen to be consistent with the criteria used for the on-going Wisconsin's Forestry BMP's for Water Quality Monitoring program.

Alternative 1: No Action

If Alternative 1 were implemented, the stream sedimentation that is currently occurring from road surface run-off, ditch erosion, or frequent culvert washouts would continue to occur. A direct effect of not implementing the proposed road/stream crossing, stream restoration, or road improvement projects could be an addition of approximately 123 tons of sediment per year into McCarthy Creek, Brush Creek, and un-named tributaries within the project area. Barriers to fish passage would also continue to occur in the tributary to Clam Lake and in Brush Creek.

Since none of the proposed water quality improvement projects would be implemented, there would not be any direct benefits to wildlife species. Sedimentation degrades habitat for wetland and aquatic species, including fish species, insect larvae, and frog and salamander species. In the case of the crossings of Brush Creek and a Brush Creek tributary, the brook trout, a Management Indicator Species (MIS), could be directly affected. Without these projects, there could be long-term effects on brook trout and other cold-water fish species.

If Alternative 1 were selected, the conversion of up to 35 acres of aspen along McCarthy and Brush Creeks would not be implemented. Habitat along these streams would remain favorable for beaver and increase the potential for flooding. As a direct effect the flooding could destroy riparian vegetation in these areas and deposit sediment. Removal of fine debris and alder along McCarthy Creek to reduce sedimentation deposition and stabilize the streambanks would not occur. There could be some gradual improvements in habitat under Alternative 1 due to natural changes, however the low gradient of the stream, together with the existing sediment load and heavy alder growth, would limit recovery.

Alternative 2

If Alternative 2 were implemented, the stream sedimentation that is currently occurring from road surface run-off, ditch erosion, or frequent culvert washouts would be corrected by the proposed water quality improvement projects. Seven culvert replacements and road reconstruction projects would be implemented. An estimated 62.25 tons would be deposited if the culverts located within an unnamed tributary to the Bad River and Forest Road 355 failed. An additional 46.73 tons are estimated to come from the imminent failure of culverts where Brush Creek is crossed by Forest Road 354. A direct effect of implementing these seven projects could be a reduction of stream sediment by an estimated 123 tons per year.

There would be potential for some direct effects from the proposed restoration activities under this alternative. The removal of old culverts involves disturbance directly in stream channels. In addition, any project that involves ground disturbance near wetlands or water bodies can potentially result in short-term erosion and sedimentation from the exposed earth. Mitigation measures W1-19 address culvert replacements (see Appendix C). Depending on site and weather conditions at the time of project work, some short-term erosion or sedimentation due to project activities could still occur. This could have temporary impacts on aquatic species within the immediate area, including amphibians, insects, and forage and game fish. The long-term effects of such projects would be an improvement in water quality due to reduction of erosion and reduced chances for culvert failure. Since the projects would occur on previously disturbed sites (roadsides) there would not be noticeable effects on terrestrial wildlife species. A direct effect of replacing these culverts would be the elimination of two fish passage barriers. The existing stream fragmentation of the unnamed tributary to Clam Lake and Brush Creek would be eliminated.

Riparian areas (the transition zones between lakes or streams and uplands) and coarse woody debris inputs would not be negatively impacted by harvest activities with the application and adherence to specified mitigation measures (see Appendix C). The application of a shelterwood cut and an even-aged thinning along 0.5 miles of McCarthy Creek would improve riparian area conditions. To ensure adequate shading of the streams, at least 60 basal area would be required to be left within 100 feet of the high water mark of lakes and perennial streams, and within 35 feet of navigable intermittent streams. Therefore, there would be no increase in water temperatures as a result of the proposed treatments.

If Alternative 2 were implemented conversion of 35 acres of aspen within the stream corridors of McCarthy and Brush Creeks to address beaver problems would occur. These streams are Class II, cold-water streams that support trout and other cold-water aquatic species. An indirect effect of converting the aspen would be a lower potential for sedimentation and increased water temperature problems due to beaver activity.

No long-term detrimental water quality effects are expected to occur from sedimentation, coarse woody debris removal, water temperature increases, or lateral sub-surface flow in wetlands due to the nature of the project locations and the application of mitigation measures.

If Alternatives 2 were implemented the proposed aquatic habitat improvement activities on up to 1.5 miles of McCarthy Creek would occur. The removal of fine debris and placement of brush bundles along 1,000 feet of McCarthy Creek would improve streamflow, reduce accumulations of sediment deposits, scour deeper pools and expose gravel bottom in some areas. Use of brush bundles would also help to restore the stream channel, with higher sinuosity, narrower width, and deeper pools. The removal of some streamside alder would also help stabilize the streambanks and promote sod growth.

There could be some short-term effects on trout and other fish species due to siltation, since much of the work would require travel and working in the stream. This type of siltation readily disperses however and does not have any long-term consequences. There could also be some temporary effects simply from the disturbance of people working in the stream and riparian areas, affecting both fish and shrub dwelling wildlife species such as the common yellowthroat.

Long-term indirect effects of the project work would include improved habitat for brook trout, due to increased holding and cover pools, increased overhead cover (from overhanging banks and woody structures), more stable stream temperatures, and more potential spawning areas.

The stands proposed for treatment under Alternative 2 primarily occur on nearly level to gently rolling topography. Treatments proposed in this alternative that are adjacent to streams, lakes, riparian areas, wetlands, or floodplains, would be conducted in ways that are sensitive to fish habitat, stream and lake quality, and follow “Best Management Practices (BMP’s) For Water and Wetland Quality” (Wisconsin Department of Natural Resources, 1995), as well as Forest Plan

standards and guidelines for wildlife, fish, soil and water resources (Chequamegon Land and Resource Management Plan, pp. IV-66-87) (see Appendix C). The soils analysis (section 4.2.8) determined that there would be a very low potential for soil erosion to occur. There would be an even lower potential for sedimentation to occur because the areas adjacent to water bodies are not disturbed, preventing erosion from occurring, and therefore eliminating the potential for sedimentation. No temporary roads would be constructed over streams. The effects of temporary road construction and maintenance to existing Forest Service roads is discussed in the Roads (4.2.5) and Soils (4.2.8) sections.

Alternatives 3 and 4

If Alternative 3 or 4 were implemented the six sites proposed for road/stream crossing improvement and road reconstruction would occur, as would the road/stream crossing removal and floodplain restoration project. The predicted direct and indirect effects of these projects would be same as those described under Section 4.2.6.2.

The predicted direct and indirect effects to wildlife and fish habitat if alternative 3 were implemented would be the same as those described under Alternative 2 (see Section 4.3.6.2).

The effects of temporary road construction and maintenance to existing Forest Service roads is discussed in Sections 4.2.5 and 4.2.8.

Cumulative Effects

Streams or lakes with proposed treatments within 200 feet of the high water mark, in any of the alternatives, were considered in this cumulative effects analysis. Other ownerships, past activities, planned activities, and reasonably foreseeable activities occurring adjacent to these streams or lakes were identified. This information was used to analyze the potential for cumulative effects to occur as a result of Forest Service proposed activities.

Alternative 1

If Alternative 1 were implemented, the long-term water quality disturbance effects would continue to occur to the streams undergoing sedimentation. An estimated 122.62 tons of sediment per year could be deposited into streams if the culverts fail and road and ditch erosion were allowed to continue.

Alternatives 2, 3, & 4

The project sites are all on National Forest land. There are private, county, and state lands nearby the project sites. Past activities on all these lands have included timber harvest, road building, agriculture, and disturbances from fire, flood, drought, and windstorm events. Disturbance caused by these past practices and events has influenced the existing condition of the water resources. No appreciable long-term water quality disturbance effects have been identified on National Forest or privately owned land in the project area from past activities and events. Long-term effects are those predicted to last more than one year after project completion.

The cumulative effects of project activities, combined with other past, present, and future activities, would be a gradual improvement in watershed health and quality. Past and proposed watershed improvement activities would result in decreased sedimentation in project area streams, benefiting a wide variety of aquatic insect, fish, and amphibian species. Beaver control, combined with proposed stream improvement activities on McCarty Creek, would improve stream temperatures and habitat structure for brook trout and other cold-water fish species, and would result in more stable riparian areas. The lack of beaver control on other streams will still allow some beaver flooding and resulting wetland habitat maintenance.

There are no known reasonably foreseeable projects that may affect water quality within the project area.

Present actions proposed in Alternatives 2, 3, and 4 include activities associated with timber harvest, such as temporary road improvement and construction in order to maintain forest health. Watershed restoration projects are also proposed in each of the action alternatives to improve water quality. All project activities would be implemented with site-specific measures taken to mitigate potential adverse effects to the water resources (see Appendix C). No appreciable long-term water quality disturbance effects are predicted from implementation of projects in Alternatives 2-4.

4.2.7 Predicted Effects on Noxious weeds (Issue 7)

Alternative 1: No Action

If Alternative 1 were selected there would be a continued chance for the introduction and spread of noxious weeds within the project area due to factors beyond Forest Service control (i.e., introduction by Forest visitors, wildlife, wind dispersal, highway maintenance, etc.). Known populations of noxious weeds within the project area would continue to expand.

Alternatives 2 and 4

Activities associated with use of a biological control, timber management, upland wildlife opening maintenance and/or construction, road and/or recreational trail maintenance and/or construction, or other soil- disturbing activities in areas that would remain open could have a long-term effect on the noxious weeds currently found in the project area.

If Alternative 2 were implemented, use of flea beetles would not fully eliminate leafy spurge from the landscape, but they would help reduce it to a tolerable member of the plant community. This biological control was chosen as the preferred method for treatment of leafy spurge for several reasons. Leafy spurge has an extensive and deep root system (tap roots can reach 20 feet in depth) and un-removed roots will re-grow, making hand removal nearly impossible. Herbicides, although shown to be affective against this species in the western United States are not approved for use by the Forest Service in the Great Lakes States. Herbicides also only offer a short-term solution, needing to be reapplied on a frequent basis making them an expensive long-term choice. It is anticipated that biological control would be self-perpetuating over time if properly established.

Release of biological control agents should have a direct effect on reducing spurge density, patch size, and overall numbers. There is concern that the release of biological control agents could have an effect on the environment. The flea beetle proposed for use within the project area to control leafy spurge has been shown to be host-specific and there is no documented evidence showing it to have an effect on any other species. Based upon this information there would not be any effects to other native plants, agricultural crops or vegetation on private lands.

Under Alternative 2, management of 5,407 acres of forest using accepted silvicultural methods would occur. Timber management often includes varying degrees of ground disturbance and opening of the canopy that could provide suitable habitat for noxious weeds known from within the project area. Subsequent growth of trees and closure of the canopy would return managed stands to a state generally unfavorable for habitation by the noxious weeds currently found in the project area.

Equipment used for timber management would pose a threat as a potential vector of infestation by transporting seeds or rootstock material of non-native invasive plant species from one site to another. Temporary road construction or road maintenance associated with timber management that uses off-site fill could pose as a potential vector of infestation by transporting seeds or rootstock material of noxious weeds as well.

If Alternative 2 were selected, the aging jack pine would be removed from a stand of mixed pine within Day Lake Campground, which would result in a lower overall basal area. Timber management activities could create a canopy open enough to allow noxious weeds to become established. Both spotted knapweed and leafy spurge are known to occur in several nearby locations but not known specifically within the campground area.

Under Alternative 2, upland openings would be restored within the project area. Although there are no documented occurrences of noxious weeds in these openings, maintenance through mowing, burning, and or hand-cutting could cause ground disturbance creating favorable habitat for noxious weeds or introduce seeds resulting in infestation of wildlife openings.

Temporary road construction, existing road maintenance, road decommissioning, recreational trail construction, watershed restoration, which would include replacement of culverts and reshaping roads at stream crossings, construction of a parking area at a snowmobile trail head, and the relocation of .4 miles of snowmobile trail. Any ground disturbance and/or importation of fill material or gravel associated with these projects could result in the inadvertent establishment of noxious weeds. Application and enforcement of mitigation measures described in Appendix C would reduce the potential spread of exotic plant species.

Alternative 3

If Alternative 3 were selected, no biological controls would be utilized to control leafy spurge. This Alternative would have the same effects as described in Alternative 1, No Action.

Under Alternative 3, the other proposed management activities would be implemented. This would result in similar effects as described in Alternative 2.

Cumulative Effects

Alternative 1

If Alternative 1 were selected, the three patches of leafy spurge would continue to grow in size. It would continue to take over nearby native vegetation. There is a continued chance for introduction and spread of noxious weeds within the project area due to factors beyond Forest Service control (introduction by Forest visitors, wildlife, wind dispersal, highway maintenance, etc.).

All Alternatives

Almost any activity that involves disturbance of the vegetation and soil can increase the chance of non-native invasive plant establishment. There have been increased efforts in past years to identify and treat known locations, but complete elimination of non-native invasive species is unlikely. Because all of the noxious weeds plants currently known from the project area are associated with open canopy areas, there would be no long-term cumulative effects regarding vegetation management. Many of the other proposed activities could have long-term effects on invasive species because these activities often continue to leave the area in some state of disturbance. These activities include recreational trail and road construction and maintenance, culvert replacement, upland wildlife opening construction and maintenance, etc. Monitoring of these areas would provide for the early detection of invasive species.

Alternatives 2 and 4

It is expected that the flea beetles would take several years to fully establish themselves after release before having an impact on the leafy spurge populations. Since the flea beetles feed exclusively on leafy spurge, they should not become a pest in their own right. The cumulative, long-term effect of the use of flea beetles as a biological control should be a significant reduction in the population of leafy spurge within the project area, making this species a more tolerable member of the local plant community.

4.2.8 Predicted Effects on Soils (Issue 8)

Summary

There would be no short or long-term detrimental soil disturbance effects on project sites or adjacent areas for the alternatives analyzed within the Cayuga Project boundary. Adherence to Forest Plan standards and guidelines, site-specific mitigation measures and timber sale contract provisions would eliminate or minimize potential adverse soil resource impacts from erosion, displacement, compaction, rutting, and nutrient removal.

Introduction

The bounds of analysis for determining direct, indirect and cumulative effects of proposed activities on the soil resource are those portions of ecological Landtypes (LT) within the project area, where treatment would take place. These ecological units delimit areas of different biological and physical conditions. Potential effects to the soil resource are reasonably confined to the soil directly beneath where the activity would take place, such as the operation of machinery to cut and remove trees. These effects may extend to adjacent Landtype phases for some activities, but not to an extent where the effect would transcend LT boundaries. As an example, heavy equipment causing soil compaction that reduces pore space for roots and water within a portion of one LT does not affect pore space on adjacent LTs.

The effects of the alternatives were assessed on a site-specific basis to determine if the degree and extent of potential soil disturbance would cause appreciable change in soil properties to be considered detrimental to the soil resource. Alternatives 2-4 propose actions that have potential to change soil properties through compaction, rutting, erosion, and displacement. Nutrient removal was considered but there are no ELTP's within the Cayuga project area, which are susceptible to it. The magnitude of potential direct, indirect and cumulative effects on the soil resource is estimated

based on 1) applicable research; 2) technical information; 3) monitoring of past activities on similar soils; and 4) the professional experience and judgment of certified soil scientists and resource specialists. National and Regional Forest Service policy states the total extent of detrimental disturbance should not exceed 15 percent of an activity area (USDA Forest Service, 1991, 2001). Duration for short-term effects from soil disturbance is considered to be less than 10 years or the shortest amount of time between harvest entries. Duration for long-term effects is considered to be greater than 10 years.

National and Regional soil quality standards set limits of change for specific types of soil disturbance (USDA Forest Service, 1991, 2001). Detrimental soil disturbance is defined as the condition where accepted limits of change for soil properties are exceeded and result in major changes in soil quality and productivity. Forest Service and Natural Resource Conservation Service soil scientists have developed interpretations for use and management of the soil resource. These interpretations are based on soil chemical, biological and physical properties that are specific to ecological unit, soil type and land management activity. Representative sites within this project area that are proposed to have ground disturbing activities, have been field checked by a soil scientist. Site-specific project design criteria based on this information and on current and proposed Forest plan standards and guidelines are incorporated into this analysis to minimize or avoid effects to the soil resource. Treatment areas would be monitored during project implementation. Selected sites would be monitored by inter-disciplinary teams to evaluate whether activities are within acceptable limits of change for measurable and observable soil properties. Mitigation measures are assigned where appropriate, to ensure the inherent long-term productivity of the land would be maintained and that soils would not be irreversibly damaged See Appendix C for a listing of mitigation measures and where they would be applied).

Alternative 1

This is the no action alternative

Soil Erosion and Displacement

The potential for soil erosion and displacement is very low since no new ground disturbing activities are proposed in this alternative. Geologic erosion would continue at a minimal rate of less than 0.18 tons/acre/year (Patric, 1976, p572). Sites where soil is eroding from existing road/stream crossings have been identified within the project area and are discussed in the Water Resources sections of Chapters 3 and 4. This alternative would continue to allow these sites to erode and in some cases cause sedimentation in lakes and streams, unless stabilization is accomplished through maintenance or separate proposed actions. A catastrophic wildfire may expose large areas of bare soil or make some soils hydrophobic (water repellant), which could initiate erosion on a few steep slope areas. However, potential for a fire of this magnitude is very low in the Cayuga area.

Soil Compaction and Rutting

The potential for soil compaction and rutting is very low since no activities involving operation of heavy equipment in the forest are proposed. Historical compaction, if any still exists on the old logging trails, would continue to be mitigated through natural soil formation processes, freeze-thaw cycles, and plant root development. Closure or reconstruction of existing woods roads that are un-surfaced and poorly located on fine textured soils would not occur at this time. Public use of some of these roads during wet conditions would continue to cause rutting of the road surface.

Soil Productivity

The potential for impacts to inherent soil productivity is very low since there would be no ground or vegetation disturbing activities proposed. Natural soil formation processes would continue, biomass would accumulate, organic matter would accumulate and be incorporated into the soil surface, and the biological and geo-chemical nutrient cycles would continue. Inputs to the system include atmospheric deposition and weathering of parent materials. Annual nutrient balances based on estimated inputs and outputs would tend to increase as succession progresses (Pritchett, 1979, p199). Potential would increase for high intensity wildfire due to fuel build up on sites where vegetation is not managed. Severe burning may appreciably change soil properties to an extent that would impair short and long-term productivity, however, the probability of such an event is very low.

Alternatives 2, 3, and 4

These are the action alternatives as described in Chapter 2. Proposed activities that have potential to affect the soil resource include:

- Timber harvesting and post-harvest mechanical site preparation
- Construction of new temporary roads
- Decommissioning of roads
- Construction of a trail parking lot
- Trail reconstruction

Table 4.2.8-1 displays the amount of each of these activities by alternative. The type and amount of these proposed activities are similar enough amongst alternatives to allow direct, indirect and cumulative effects to the soil resource to be summarized together in this section.

Alternatives 2 through 4 were assessed on a site-specific basis for potential effects to the soil resource. This assessment was completed by a soil scientist, as well as by other resource specialists. The purpose was to ensure that the inherent long-term productivity of the land would be maintained, and that soils would not be irreversibly damaged by these proposed actions.

The Stand Treatment Table in Appendix J lists the ELTP, and appropriate design criteria and mitigation measures specific to each treatment area. A listing of soil quality mitigation measures and design features common to all action alternatives and those that are treatment area specific can also be found in Appendix C.

Of the 32,416 acres of National Forest lands in the project area, from 15 to 19 percent would have potential ground-disturbing activities in alternatives 2-4 across the range of ELTs described in Section 3.3.8 and ELTPs listed in Appendix J. This leaves between 81 to 85 percent of the federal lands in the project area that do not have such activities planned. All of the ELTs receiving treatments in these alternatives are also represented in the untreated portions of the project area.

Table 4.2.8.2 Potential Ground Disturbing Activities by Alternative

Activity	Alternative 2	Alternative 3	Alternative 4
Harvest acres	5,414 acres	6,176 acres	4,880 acres
Post-Harvest Mechanical Site Preparation	94 acres	187 acres	68 acres
Construct new temporary road	12.6 miles	16.3 miles	10.5 miles
Decommission road	6.5 miles	5.7 miles	11.4 miles
Construct trail parking lot	1 acre	1 acre	1 acre
Reconstruct trail	2,112 feet	2,112 feet	2,112 feet

Soil Erosion and Displacement

The potential for soil erosion and displacement is very low within the majority of proposed harvest areas. There is a low to moderate potential for erosion and displacement to occur on ELTP's SL/LS4C/4v, SL/LS4C/3, and LS4C/3 (Alt. 2, 4%, 212 acres; Alt. 3, 4%, 244 acres; Alt. 4, 2%, 118 acres). These ELTP's have slopes greater than 15 percent. However, the forest floor cover such as litter, slash and surface rock protects the soil from erosive forces of raindrop impact and runoff. An undisturbed and totally covered forest soil usually yields no surface runoff, thus, it has no sheet and rill erosion (Dissmeyer and Foster, 1980, p7). Tracked harvesting machines (fell, limb and cut to length) and rubber-tired forwarders (haul) are used in 90% of the tree harvest operations on the Great Divide Ranger District land base and the average ground traveled is less than 11% of a sale unit for all harvest types (Schumacher, 2002). The two machines typically operate on the same trails and run on top of slash generated from the harvested trees, surface rock and forest floor litter. Potential to expose mineral soil is minimal. Verry (1972, p283) found no evidence of accelerated erosion after clear-cutting an aspen stand in Minnesota. A few scattered areas (less than several square feet) of exposed soil may occur within harvest areas due to maneuvering machines over uneven ground. These isolated areas would re-vegetate naturally within one or two growing seasons and are not an erosion concern. Operation of this type of harvesting equipment does

not remove the surface organic or mineral soil layers, thus, soil displacement rarely occurs. When thinning red pine, full-length trees may be pulled to a landing with a grapple skidder, allowing the limbed treetops to drag on the ground. This would cause some mixing of the organic and mineral soil materials but is not considered detrimental displacement (USDA Forest Service, 2001).

Landings are locations where wood is temporarily stored until it can be trucked away. They are often located on open areas adjacent to woods roads and the wood is placed directly on the undisturbed ground surface. A landing "spur" within or adjacent to a harvest unit, may be approved by the Sale Administrator, when decking wood along the road is not permitted. A spur typically is an area about 40 feet by 100 feet and wood is placed on undisturbed ground, if possible. Some spurs may require clearing of trees, stumps, rocks or other debris. Some soil may be displaced in this process. Potential for soil erosion is very low because level, well drained upland areas are chosen and natural ground cover would be re-established within one growing season. Main skid trails near landing areas would have more exposed mineral soil due to repeated use. These areas would re-vegetate naturally within one growing season.

Mechanical site preparation is necessary on some areas to prepare the ground for regeneration. It may involve Bracke scarification, salmon blade scarification or other similar mechanical scarification equipment. Some mineral soil would be exposed and displaced in the process, however, the project goal is to regenerate these sites and get ground cover within one growing season. Mitigation measures have been identified to minimize further potential for erosion or displacement while these sites are regenerating.

Site-specific design features and mitigation measures were identified to eliminate or further minimize potential for soil erosion and displacement within harvest units. Some of the mitigation measures developed for the Cayuga Project include:

- avoiding steep slope areas (>30%) within sale unit boundaries;
- operating along slope contours rather than perpendicular to the slope
- approving the location of main skid trails and log landings or spurs;
- artificial seeding of exposed soil that does not re-vegetate naturally;
- use of water diversion structures to control potentially erosive runoff, and
- restricting the operating season.

The mitigation measures relating to soil are found in Appendix C, and are labeled S-1, S-2, S-3, etc.

Potential for soil erosion exists when mineral soil is exposed during the temporary road construction process. This potential is eliminated or minimized by following Wisconsin BMPs pages 21-37, Forest Plan Standards and Guidelines pages IV-66-75, and FSH 7709.58 for site-specific road design features (in the project file at the Hayward Ranger Station). Soil would be displaced and portions covered with other materials in the temporary road construction process, however these roads would be decommissioned after use. Roads are part of the transportation system necessary to manage the forest and provide public access for recreation. The lands dedicated for use as system roads are not considered as having detrimental soil displacement conditions (USDA Forest Service, 2001).

Permanently closing roads, constructing a trail parking lot, and reconstructing a trail as described in the proposed action, would expose and displace some mineral soil in the process. However, the project goal is to stabilize these sites and eliminate existing erosion potential. Design features would minimize further potential for erosion while these sites are stabilized.

Geologic erosion would continue at a minimal rate of less than 0.18 tons/acre/year (Patric, 1976, p572). Patric (1976, p576) also notes the overwhelming weight of evidence supporting the view that soil losses from responsibly managed forest land are slight compared to those that accompany most other land uses. A catastrophic wildfire may expose large areas of bare soil or make some soils hydrophobic (water repellant), which could initiate erosion on a few steep slope areas. However, potential for a fire of this magnitude is very low.

There would be no short or long-term detrimental soil disturbance effects from erosion on project sites or adjacent areas, when design features and mitigation measures are followed.

Soil Compaction

The potential for soil compaction and rutting from operation of heavy equipment is moderate for project sites on the sandy to loamy textured LS/MCS2A/3, SL2A, SL/LS3-1A/3, and SL/LS3-1B/3 ELTPs. These ELTPs are somewhat poorly to moderately well drained. The potential is high for project sites on the fine sandy loam to silt loam textured M1A, SiL/SL2A/3, SiL/SL3A/3, and Pn1A ELTPs. The percentage and acreage of soils in the areas proposed for harvest with moderate to high potential for compaction and rutting in each alternative are: Alt. 2, 7%, 379 acres; Alt. 3, 9%, 538 acres; Alt. 4, 4%, 207 acres.

These ELTPs hold moisture in surface horizons longer and lose strength when temporarily saturated from spring snowmelt and heavy rainfalls. The fine textured soils that are moderately well drained and sandy textured soils that are somewhat poorly drained are firm and hold up well to use of heavy equipment when moisture in the surface is reduced during dry periods of late spring, summer and fall. The fine textured soils that are somewhat poorly drained hold up well when frozen. Site-specific mitigation measures and design features listed in the Stand Treatment Table of Appendix J and the Mitigating Measures Table of Appendix C limit equipment use to dry seasons or winter (frozen ground) conditions based on soil type, minimizing the potential for compaction or rutting of the soil surface. Five year results of a long-term site productivity study concluded harvesting aspen when soils were frozen had little effect on physical soil properties and produced a fully stocked stand of aspen suckers (Stone and Elioff, 1997, p56-57). Potential for compaction and rutting is also reduced, by operating low ground pressure equipment (tracked harvesters and wide rubber tired forwarders) over snow, forest floor litter, logging slash, and surface rock. A Michigan study intentionally tested the latest harvesting equipment on wet fine sandy loam soil and found no rutting or compaction that exceeded acceptable limits (Miller et al, 2001, p3). On-site inspections performed by sale administrators determine whether contract provisions to shut down operations during intermittent wet periods are enforced. Main trails nearer the log landings have repeated use by forwarders and have higher potential for compaction, depending on moisture conditions at the time of operation. There would be an increase in soil bulk density on the main haul trails. High use skid trails typically occupy less that 5% of the sale unit area and potential for long-term detrimental compaction or rutting is minimized by limiting operation of equipment to periods when the soil surface is frozen or not saturated. Soil scientists and resource specialists have monitored harvested areas on these ELTPs both within and outside of the Cayuga project area. Findings to date indicate no signs of reduced productivity due to soil compaction or rutting (Great DivideTimber Sale Activity Review, 2001, and End-of-Decade Monitoring Report Che-Nic NF, 1986-1996).

Constructing up to 16.3 miles of new temporary road would compact new soil areas but would not affect soil productivity, as these temporary roads would be decommissioned after use. Additionally, decommissioning of between 5.7 to 11.4 miles of existing woods roads that are unsurfaced and poorly located would reduce rutting and compaction from public use during wet conditions. Natural processes would eventually eliminate existing compaction and return this land area to productive forest. The overall long-term effect to the soil resource from proposed road activities in the project area would be beneficial, since there are many more miles of road decommissioning than new construction proposed.

There are no known areas of historical compaction (outside of historical roads that still remain in use). However, if any still exists, it would continue to be mitigated through natural soil formation processes, freeze-thaw cycles, and plant root development. There would be some increase in soil bulk density from operation of heavy equipment in high use areas. The extent and intensity of soil compaction would be minimized through design features and mitigation measures and would be within acceptable limits over the treatment areas. Long-term productivity of the land would not be adversely affected.

Soil Productivity

The potential for activities in these alternatives to impact inherent soil productivity in the project area is low.

Soil productivity could be reduced from the proposed activities if excessive organic matter and nutrients were removed through harvesting, erosion or displacement. Productivity could also be reduced if soil physical properties such as structure or porosity, were impaired by compacting or rutting soil beyond acceptable limits for a treatment area (USDA Forest Service, 2001). Potential for soil impacts from erosion, displacement, rutting and compaction are determined to be minimal, as described in the three previous sub-issues, and would not adversely affect the inherent soil productivity of the ELTPs in the project area. Direct evidence is rare that nutrient removals in biomass harvesting trigger declines in soil productivity (Powers et. al., 1998, p 57).

Permanently closing 5.7-11.4 miles of roads that would return to productive forest over time provides a net increase in

productive forest land in the project area.

Cutting trees and removing the merchantable bole wood would remove some nutrients from treatment areas. The ratio and amount of nutrients in the bole and bark of trees varies by species, age, stocking and site quality, but is generally less than one half of nutrients found in the whole tree and accounts for a relatively small portion of total site nutrients. A major portion of the nutrients taken up annually into the above-ground components of trees is returned to the soil in litter fall and canopy wash resulting in a long-term accumulation of nutrients in the surface of mineral soils under forests (Pritchett, 1979, p205). Alternatives 2-4 propose to treat 4,081, 4,519, or 4,292 acres, respectively, with a thinning or selection harvest that removes between 20-40 percent of the existing overstory trees. This harvest method will not remove excessive amounts of nutrients because a large percentage of the total site nutrients remain in the cut tree tops and limbs (slash), standing trees, shrubs, organic matter, roots, and mineral soil.

Alternatives 2-4 propose to clearcut from 737, 1,407, or 424 acres, respectively, by having all of the merchantable bole wood removed. Alban and Perala (1990, p389) found that merchantable bole harvesting of mature aspen stands in Minnesota and Michigan did not affect forest floor weight, soil carbon, or nutrients (nitrogen, phosphorus, potassium, calcium, and magnesium). They found that within 5 years the clearcut sites are fully revegetated, litterfall has returned to normal, and nutrients accumulated in the perennial vegetation tissues are as great as the amounts left in logging slash. Accelerated leaching of nutrients below the rooting zone after harvesting aspen is quite small and short-lived (Silkworth and Grigal 1982, p630; Verry, 1972, p 283). The clearcut acres are on relatively rich ELTPs where nutrient storage is medium to high. This harvest method would not remove excessive amounts of nutrients from these ELTPs because logging slash, non-merchantable trees, shrubs, organic matter and soil retain a high percentage of the total site nutrients. Logging slash contains three to four times more nutrients than annual litterfall and can be considered replacements for litterfall nutrients (Alban and Perala, 1990, p389).

Natural soil formation processes would continue, biomass and organic matter would accumulate and be incorporated into the soil surface, and the biological and geochemical nutrient cycles would continue. Inputs to the system include atmospheric deposition and weathering of parent materials. Annual nutrient balances based on estimated inputs and outputs would tend to increase as succession progresses (Pritchett, 1979, p199). Potential would remain very low for high intensity wildfire because managing the fire prone forest communities in the southern portion of the project area would reduce potential fuel build up.

Recent studies in the Lake States documented the distribution of soil and biomass carbon in red pine and hardwood forests before and after harvest. The conclusion was that in general, tree harvesting activities slightly reduced carbon storage, but the effect was not significant when considering total ecosystem carbon (Rollinger and Strong, 1995, p206; Strong, 1997, p5). Also, there was no difference in total ecosystem carbon between red pine plantations and native hardwood stands (Perala et al., 1995, p242). Alban and Perala (1992, p1109) found that neither whole-tree nor conventional harvesting (tops and limbs left on site) had any effect on soil carbon in aspen ecosystems in the Lake States. They also reported finding no evidence that soil carbon is changing as succession proceeds from an aspen-dominated community to a northern hardwood community. Johnson (1992) reviewed several studies reporting soil carbon changes after harvesting of forests. The majority of the studies reported no effects or only slight decreases in soil carbon. The overall conclusion was that little (10%) or no change of soil carbon could be expected to occur after forest harvesting alone (Bouwman and Leemans, 1995, p516). Detweiler (1986) concluded that managed forests, currently covering 970 Mha worldwide (WRI, 1992), may have no net global effect on the carbon cycle. Mitigation measures as described in Appendix C would prevent or minimize net removal of soil carbon. This should be underscored when considering the addition of tree leaves, limbs, bark, roots, stumps, and wood not removed from the project sites, and the fact that more than 80 percent of the federal lands within the project area have no proposed activities for Alternatives 2-4.

The harvest activities proposed in Alternatives 2-4 are expected to increase above ground carbon storage as remaining trees increase biomass and understory and ground vegetation respond to increased light. The proposed projects in Alternatives 2-4 would have no direct or indirect adverse effects to total ecosystem carbon storage on the project sites, in the Lake States or to the national or global carbon budget.

Alternatives 2-4 would not negatively impact soil nitrate levels. Soils of the Chequamegon-Nicolet Forest are not nitrogen saturated. Total soil N varies from less than 0.02% in subsoils to greater than 2.5% for some peats. The average N content for most surface soils ranges from 0.03 to 0.4%. Generally, the amount of total N decreases with depth in the soil profile (Bremner, 1967). Soil lab analysis for total nitrogen on 68 sites across the northern Nicolet land base sampled from 1991-1993 showed N levels to be less than 0.25% in the surface and decreasing to less than 0.01 % in the

subsurface. Under normal circumstances, 90 to 95% of the soil N occurs in a combined organic form, while only 5 to 10% exists either as ammonium, nitrate or nitrite (Wollum and Davey, 1976).

Forest soils are generally credited with restricting elemental losses through leaching in temperate forest regions. Elements are retained within a cycle between the plant and soil system and a general deficiency of anions exists in a forest soil profile of this region. Removal of trees through thinning or clear cutting would increase nitrification. The accelerated release of elements (including nitrates) from the forest floor is utilized by remaining vegetation on these sites or retained in the root zone, with little if any expected loss from leaching. Johnson (1995, p1351) found that redistribution of soil caused by logging machinery may serve to retain soil nitrogen at least in the first few years after clear-cutting. Hendrickson et al. (1989) reported up to 81% higher nitrogen concentrations in the top 20 cm of mineral soil 3 years after stem only and whole tree clear-cutting in Ontario. Harvesting practices in this project will preserve organic matter on-site, which will also promote nitrogen retention. Practices that encourage rapid re-vegetation will shorten the period in which conditions are favorable to high nitrification rates.

National Atmospheric Deposition Program sites located across northern Wisconsin near Spooner, Trout Lake and Popple River have recorded a decreasing annual trend for wet deposition of nitrates and inorganic nitrogen from 1980-1998.

The proposed activities in Alternatives 2-4 would have no long-term direct or indirect detrimental effects to soil productivity.

Cumulative Effects (all alternatives)

Effects of Past, Present, and Reasonably Foreseeable Connected and Cumulative Actions

The analysis boundary for cumulative effects was determined to be those portions of ELTPs, on federal land within the project area, where treatment would take place. Since analysis has indicated negligible erosion potential, cumulative impacts to the soil resource in the project area would not affect surrounding landtypes on federal land or land in other ownerships.

Past Actions

Numerous historic, natural and human caused ground disturbing events, such as, windstorms, exploitive logging and associated fires, road and railroad building, have taken place in and around the area of cumulative effects analysis. While these events have influenced the existing condition of the soil resource, there are no known adverse residual impacts.

Recent activities, such as, timber harvesting and road building, have occurred over the past 15 years and were implemented following Land and Resource Management Plan standards and guidelines, sites specific design features to mitigate soil resource impacts, and contract operating restrictions on Forest Service lands. Site specific field monitoring by resource specialists within the project area and on similar ELTPs outside the project area has shown no short or long-term impairment to the soil resource from recent activities. The Forest has also implemented Wisconsin Forestry Best Management Practices for Water Quality since 1995 and recent field monitoring indicates that 99% of the time there will be no adverse impacts to water quality from soil erosion/sedimentation when BMPs are applied correctly (WDNR, 1999, p62). Current conditions indicate key soil properties affecting ecosystem health and sustainability such as porosity, organic matter content and nutrient availability are representative of the natural range of soil conditions inherent to the landscape of the Chequamegon-Nicolet NF (USDA Forest Service, 1998, p6). Healthy populations of soil microorganisms such as bacteria and fungi exist in the favorable environment of the forest floor litter layer and soil surface organic matter (Pritchett, 1979, p72). Storage of soil and biomass carbon is increasing in the vegetation and soil.

No appreciable long-term effects to the soil resource or long-term productivity of the land from past activities have been identified in the project area.

Present Actions

There are no known actions presently taking place within this cumulative effects analysis area that would have any measurable effects on the soil resource. Alternative 1 does not propose any new actions. Alternatives 2-4 do propose actions that would include potential ground-disturbing activities. Some of these proposed actions would occur over the same acres that have previously had similar treatments, such as a thinning harvest. Alternative 4 has less potential to impact the soil resource than the other action Alternatives, because fewer acres are proposed for harvesting, and temporary road building activities. Alternative 3 would potentially impact more of the soil resource than Alternatives 2 and 4. Assessment of potential direct and indirect impacts from activities in each action alternative indicates that no

appreciable short or long-term detrimental soil disturbance would be expected. Monitoring indicates adherence to current and proposed Land and Resource Management Plan standards and guidelines, site-specific mitigation measures and contract provisions would eliminate or minimize potential adverse impacts from erosion, displacement, compaction, or rutting. Storage of soil and biomass carbon is projected to increase in the vegetation and soil.

Future Actions

At this time no specific actions are planned within the area of cumulative effects analysis for the soil resource. It is likely that timber harvesting and associated activities would be proposed to some degree, but it is not possible to foresee exactly where or when such actions would occur. All future proposed actions on federal lands would be subject to environmental effects analysis and any project implementation would follow site specific design criteria, applicable research, current Land and Resource Management Plan direction, standards and guidelines, mitigation measures and best management practices to eliminate or minimize potential adverse soil resource impacts from erosion, displacement, compaction, rutting, or nutrient removal. Storage of soil and biomass carbon is projected to increase in the vegetation and soil.

Conclusions

The effects of implementing Alternative 1 or any of the action Alternatives 2-4, when added to the effects of past, present, and reasonably foreseeable actions would not be expected to result in appreciable adverse cumulative effects to the quality of the soil resource or to the total forest ecosystem carbon storage capacity.

4.2.9 Predicted Effects on Floodplains and Wetlands (Issue 9)

Alternative 1

If Alternative 1 were selected, none of the proposed resource management activities would be implemented. Therefore, there would not be any impacts to floodplains and wetlands.

Alternative 2

If Alternative 2 were implemented, temporary access would be located adjacent to, and possibly within wetlands under frozen conditions. Small pothole wetlands or wet spots are located throughout the analysis area. There are also large wetland complexes between uplands and adjacent to most streams. Most streams also have floodplains located on either side or adjacent to them. Wetlands and floodplains would not be negatively impacted because trees would not be removed, slash would not be placed within these areas, and adjacent slopes would be protected so that erosion and sedimentation would not occur. Equipment would not be operated within wetlands or floodplains, except where it can't be avoided to access a stand or portion of a stand. This would only occur under frozen conditions and when no other reasonable alternative for access exists. Mitigation measures W1-W4 address wetlands and floodplains (see Appendix C).

Due to the nature of the project locations and the application of mitigation measures, no long-term detrimental water quality effects to wetlands or floodplains are expected to occur from sedimentation, or blockage of the lateral subsurface flow, in wetlands.

The indirect and direct effects of the proposed culvert replacement at seven sites are described in Section 4.2.6.2. Replacement of the culverts would reduce sedimentation of the floodplains that lie adjacent to these streams.

Alternative 3 and 4

If Alternative 3 were implemented, the direct and indirect effects would be the same as those described under Alternative 2 with the exception of the restoration of the floodplain located on FR 355. In addition, there are only six culvert replacements proposed under Alternative 3. The direct and indirect effects of the culvert replacements are described in Section 4.2.6.3.

Under Alternative 3, six culvert replacement and road reconstruction projects would be implemented. In addition, the crossing of the unnamed tributary to the Bad River by FR 355 would be removed and returned to the original floodplain. The direct effects of the removal of the twin culverts would be a reduction of 62.25 tons of sediment per year and restoration of 1 acre of floodplain.

Cumulative Effects

All Alternatives

There are approximately 11,209 acres of wetland located on National Forest lands in the Cayuga Project Area. This accounts for approximately 35% of the analysis area. There are no activities proposed in these 11,209 acres in any of the action alternatives, with the exception of temporary roads under frozen conditions. The effects of the proposed stream restoration projects, when added to the effects of past practices and events, current practices, and future proposed actions, would not be expected to result in any adverse cumulative effects to the quality of the floodplains. The cumulative effects of these projects would cumulatively improve the overall health of the watersheds in the Cayuga Project Area.

4.2.10 Predicted Effects on Visual Quality (Issue 10)

Alternative 1: No Action

If Alternative 1 were implemented, no vegetation management activities would be implemented to improve visual quality along Day Lake, County Highway GG, and Spillerberg Lake. The mixed aspen and hardwood stands along County Highway GG would convert mainly to hardwoods over time. These stands would convert mostly towards all aged maple stands partially hidden, in some areas along the corridor, by a dense conifer strip along the edge of clearing for the highway. In the short term, dead and dying aspen would blow over with their boles elevated above the ground.

Alternatives 2, 3, and 4

If Alternative 2, 3, or 4 were implemented, approximately 77 acres of aspen would be converted to northern hardwoods along Highways GG and M. In these stands aspen would be removed leaving a residual stand of hardwoods. Much of the harvest activity would be shielded from view along portions of the corridor, by the dense screen of balsam fir saplings, which has become established at the edge of the clearing along Highway GG over the last 25 years.

Photo 4.2.10. This shoreline retains its scenic qualities due to a strip along the lake that screens a clearcut from view

Approximately 76 acres of aspen, balsam fir, and paper birch would be harvested along the shorelines of Day Lake, Spillerberg Lake and East Twin Lake, either through a thinning or shelterwood method. An observer would notice a less dense appearing forest near the lake, but the change would be temporary as the trees within the stands grow to occupy the space around them. The direct effect to visual quality due to timber harvesting activities would be relatively minimal from the water with the application of mitigation measures (see Appendix C).

Approximately 40 acres of long-lived conifers, such as white pine, would be underplanted along the shoreline of Day Lake and Spillerberg Lake. In the short-term, the newly planted trees would not be noticeable. Under planting of long-lived species along these shorelines would gradually improve the visual quality in the foreground and middle ground from the water. In the longer term, long-lived species would become evident along the shore of these lakes as the short-lived species such as balsam fir, aspen, and paper birch die out naturally.

Cumulative Effects

Alternative 1

Under Alternative 1 the visual quality of the stands along County Highway GG and M would eventually convert to long-lived hardwoods through natural mortality of short-lived species.

Alternatives 2, 3, & 4

Under the action alternatives, the tree species in stands along Highways GG and M would change to long-lived hardwood species. For the most part, the dense balsam fir screen along portions of the corridors would not be affected. Those areas within the corridors of County Highways GG and M would progress toward a corridor lined by a narrow band of balsam fir.

4.2.11 Predicted Effects on Recreation Facilities and Trails (Issue 11)

Alternative 1: No Action

If Alternative 1 were selected, campsites located on the Jack Pine Circle and Heron Circle at Day Lake Campground would be closed to protect the public from injury. This would be a 5.7 percent reduction in the campsite capacity on the Great Divide Ranger District as a whole.

Under this Alternative, the portion of Snowmobile Trail 8 located on FR 1296 would not be relocated. Mixed traffic during the winter would continue to be a safety concern. The safety issue of parking at the community center, where emergency vehicles and personnel are housed, would continue to be a concern.

Alternatives 2 and 3

If Alternative 2 or 3 were implemented approximately 25 acres of jack pine would be removed on the Jack Pine Circle and Heron Circle loops in Day Lake Campground to address safety issues. As a result of the jack pine removal, this stand would appear to be quite open for probably 3-5 years.

Approximately 101 acres (Compartment 124, Stands 19 and 20) of red pine in Day Lake Campground would also be thinned to promote growth of larger trees within the campground and aid in air movement through the campground. The stands would be thinned to approximately 80 square feet of basal area – The appearance would be similar to the stand of red pine located just east of the entrance to Day Lake Campground.

Photo 4.2.11. This stand was thinned to a slightly lower stand density than proposed in Alternative 2. The red pine trees developed large crowns and small maple and oak trees dominate the lower levels of the stand.

To provide a safe and quality recreational experience, Snowmobile Trail 8 would be re-routed off of FR 1296 onto National Forest land. The total length of the reroute would be approximately 1,600 feet. The new section of trail would utilize existing skid trails in the adjacent pine plantation and would require the removal of only about 12 small saw timber size red pine. The rerouted trail would cross Highway GG just north of the campground entrance.

A new parking lot would be constructed adjacent to FR 1296 in a flat open area south of the road. An existing skid trail approximately 550 feet in length would be utilized as a connector to Snowmobile Trail 8. The trail would cross County Highway GG just north of the campground entrance.

The direct effect of the harvest in Day Lake Campground would include the removal of the safety hazard of the old jack pine. The appearance of the pine stands within the campground would change as well, and in the first year the pine stands would appear to be very open. By the second growing season the pine stands would appear to have a more normal stand density and indications of logging would begin to disappear. Within three to

four years the crowns and branches of would expand out to fill in the gap from the trees that were removed.

Direct effects of rerouting the snowmobile trail and constructing a parking lot include the reduction in the amount of trails sharing plowed town roads and the establishment of a safe parking place for visitors with snowmobiles and ATV's. Re-routing of Snowmobile Trail 8 was a relatively minor portion of the project in terms of effects on the wildlife and fish resource. For more detail, see the specialist report on the wildlife and fish resources.

Indirect effects of harvesting in Day Lake Campground would include the development of larger stand tree diameters and larger crowned trees. Air movement would improve as the result of wider tree spacing within the stand. Visually, the stands within the campground would begin to be dominated by large trees with the removal of smaller trees and increased growth on the remaining trees.

Alternative 4

If Alternative 4 were implemented the direct and indirect effects would be similar to those described for Alternatives 2 and 3, with one exception. Compartment 124 Stands 19 and 20 would not be treated. This would prolong the excessively high density of the red pine stand near the campsites in Day Lake Campground.

Cumulative Effects

Alternative 1

In this alternative the hazardous condition in stand 21 of compartment 124 would continue resulting in a forced reduction in the amount of open campsites on the district. Campsites at Day Lake would remain shaded and airflow would continue to be restricted.

Alternative 2 and 3

As a result of the proposed harvest within the campground, Day Lake could conceivably become a more desirable place to camp and campground visitation may increase. The minor snowmobile trail reroute would contribute to the safety of the overall trail system on the district.

Alternative 4

Campsites at Day Lake would remain shaded and airflow would continue to be restricted. The minor snowmobile trail reroute would contribute to the safety of the overall trail system on the district.

4.2.12 Predicted Effects on Local Economy (Issue 12)

Background

A variety of methods can be used to measure the economic effects associated with natural resource management. Some of these effects are easily quantifiable such as the production of saw timber and pulpwood that result from various management actions. Other values associated with resource management such as ecosystem values, aethetics, recreation, wildlife viewing and others are more difficult to quantify. This analysis does not attempt to do so and solely addresses the economic effects of managing and harvesting timber. The "Quick Silver" Forestry Investment Analysis program (Vasievich, 1998) was used to address economic efficiency by calculating the present value of costs, the present value of benefits, the present net worth, benefit/cost ratio of implementing each alternative. Commodity production, money to the economy, monies to local and federal governments, and cumulative effects of implementing each alternative were analyzed using volume estimates and the current base rates for timber.

Commodities delivered under the action alternatives would be produced from timber harvest activities. The production of pulpwood and sawtimber would generate employment and income for persons engaged in harvesting, transporting and processing of these products. Estimates of the number of jobs created and income to local communities under Alternatives 2, 3 and 4 were calculated using averages from the 1997 Chequamegon/Nicolet National Forest TSPIRS report (Timber Sale Program Information Reporting System). One measure of the effects of commodities produced would be million board feet (MMBF) of timber. Table 4.2.12a displays the timber volumes produced under each alternative and an estimate of the number of jobs created under each alternative.

Alternative 1: No Action

If Alternative 1 were implemented, there would not be any new timber sale projects. The total volume harvested would be 0 MMBF for the time period 2003-2008 (For the purposes of comparable calculations it was assumed that these stands would never be thinned during the period analyzed). Local revenues would be deferred. In order to contribute to the Forest wide timber program, the shortfall that would occur under Alternative 1 would likely be addressed through proposals to harvest timber in other parts of the Great Divide Ranger District. Although no harvests would occur in the stands proposed for treatment in this project during the period of 2003-2008, much of the timber that is presently available would remain available for future years. If Alternative 1 were implemented, there would not be any timber harvest and, therefore, there would not be any related costs or revenues. The local and area communities would not directly realize any income generated from the sale of timber from National Forest System lands under Alternative 1.

Table 4.2.12a: Estimated volumes and jobs created by each alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Volume Harvested By Alternative (MMBF)	0	23.0	28.0	20.0
Jobs Created	0	325	396	283

Alternative 2

If Alternative 2 were implemented, timber sale projects would result in the harvest of approximately 23.0 MMBF of timber over the time period of 2002-2007. This level of timber commodity output would increase local revenues through initial harvesting and hauling of wood products. Producing this level of commodities would also increase local and regional revenue through the processing of the raw wood products. This would create about 325 jobs. Many of the red pine and northern hardwood stands would continue to be available for thinnings on a 10-15 year intervals until the final rotation ages are reached. Aspen and jack pine stands would also be available for future rotation harvests, which would contribute to local revenues. If this alternative would be implemented, an estimated $23.6 million would be generated as a direct and indirect result of the timber harvest proposed in the Cayuga Project Area.

Alternative 3

If Alternative 3 were implemented, timber sale projects would result in the harvest of approximately 28.0 MMBF of timber over the time period 2002-2007. This level of timber commodity output would have the same effects as in Alternative 2. However, producing this level of commodities would create about 396 jobs. If this alternative were implemented, an estimated $28.75 million would be generated as a direct and indirect result of the timber harvest proposed in the Cayuga Project Area.

Alternative 4

If Alternative 4 were implemented, timber sale projects would result in the harvest of approximately 20.0 MMBF of timber over the time period 2002-2007. This level of timber commodity output would have the same effects as in Alternative 2 and 3. However, producing this level of commodities would create about 383 jobs. If Alternative 4 were implemented, an estimated $20.54 million would be generated as a direct and indirect result of the timber harvest proposed in the Cayuga Project Area.

Cumulative Effects

Table 4.2.12b: Summary of Discounted Returns to Local and Federal Governments

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Total Revenue	0	$382,111.73	$618,568.63	$358,615.36
Return to US Treasury	0	$286,583.80	$463,926.47	$268961.52
25 % Payment*	0	$95,527.93	$154,642.16	$89653.84

*This figure is subject to adjustment after payment in lieu of taxes (PILT) is calculated.

4.2.13 Analysis of Effects on Threatened, Endangered and Sensitive Species

Biological Assessment

A Biological Assessment (BA) will be prepared as a separate document, prior to completion of the Final Environmental Impact Statement and Record of Decision, to analyze effects from project area activities on federally listed threatened and endangered species. A preliminary project review has indicated no effect on listed species.

Contact was initiated with the U.S. Fish and Wildlife Service at the time of project scoping. A reply dated June 5, 2001 concluded that listed species or critical habitat would not be affected. If the final Biological Assessment also concludes no effect, or not likely to adversely affect, the BA will be sent to the Fish and Wildlife Service for review and concurrence of the effects determination. If the BA concludes that any listed species or critical habitat is likely to be adversely affected, the BA will be submitted to the Fish and Wildlife Service, and a request made for formal consultation and a Biological Opinion.

Biological Evaluation

A Biological Evaluation (BE), summarized here, was prepared as a separate document for the proposed action and all alternative actions, to determine any effects on species listed as Region 9 Regional Forester Sensitive Species (RFSS). These species were identified in cooperation with the Wisconsin Department of Natural Resources, the state Natural Heritage Program, The Nature Conservancy, USDA Forest Service Region 9 TES staff, and other species experts outside the agency.

The following RFSS were determined to be present in the project area, or to have potential for occurring (potential habitat exists within the project area), and were evaluated in more detail.

Regional Forester Sensitive Species	*Occurrence Potential*
Martes americana – American pine marten	Confirmed
Myotis septentrionalis – Northern (long-eared) myotis**	Minimal
Pipistrellus subflavus – Eastern pipistrelle**	Minimal
Accipiter gentilis – Northern goshawk	Confirmed
Ammodramus leconteii – LeConte's sparrow	Minimal
Buteo lineatus – Red-shouldered hawk	Minimal
Catharus ustulatus – Swainson's thrush	Confirmed
Chlidonia niger – Black tern	Confirmed
Cygnus buccinator – Trumpeter swan	Minimal
Dendroica cerulea – Cerulean warbler	Confirmed
Falcipennis canadensis – Spruce grouse	Minimal
Oporornis agilis – Connecticut warbler	Confirmed
Picoides arcticus – Black-backed woodpecker	Confirmed
Gomphus viridifrons – Green-faced clubtail	Minimal
Incisalia henrici – Henry's elfin butterfly	Minimal
Botrychium oneidense – Blunt-lobed grapefern	Minimal
Calypso bulbosa – Calypso orchid	Minimal
Carex assiniboinensis – Stoloniferous sedge	Minimal
Cypripedium arietinum – Ram's head lady's-slipper	Minimal
Dryopteris expansa – Spreading woodfern	Minimal

Regional Forester Sensitive Species	*Occurrence Potential*
Malaxis brachypoda – White adder's mouth	Minimal
Panax quinquefolius – Ginseng	Minimal
Poa paludigena – Bog bluegrass**	Minimal
Polystichum braunii – Braun's holly fern	Minimal
Potamogeton pulcher – Spotted pondweed**	Minimal
Pyrola minor – Lesser wintergreen	Minimal
Ranunculus lapponicus – Lapland buttercup**	Minimal

Species identified by ** are not currently listed as RFSS for the Forest. They are listed as Sensitive for nearby National Forests however, and suitable habitat exists on the Chequamegon-Nicolet, therefore they were considered in the BE.

Direct, Indirect, and Cumulative Effects

The following list summarizes the determination of effects for the above listed species:

No impact

- *Ammodramus lecontei* – LeConte's sparrow
- *Buteo lineatus* – Red-shouldered hawk
- *Chlidonia niger* – Black tern
- *Dendroica cerulea* – Cerulean warbler
- *Picoides arcticus* – Black-backed woodpecker
- *Botrychium oneidense* – Blunt-lobed grapefern
- *Calypso bulbosa* – Calypso orchid
- *Carex assiniboinensis* – Stoloniferous sedge
- *Cypripedium arietinum* – Ram's head lady's-slipper
- *Dryopteris expansa* – Spreading woodfern
- *Malaxis brachypoda* – White adder's mouth
- *Panax quinquefolius* – Ginseng
- *Poa paludigena* – Bog bluegrass
- *Polystichum braunii* – Braun's holly fern
- *Potamogeton pulcher* – Spotted pondweed
- *Pyrola minor* – Lesser wintergreen
- *Ranunculus lapponicus* – Lapland buttercup

May impact individuals but not likely to cause a trend to federal listing or loss of viability

- *Martes americana* – American pine marten
- *Myotis septentriopnalis* - Northern (long-eared) myotis
- *Pipistrellus subflavus* - Eastern pipistrelle
- *Accipiter gentilis* – Northern goshawk
- *Catharus ustulatus* – Swainson's thrush

- *Cygnus buccinator* – Trumpeter swan
- *Falcipennis canadensis* – Spruce grouse
- *Oporornis agilis* – Connecticut warbler
- *Gomphus viridifrons* – Green-faced clubtail
- *Incisalia henrici* – Henry's elfin butterfly

Recommendations, Mitigation

Measures were recommended to mitigate potential effects of project area activities on known sensitive species populations and/or potential habitat. They are listed by species within the Biological Evaluation, Chapter VI. These measures cover northern goshawk, trumpeter swan, spruce grouse, black-backed woodpecker, Swainson's thrush, calypso orchid, ram's head lady's-slipper, and white adder's mouth. These mitigation measures are also included in the summary of project area mitigation measures listed in Appendix C and the Record of Decision.

4.3 Relationship Between Short-term Uses and Long-term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The short-term and long-productivity pertaining to water, soils and timber productivity are discussed in Section 4.2.

All alternatives would be implemented under the mandate of the Multiple Use and Sustained Yield Act of 1960, which requires the Forest Service to manage National Forest System lands for multiple uses, including timber, recreation, fish and wildlife, range, and watershed. All renewable resources are to be managed in such a way that they are available for future generations. The harvest and use of standing timber can be considered a short-term use of a renewable resource, trees can be reestablished and grown again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives would protect the long-term productivity of the Project Area through the use of specific standards and guidelines, mitigation measures, and BMPs. Timber management activities would have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all effected areas in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. The quality and quantity of water from the Project Area may fluctuate as a result of short-term uses, but no long-term effects to the water resources are expected to occur as a result of resource management activities.

All alternatives would provide the wildlife habitat necessary to contribute to the maintenance of viable, well-distributed populations of existing native and desired non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Management Indicator Species (MIS) are used to represent the habitat requirements of all wildlife species found in the Project Area. By managing habitats and populations of indicator species, the other species associated with the same habitat would benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity.

Timber harvest rotations, in aspen stands are normally on a 45-year or longer rotation, depending upon site quality. Management of timber resources on these rotations could affect long-term productivity, depending on the intensity of silvicultural practices. Projected timber management activities are not anticipated to affect long-term productivity. Mitigation measures would be planned under all the alternatives to ensure future availability of other renewable resources as well.

Opportunities for developed and dispersed recreation use, including hiking, hunting, canoeing, skiing, camping, snowmobiling, and fishing would be maintained for future generations. The setting in which these activities occur varies, but the long-term potential for the Project Area to provide a spectrum of recreational opportunities would be maintained in all alternatives.

4.4 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. The effects analyses identified no irreversible or irretrievable commitments of resources for any of the 12 issues that were analyzed.

4.5 Optimality and Appropriateness of Harvest Method

Choosing the optimum harvest method for regenerating a particular stand is influenced by the silvicultural requirements of the species on the site, existing stand conditions, issues raised during the analysis, prior experiences in the area, and direction from the Forest Plan. A silvicultural prescription is assigned to each stand after a field examination of the stand is completed. This prescription is based primarily on the biological requirements of the stand and the objectives of the Management Area. This prescription is then subject to interdisciplinary analysis, with special consideration given to the issues raised during scoping and the alternatives developed.

Just as the objectives of each alternative are different, the harvest method for a given stand may also differ. In some cases, prescriptions may be modified in order to mitigate other resource concerns such as visual quality, water quality, or composition guidelines. Regardless of the alternative, the proposed harvest method would always be sufficient to ensure adequate regeneration stocking of the stand.

The National Forest Management Act of 1976 (Section 6(g)(3), (e)(iv) and (f)(i)) and the resulting Secretary's Regulations (36 CFR 219.15) require that vegetation management practices be chosen that are appropriate to meet the objectives and requirements of the Land and Resource Management Plan. Appendix D of the Forest Plan has a detailed discussion of this topic arranged in four sections; silvicultural systems and regeneration harvest methods, choice of harvest method, criteria for choosing harvest method by management prescription, and the optimality of the harvest method.

The use of clearcutting is the optimum method for promoting the regeneration of certain species in the Project Area. These activities are consistent with the Forest Plan, in particular for regeneration of aspen, jack pine, and red pine. The use of even-aged management is consistent with the direction for Goal Areas 1 and 2. For further discussion, see Appendix D of the Chequamegon National Forest Land and Resource Management Plan.

In addition, there would be a number of proposed treatment sites that would create temporary openings that are larger than 40-acres. These proposed (over 40 acre) aspen harvest units are designed to manage large contiguous blocks and reduce edge and are subject to review under 36 CFR 219.27(d)(2). The review process will follow the direction from the Regional Office stated in the September 1, 1999 memo to Forest Supervisors. Refer to the silvicultural diagnosis matrix in the project file.

5.0 Chapter 5. Consultation and Coordination

5.1 Preparers and Contributors

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and non-Forest Service persons during the development of this environmental impact statement:

CORE INTERDISCIPLINARY TEAM MEMBERS:

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Note: See Appendix B for a complete list of preparers

FEDERAL, STATE, AND LOCAL AGENCIES:

US Fish and Wildlife Service

Wisconsin Department of Natural Resources

Great Lakes Indian Fish and Wildlife Commission (GLIFWC)

U.S. Environmental Protection Agency

TRIBES

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Red Cliff Band of Lake Superior Chippewa

Lac Courte Oreilles Band of Lake Superior Chippewa

Bad River Band of Lake Superior Chippewa

Mille Lacs Band of Lake Superior Chippewa

See Appendix E for a complete list of agencies, organizations and individuals.

5.2 Distribution of the Draft Environmental Impact Statement

This draft environmental impact statement has been distributed to individuals who specifically requested a copy of the document and those who submitted substantive comments on the proposal. In addition, copies have been sent to the Federal agencies, federally recognized tribes, State and local governments, and organizations listed above and in Appendix E.

6.0 Appendices

6.1 Appendix A- Maps (see insert)

6.2 Appendix B- List of Preparers

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6.3 Appendix C- Mitigation Measures

Condition that Triggers Mitigation	Measure Number	Mitigation Measure	Alternative 2	Alternative 3	Alternative 4
Sensitive Species	E1	Remove the southeastern portion of Compartment 203, stand 16 from harvest (this involves approximately 10 acres)	203-16	203-16	203-16
	E2	Remove from harvest	203-17		203-17
	E3	Do not improve or maintain existing unclassified road W218202 in Compartment 203. Use unclassified road W219314 to access stands 1 and 5 in Compartment 203.	All Alternatives		
	E4	Allow no harvest activities between February 15 and August 1 in the remainder of Compartment 203, stand 16 (approximately 17 acres), and in the southern 1/3 of Compartment 203, stand 5 (approximately 25 acres).	203-5, 203-16	203-5 203-16	203-5 203-16
	E5	Reserve all mature, long-lived conifers from cutting (white pine, hemlock, northern white cedar, white spruce)	203-5, 203-16	203-5, 203-16	203-5, 203-16
	E6	Ensure that harvest boundary along the southwestern edge of Compartment 203, stand 5 does not include the conifer transition edge; exclude that area from harvest activity.	203-5	203-5	203-5
	E7	Utilize winter harvest only (do not harvest between April 1 and October 31) in stands adjacent to the Iron River	178-20 178-21 178-23 178-25	178-20 178-21 178-23 178-25	178-20 178-21 178-23 178-25

	E8	Reserve several pockets of dense mid-level conifer cover (2-3 reserve islands approximately 1/8-1/2 acre in size).	178-25	178-25	178-25
	E9	Close or decommission all temporary roads following use for timber harvest, unless needed for additional administrative use. In sites requiring use of temporary road construction across areas of lowland conifer, survey proposed sites prior to construction to determine presence of rare plants; modify road location or design as needed to protect any rare plant sites.	All affected stands and roads	All affected stands and roads	All affected stands and roads
	E10	Reserve mature live jack pine and snags within Compartment 124, stands 53 and 56; reserve trees should be in groups (3-5 groups per stand); consider visual impact when designing reserve groups.		124-53 124-56	124-53 124-56
	E11	Follow Forest guidelines concerning heron rookery protection in terms of protection zones and seasonal restrictions	127-17 200-11	127-17 200-11	127-17 200-11
	E12	Do not harvest between May 15 and August 1, to protect nesting birds.	188-18 202-1	188-18 202-1	188-18 202-1
	E13	Manage Compartment 179, stand 17 with partial cutting only, to encourage long-lived conifer	179-17	179-17	

		Note: Additional information concerning mitigation measures by species can be found in the document "TES Species: Recommended Mitigation for Cayuga Project" in the project file.			
Improvement or maintenance of fish habitat	F1	Keep all slash out of Class I and II trout streams during timber sale activities. (Forest Plan, pp. IV-79)	157-7, 157-8, 158-1, 158-8, 158-9, 158-33, 161-14, 161-15, 180-5, 180-30, 188-6, 188-11, 188-41	157-7, 157-8, 158-1, 158-8, 158-9, 158-33, 161-14, 161-15, 180-5, 180-30, 188-6, 188-11, 188-41	157-7, 157-8, 158-1, 158-8, 158-9, 158-33, 161-14, 161-15, 180-5, 180-30, 188-6, 188-11
Noxious weeds	N1	Equipment used for timber harvest, wildlife opening construction or maintenance, or road and recreational trail construction on maintenance should either be documented as coming from an area free of noxious weeds or be cleaned prior to use on National Forest lands. Equipment should have all mud, dirt, and plant parts removed before working in the project area.	All treatments with soil disturbance (timber harvest, trail construction, maintenance, and rehabilitation, road construction, maintenance, closure, and obliteration, opening maintenance or creation, watershed restoration, and fish habitat improvement)	All treatments with soil disturbance (timber harvest, trail construction, maintenance, and rehabilitation, road construction, maintenance, closure, and obliteration, opening maintenance or creation)	All treatments with soil disturbance (timber harvest, trail construction, maintenance, and rehabilitation, road construction, maintenance, closure, and obliteration, opening maintenance or creation)
	N2	Equipment used in sites within the project area already documented as containing noxious weeds will be cleaned prior to leaving the contaminated site.	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).

	N3	Fill material sources (sand, gravel, etc.) should be inspected before use in the project area for contamination by noxious weeds. Monitor areas where fill is used annually for a minimum of 3 years to ensure that noxious weeds were not inadvertently established by the activity.	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).
	N4	Minimize soil disturbance to the extant practical, consistent with the project objectives.	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).
	N5	Monitor the effectiveness of biological control methods for leafy spurge on an annual basis for a minimum of 3 years. Monitor both the anticipated reduction of leafy spurge and the numbers of flea beetles present at the release site.	In areas with non-native invasive species.		In areas with non-native invasive species.
	N6	Revegetate disturbed soil in a manner that optimizes plant establishment. Use certified weed-free seed and/or mulch where needed.	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).	All treatments with soil disturbance (see description for N1).
Woodland ponds	P1	Protect all woodland ponds that retain water through the summer as breeding habitat for reptiles and amphibians. Maintain dense overstory around woodland ponds. (Forest Plan, pp. IV-78)	All stands	All stands	All stands
Wildlife	R1	Provide for the retention of some dead and down logs and other ground material necessary to maintain viable populations of reptiles, amphibians, and other animals. (Forest Plan, pp. IV-77)	All stands	All stands	All stands

	R2	Reserve small clumps and/ or scattered individual trees within clearcut, overstory removal cuts, and other final regeneration harvests. Focus on cover and mast species, such as oak, cedar, hemlock, and white pine, to maintain structural and species diversity within stands. (Forest Plan, pp. IV-78)	All final regeneration harvest areas	All final regeneration harvest areas	All final regeneration harvest areas
	R3	Reserve at least two live den trees per acre where they are a component of the stand (long-lived species preferred). This measure is designed to maintain habitat features necessary for cavity nesting birds, and animals such as pine marten, flying squirrels, and raccoons. These birds and animals utilize these cavity trees for denning and resting. (Forest Plan, pp. IV-78)	All stands	All stands	All stands
	R4	Provide interior refugia within clearcuts, overstory removal cuts, and other final harvest areas that are greater than 10 acres in size. Establish reserve areas of ½ to 1 acre in size, at the rate of one for every 10 acres in size. Adjustments may be necessary for long narrow cuts, or where reserve trees and clumps have been designated for visual quality.	All final regeneration harvest areas greater than 10 acres in size.	All final regeneration harvest areas greater than 10 acres in size.	All final regeneration harvest areas greater than 10 acres in size.
	R5	Provide for future and existing coarse woody debris by retaining snag trees, live den cavity trees, and other large diameter live trees within all harvest areas.	All stands	All stands	All stands

	R6	Reserve scattered large canopy red and white pine within ½ mile of major rivers or lakes over 20 acres that have a productive fishery, to maintain nesting and perch trees for eagles and osprey. (Forest Plan, pp. IV-79	124-22 125-30 127-04 127-11 127-17 168-32 170-53 171-06 171-19 171-29	124-03 124-22 124-27 124-53 124-57 125-03 125-30 127-04 127-11 127-17 168-32 170-53 171-06 171-19 171-29	124-53 124-57 125-30 127-04 127-17 168-32 170-53 171-06 171-19 171-29
Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred season- year round) (ELTP-SL/LS4C 3&4V)	S1 S2	Plan erosion control measures for roads and trails within each unit. (Forest Plan, pp.IV- 70) Operate equipment on the contour as much as possible. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 126-10 157-21 158-15 178-20 199-25	All mitigation measures apply to the following stands: 126-10 157-21 158-15 159-9a 159-9b 178-20 199-25	All mitigation measures apply to the following stands: 126-10 158-15 178-20 199-25
Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred season-winter with frozen ground) (ELTP-LS/MCS2A 3 and SL2A)	S3 S4 S5 S6	Use short-term roads and temporary landings when ground is frozen. (Forest Plan, pp. IV-70) The use of low ground pressure equipment (less than 13 PSI) during July and August will lessen any adverse soil impacts. (Forest Plan, pp. IV-70) Allow the use of heavy mechanical site preparation equipment during July to September. Avoid October and November. (Forest Plan, pp. IV) Restrict activities to dry periods. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 161-12 161-14 161-33 169-25 170-19 180-5 180-10 188-18	All mitigation measures apply to the following stands: 127-23 127-24 127-28 153-2 161-7 161-12 161-14 161-33 169-25 170-19 180-5 180-10 188-18	All mitigation measures apply to the following stands: 161-12 161-14 161-33 180-5 180-10 188-18

Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred season-winter with frozen ground) (ELTP- M1A))	S7 S8 S9 S10	Use short-term roads and temporary landings when ground is frozen. (Forest Plan, pp. IV-70) Consider natural regeneration. (Forest Plan, pp. IV-70) Encourage winter logging. (Forest Plan, pp. IV-70) Restrict activities to dry periods. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 153-3 153-5 153-11 158-22 158-24a 158-24b	All mitigation measures apply to the following stands: 153-3 153-5 153-11 158-22 158-24a 158-24b 161-30	All mitigation measures apply to the following stands: 153-11
Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred conditions-dry) (ELTP- SL/3-1B&A 3)	S11	Designate skid trails and landings. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 157-20 157-21 166-15	All mitigation measures apply to the following stands: 157-20 157-21 166-15	All mitigation measures apply to the following stands: 157-20 166-15
Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred conditions-dry) (ELTP- Sil/ SL3A 3)	S12 S13 S14	Plan erosion control measures for roads and trails within each unit. (Forest Plan, pp. IV-70) Encourage winter logging as much as possible. (Forest Plan, pp. IV-70) Allow the use of heavy mechanical site preparation equipment during July to September. Avoid October and November. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 171-24	All mitigation measures apply to the following stands: 171-24	All mitigation measures apply to the following stands: 171-24

Temporary Roads and landings, skid trails, logging area, site preparation and planting, and haul roads (preferred conditions-dry) (ELTP- Sil/ S12A 3	S15 S16 S17	Use short-term roads and temporary landings when the ground is frozen. (Forest Plan, pp. IV-70) The use of low ground pressure equipment (less than 13 PSI) during July and August will lessen any adverse soil impacts. (Forest Plan, pp. IV-70) Allow the use of heavy mechanical site preparation equipment during July to September. Avoid October and November. (Forest Plan, pp. IV-70)	All mitigation measures apply to the following stands: 176-33 176-34 176-39 177-11 179-17 202-1 203-25	All mitigation measures apply to the following stands: 176-33 176-34 176-39 177-11 179-17 199-41 202-1 203-25	All mitigation measures apply to the following stands: 202-1 203-25
Timber management activities within or adjacent to trails or recreation facilities	T1	Minimize skidding across designated trails. Rehabilitate skid trails upon completion. (Forest Plan, pp. IV-27)	158-1 158-8 158-9 158-33 161-15 161-18 161-19 162-12 166-28 166-32 168-28 169-44 170-41	158-1 158-8 158-9 158-33 161-15 161-18 161-30 162-12 166-28 166-32 168-28 169-44 170-41	158-1 158-9 158-33 161-15 161-18 161-19 162-12 166-28 166-32 169-44 170-41
	T2	Completely remove slash within 50 feet of campsites and picnic area at Day Lake Campground and Picnic Areas (Sensitivity Level 1). (Forest Plan, pp. IV-38)	124-19 124-21	124-19 124-21	124-21
	T3	Reduce the amount of slash to 24 inches within 50 to 100 feet of sites and trails in Day Lake Campground and Picnic Areas (Sensitivity Level 1). (Forest Plan, pp. IV-38)	124-19 124-21	124-19 124-21	124-21

	T4	Reduce the amount of slash to 48 inches within 100 to 300 feet of sites and trails in Day Lake Campground and Picnic Areas (Sensitivity Level 1). (Forest Plan, pp. IV-38)	124-19 124-21	124-19 124-21	124-21
	T5	Completely remove slash within 50 feet of the Dead Horse Trail (Sensitivity Level 2). (Forest Plan, pp. IV-38)	158-1 158-8 158-9 158-33 161-15 161-18 161-19 162-12 166-28 166-32 168-28 169-44 170-41	158-1 158-8 158-9 158-33 161-15 161-18 161-30 162-12 166-28 166-32 168-28 169-44 170-41	158-1 158-9 158-33 161-15 161-18 161-19 162-12 166-28 166-32 169-44 170-41
	T6	Conduct harvest activities within Day Lake Campground from December to March to reduce user conflicts and impacts to soils.	124-19 124-21	124-19 124-21	s 124-21

<table>
<tr>
<td>Timber management activities within the Alternative Management Areas (AMA)</td>
<td>T7</td>
<td>a. Generally the target distribution displayed in Table Y (below) will be applied on uneven-aged hardwood sites within the AMA
<table>
<tr><th></th><th>Trees/ ac</th><th>Basal Area</th></tr>
<tr><td>25” +</td><td>1.0</td><td>4</td></tr>
<tr><td>23-24.9”</td><td>2.2</td><td>7</td></tr>
<tr><td>21-22.9”</td><td>2.9</td><td>8</td></tr>
<tr><td>19-20.9”</td><td>3.9</td><td>8</td></tr>
<tr><td>17-18.9”</td><td>5.0</td><td>9</td></tr>
<tr><td>15-16.9”</td><td>6.6</td><td>9</td></tr>
<tr><td>13-14.9”</td><td>8.6</td><td>9</td></tr>
<tr><td>11-12.9”</td><td>11.2</td><td>9</td></tr>
<tr><td>9-10.9”</td><td>14.6</td><td>8</td></tr>
<tr><td>7-8.9”</td><td>19.0</td><td>7</td></tr>
<tr><td>5-6.9”</td><td>24.7</td><td>5</td></tr>
<tr><td>1-4.9”</td><td>192.0</td><td>7</td></tr>
<tr><td>TOTAL</td><td>284.7</td><td>90</td></tr>
</table></td>
<td>All mitigation measures apply to the following stands:
199-35a 200-1
200-2 200-11
202-1
202-8
202-9
202-14
202-15
202-16
203-1
203-4
203-5
203-8
203-14
203-15
203-16
203-19
203-21
203-28
203-30
203-31
204-2
204-7
204-12
204-19</td>
<td>No AMA mitigation measures apply in this Alternative</td>
<td>All mitigation measures apply to the following stands:
199-22a 199-25
199-32 199-35a
199-39 199-43
199-46 200-1
200-2 200-8
200-11 202-1
202-8 202-9
202-14 202-15
202-16 203-1
203-4
203-5
203-8
203-14
203-15
203-16
203-19
203-21
203-28
203-30
203-31
204-2
204-7
204-12
204-19</td>
</tr>
<tr>
<td></td>
<td>T7</td>
<td>b. Reserve live trees in the following distribution: 2-4 trees per acre > than or = to 17” dbh if available. Focus on the largest sizes classes present. Also, reserve 2-5 trees per acre > than or = 11-16.9” dbh if available. Emphasize species diversity especially those species such as yellow birch, red/ white oak, beech, white pine or other species which are not well represented in the stand or on the Forest.</td>
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Haul and skid roads on snowmobile trails	T8	c. Increase the probability of natural gap formation and tip-up mounds within the AMA. Promote both the retention and the development of individual trees larger than 24”in diameter (especially basswood, ash, yellow birch and red oak). d. For each disturbance event within the AMA, leave 25% of the potential salvage unharvested except where forest health and safety maybe compromised (especially within white pine). e. Within the AMA convert most of the aspen to long-lived species. f. Within the AMA the long-lived conifer dominated transtion zones (between upland and lowland) shoud be excluded from timber sales unless treatment enhances conifer component. g. Utilize reserve area or exclusions from timber sale design and lay-out to minimize impacts on ground flora, fauna and nesting birds.	157-3 157-4 157-7 157-8 158-1 158-8 158-9 158-33 161-15 161-18 161-19 162-12 162-20 166-32 166-28 168-28 169-44 170-41	157-3 157-4 157-7 158-1 158-8 158-9 158-33 161-30 161-15 161-16 161-18 162-12 162-20 166-32 166-28 168-28 169-44 170-41	157-3 157-4 157-7 158-1 158-9 158-33 161-15 161-16 161-19 162-12 162-20 166-32 168-28 169-44 170-41

Visual quality along Cty. Hwy GG (north)	V1 V2 V3	Completely remove slash within 50 feet of Cty. Hwy. GG (Sensitivity Level 1). (Forest Plan, pp. IV-38) Reduce the amount of slash to 24 inches within 50 to 100 feet of Cty. Hwy. GG (Sensitivity Level 1). (Forest Plan, pp. IV-38) Reduce the amount of slash to 48 inches within 100 to 300 feet of Cty. Hwy. GG (Sensitivity Level 1). (Forest Plan, pp. IV-38)	124-19 124-20 170-54 170-42 170-65 168-1 177-16 176-38 176-36 176-34 177-9 176-33 177-3 188-12 188-1 188-41 198-4 199-37 199-35 199-21 199-22	124-19 124-20 170-54 170-42 170-65 168-1 177-16 176-38 176-36 176-34 177-9 176-33 177-3 188-12 188-1 188-41 198-4 199-37 199-35 199-22	124-20 170-54 170-42 168-1 177-16 176-38 176-36 177-9 177-3 188-12 188-1 199-37 199-35 199-21 199-22
Visual Quality along Lakes	V4	Maintain a 200 foot wide uncut strip along lakes adjacent to clearcuts	127-17	127-17	
BMPs	W1	All applicable Best Management Practices (BMP's) as described in "Wisconsin's Forestry Best Management Practices for Water Quality Field Manual, Publication Number FR093, Wisconsin Department of Natural Resources, 1995 will be applied.	All stands and all culvert replacement sites.	All Stands, all culvert replacement sites, and the culvert removal site.	All Stands, all culvert replacement sites, and the culvert removal site.

Wetlands (areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or water loving vegetation and which has soils indicative of wet conditions. In addition, use this measure in ELTP- Pn1 and ELTP-Pa1A for temporary Roads and landings, skid trails, logging area, and haul roads a during frozen ground conditions; for site preparation and planting)	W2	Equipment operations will not take place in wetlands, except to cross during frozen conditions in order to access areas where no other means of access exists.	All stands	All stands	All Stands
Wetlands	W3	All logging slash will be kept out of wetlands.	All stands	All stands	All Stands
Wetlands	W4	Trees will not be removed from wetlands.	All stands	All stands	All Stands
Cold-water streams	W5	Discourage aspen and other vegetation attractive to beaver within 300 feet of Class I and II trout streams. Encourage long-lived timber species such as maple and spruce within the 300 foot zone along, for this project, Brush Creek and McCarthy Creek (Forest Plan, pp. IV-79).	188-11 188-41 180-30 180-28	188-41	188-11

Riparian areas	W6	Riparian Area buffer zones would run from the ordinary high water mark to the slope break where slopes adjacent to a lake or stream are greater than 10 percent.	157-21 178-20 199-25	157-21 178-20	178-20
Temporary road construction or reconstruction	W7	Designate the location of water diversion structures when it is determined that potentially erosive water runoff will take place in the road construction/ reconstruction process.	All stands needing temporary roads.	All stands needing temporary roads.	All stands needing temporary roads.
Erosion prevention construction	W8 W9	Construct erosion prevention structures during the same growing season that ground-disturbing activity occurs. Utilize erosion control practices outlined in the Soil and Water Conservation Handbook (FSH 2509.22), and "Wisconsin's Forestry Best Management Practices for Water Quality" (pub. Number FR093, Wisconsin DNR). Seed mixes for erosion control will consist of non-invasive and short-lived species to encourage native species colonization while meeting the need for erosion control. (all sites)	All stands and culvert replacement sites.	All stands, culvert replacement sites, and the culvert removal site.	All Stands, culvert replacement sites, and the culvert removal site.

Riparian Management Zone (RMZ) for Lakes and Navigable Perennial Streams* *Navigable streams have bed and banks and can be floated with a canoe on a regular or recurring basis.	W10 W11 W12 W13	For Lakes and Navigable Perennial Streams, the Riparian Management Zone (RMZ) is a strip of land running along the shoreline of lakes and on each side of streams. It begins at the ordinary high water mark and extends a minimum of 100 feet landward. (BMPs, p. 19) This includes treeless areas existing between ponds, lakes, streams and wetlands whether wet or dry. All logging slash will be kept out of stream and lake riparian management zones, the lakes themselves, stream channels, and away from areas where it may be swept into the water. Within the RMZ, at least 60 square feet of basal area per acre in trees 5 inches dbh (diameter at breast height) and larger, would be left, evenly distributed to promote large woody debris input and prevent rises in temperature of lakes and streams. Locate log landing areas outside of riparian management zones.	124-3 124-15 124-24 124-20 124-38 153-5 158-3 157-21 159-2 158-9 161-15 161-14 168-32 161-19 171-53 170-31 171-19 171-54 177-3 171-29 180-30 180-28 188-41 188-11 199-37 199-21 200-1 200-2 202-1 202-8 203-4 203-14 203-31 203-19 204-12 204-2	124-3 124-15 124-24 124-20 124-38 159-2 158-3 157-21 161-7 158-9 161-15 161-2 168-32 161-19 171-53 170-31 171-19 171-54 177-3 171-29 180-30 180-28 188-41 199-37 199-48 200-1 200-2 202-1 202-8 203-4 203-14 203-31 203-19 204-12 204-2	124-3 124-15 124-24 124-20 124-38 159-2 158-9 157-21 161-7 161-15 168-32 171-53 170-31 171-19 177-3 171-29 180-30 188-11 199-37 199-21 199-46 200-1 200-2 202-1 202-8 203-4 203-14 203-31 203-19 204-12 204-2

Riparian Management Zone (RMZ) for Navigable Intermittent Streams and Non-Navigable Streams ** **Non-navigable streams do not have bed and banks and cannot be floated with a canoe on a regular or recurring basis – even if only during spring runoff.	W14 W15 W16 W17 W18	For Navigable Intermittent Streams and Non-Navigable Streams**, the RMZ is a strip of land on each side of the stream, beginning at the ordinary high water mark and extending a minimum of 35 feet landward. This includes treeless areas existing between ponds, lakes, streams and wetlands whether wet or dry. All logging slash will be kept out of stream and lake riparian management zones, the lakes themselves, stream channels, and away from areas where it may be swept into the water. Within the RMZ, at least 60 square feet of basal area per acre in trees 5 inches DBH (diameter at breast height) and larger, would be left, evenly distributed to promote large woody debris input and prevent rises in temperature of lakes and streams. Locate log landing areas outside of riparian management zones. Operate equipment within 15 feet of the high water mark of non-navigable streams only when the ground is frozen or dry.	153-3 153-11 157-7 157-20 157-21 158-1 158-8 158-9 158-33 161-14 177-6 177-10 177-11 178-20 178-21 180-5 180-6 180-7 180-10 180-27 180-28 188-11 188-18 188-41 198-17 198-24 199-22 199-24 199-25 199-30 199-32 199-35 199-37 199-39 199-43 200-1 200-2 202-1 202-14 202-15 202-16 203-1 203-19 204-2 204-14	153-3 153-11 157-7 157-20 157-21 158-1 158-8 158-9 158-33 161-14 177-6 177-10 177-11 178-20 178-21 180-5 180-6 180-7 180-10 180-27 180-28 188-18 188-41 198-17 198-24 199-22 199-24 199-25 199-30 199-32 199-35 199-37 199-39 199-43 200-1 200-2 202-1 202-14 202-15 202-16 203-1 203-19 204-2 204-14	153-11 157-7 157-20 157-21 158-1 158-8 158-9 158-33 161-14 177-6 177-10 177-11 178-20 178-21 180-5 180-6 180-7 180-10 180-28 188-11 188-18 198-17 199-22 199-24 199-25 199-30 199-32 199-35 199-37 199-39 199-43 200-1 200-2 202-1 202-14 202-15 202-16 203-1 203-19 204-2

Lakes or streams	W19	Do not operate wheeled or tracked harvesting equipment within 50 feet of the ordinary high water mark of lakes or streams. (BMPs, p. 1)	124-3 124-15 124-24 124-20 153-5 124-38 158-3 157-21 159-2 158-9 161-15 161-14 168-32 161-19 171-53 170-31 171-19 171-54 177-3 171-29 180-30 180-28 188-41 188-11 199-37 199-21 200-1 200-2 202-1 202-8 203-4 203-14 203-31 203-19 204-12 204-2	124-3 124-15 124-24 124-20 158-3 124-38 159-2 157-21 161-7 158-9 161-15 161-2 168-32 161-19 171-53 170-31 171-19 171-54 177-3 171-29 180-30 180-28 188-41 199-46 199-37 200-2 200-1 202-8 202-1 203-14 203-4 203-19 203-31 204-12	124-3 124-15 124-24 124-20 158-3 124-38 159-2 158-9 161-15 161-19 168-32 170-31 171-53 171-54 171-19 171-29 177-3 188-11 180-30 199-21 199-37 199-46 200-1 200-2 202-1 202-8 203-4 203-14 203-31 203-19 204-12 204-2

Streams **(culvert replace-ments)**	W20	Appropriate Federal and State Water Regulatory and Army Corps permits, and Trans. 207 Agreements will be obtained prior to project implementation. A Chapter 30 (Wisconsin State Statute) permit is required to construct a ford or install a culvert or bridge across any navigable perennial or intermittent stream. This applies to modifying, repairing, or expanding existing stream crossings. (p. 9 and 23) The U.S. Army Corps of Engineers regulations will be followed and necessary permits applied for when project involves a wetland or floodplain. (p. 10)	All culvert replace-ment sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W21	Use soil stabilization practices on exposed soil at stream crossing. Use seed and mulch and install temporary sediment control structures such as straw bales or silt fences immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W22	Design, construct and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life. Bridges and arch culverts that retain natural stream bottom and slope are preferred for this reason. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W23	Install stream crossings using materials that are clean, non-erodible and non-toxic to aquatic life. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.

	W24	Minimize channel changes and the amount of excavation or fill needed at the crossing. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W25	Limit construction activity in the water to periods of low or normal flow. Keep use of equipment in the stream to a minimum. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W26	Construct a bridge or place fill directly over a culvert higher than the road approach to prevent surface road runoff from draining onto the crossing structure and into the stream. (p. 24)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W27	Divert road drainage into undisturbed vegetation, preferably outside the riparian management zone so that the drainage does not directly enter the stream. (p. 25)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W28	Stabilize approaches to bridge, culvert, and ford crossings with aggregate or other suitable material to reduce sediment entering the stream. (p. 25	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W29	Install pipe culverts long enough so that road fill does not extend beyond the end of a culvert. (pp. 25, 30)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.

	W30	Install permanent culverts that are large enough to pass flood flows and are a minimum of 12 inches in diameter. Culverts that are too small can plug up with debris and result in the road washing out or in flooding upstream. Wisconsin law states that the landowner and/or contractor are responsible to obtain a flood easement from any affected property owners upstream of culvert crossings that are not designed to pass the 100-year flood. (p. 25)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W31	Install culverts so there is no change in the stream bottom elevation. Culverts should not cause damming or pooling. (p. 26)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W32	Use riprap around the inlet of culverts to prevent water from eroding and undercutting the culvert. For permanent installations, use filter fabric under the riprap. In addition, consider using flared-end culvert sections for inlets. (p. 26)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W33	Keep culvert clear and free of debris so that water can pass unimpeded at all times. This is especially important in areas where beaver are present. (p. 27)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W34	Where necessary to protect water quality, install road drainage structures to remove storm water or seepage from the road surface and ditches. Space these structures at intervals close enough to minimize water flow volume and speed, avoiding ditch erosion. (p. 29)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.

	W35	Where necessary, provide erosion protection for outflows from road drainage structures to minimize erosion and disperse the water, allowing it to soak into the soil. Riprap, mulch, and/or seeding may be necessary. (p. 29)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W36	Install pipe culverts to provide cross drainage on road grades at regular intervals immediately above steep grades, below bank seepages, and where water will run onto log landings or forest roads. (p. 30)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W37	Install cross drain pipe culverts at grades at least 2% more than the ditch grade and angled 30 to 45 degrees to improve inlet efficiency. (p. 30)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W38	Select the size of cross-drain culverts according to the size of the road and area drained by the ditch. To avoid clogging, permanent culverts should be at least 12 inches in diameter. (p.30) (Nic-3, 5, and 11, Che-7 and 8)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W39	Install pipe culverts on a surface of compacted granular material. Firmly compact fill around culverts, particularly around the bottom half. Cover the top of the culvert with fill to a depth of one third of the pipe diameter, or at least 12 inches (whichever is greater) to prevent crushing. (pp. 26, 31)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W40	Use mulch and/or seed where necessary to minimize soil erosion into streams, lakes and wetlands. (p. 34)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.

	W41	Install sediment control structures where necessary to slow the flow of runoff and to trap sediment until vegetation is established at the sediment source. Sediment control structures include straw bale fencing, silt fencing, and sediment traps. (p. 35)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
	W42	Maintain, clean, or replace sediment control structures until areas of exposed soil are stabilized. (p. 35)	All culvert replacement sites.	All culvert replacement sites, and the culvert removal site.	All culvert replacement sites, and the culvert removal site.
Cold-water streams	W43	No instream activity will take place between September 15th and April 15th to protect trout spawning areas.	The culvert replacement sites on Brush Creek and the tributary to Brush Creek. Includes the following stands: 188-41 198-27	The culvert replacement sites on Brush Creek and the tributary to Brush Creek. Includes the following stands: 188-41 198-27	The culvert replacement sites on Brush Creek and the tributary to Brush Creek. Includes the following stands: 188-41 198-27

6.4 Appendix D- Biological Assessments and Evaluation

I. INTRODUCTION

A. Purpose

The purpose of this evaluation is to review the proposed Forest Service action and all alternative actions for the Cayuga project in sufficient detail to determine if these actions may affect any species on the Regional Forester Sensitive Species (RFSS) list or their habitat. The Forest Service Manual (2672.4) requires a review of all Forest Service planned, funded, executed, or permitted programs and activities for potential effects on endangered, threatened, proposed, or sensitive species. The biological evaluation is the means of conducting the review and of documenting the findings for RFSS.

The Forest Service Manual (FSM 2670.15) defines sensitive species as "those plants and animal species identified by a Regional Forester for which population viability is a concern as evidenced by a) significant current or predicted downward trends in numbers and density" and "b) significant current or predicted downward trends in habitat capability that would reduce a species existing distribution."

Sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat and on the viability of the species as a whole (Forest Service Manual 2672.1).

The list of RFSS species evaluated was identified in cooperation with the USDI Fish and Wildlife Service, Wisconsin Department of Natural Resources, the state Natural Heritage Program, The Nature Conservancy, USDA Forest Service Eastern Region TES staff, and other species experts outside the agency.

See the 2001 Biological Evaluation Reference Document for more detailed information on species status, species considered, requirements, management guidelines, and bibliography used to complete this site specific Biological Evaluation.

B. Description of Project Area

The project area includes 32,338 acres of National Forest System lands within the project area, including a variety of upland and lowland forest and non-forest types. Two landforms, ground moraines and silt-capped drumlin hills dominate the topography within the project area. The vegetation on these landforms has changed over time. Past timber harvest within this area included extensive pine logging and slash fires prior to the turn of the century. This was followed by hemlock and hardwood logging and slash fires after the turn of the century until the mid 1930's. Post logging slash fires changed the composition of hemlock/hardwood dominated stands to aspen/birch/fir or even-aged second-growth hardwoods. There is no evidence of past intensive logging in the lowland conifer forests, although it is likely that they were entered by loggers and the best quality trees, particularly cedar, were removed.

The Cayuga project area is located within three 5th level watersheds, the Upper Bad River, Marengo River, and West Fork Chippewa River. Most of the streams within the project area are small headwater streams, with primarily warm or cool water. There are several smaller lakes, as well as Day Lake, a large impoundment on the West Fork Chippewa.

The project area is located within Goal Area 1 (aspen management emphasis) and Goal Area 2 (uneven-age hardwood management emphasis), as identified in the 1986 Chequamegon National Forest Land and Resource Management Plan (Forest Plan). Paved roads within or adjacent to the project area include portions of County Road GG, State Highway 13/77, State Highway 77, and County Road M. The remainder of the roads within the project area are a combination of gravel and native surface arterial, collector, and local roads.

C. Project Description and Location

The Cayuga project area is located northwest of Glidden, Wisconsin, entirely within Ashland County. The project area is located within T43N, R2W, Sections 6-7, 16-20, and 29; T43N, R3W, Sections 1-18, and 23-24; T43N, R4W, Sections 1-3, 10-23, and 27-33; T43N, R5W, Section 24; T44N, R3W, Sections 19-23 and 26-35; and T44N, R4W, Sections 23-27 and 34-36.

Proposed project area activities include a variety of timber management, wildlife and fish habitat, recreation, transportation, and watershed improvement projects. The following is a summary of proposed activities (for a more detailed description of activities, see the Purpose and Need For Action, or the Description of Alternatives sections in the Environmental Impact Statement):

A variety of timber harvest projects, including clearcutting, selection cutting, shelterwood harvest, and commercial thinning of both hardwoods and conifer.

Conversion of aspen to other forest types by methods such as thinning, shelterwood harvest, and underplanting.

Maintenance of existing upland openings.

Treatment to reduce an infestation of leafy spurge.

Road maintenance, road decommissioning, and temporary road construction.

Habitat improvement activities in McCarthy Creek, a Class II trout stream.

Watershed improvement through replacement of culverts and road drainage improvements.

Relocation of a snowmobile trail.

Regional Forester Sensitive Species					
Species	*Common Name*	*Status **	*Known Occur-rence***	*Potential Habitat Y/N*	*Survey C-ompleted P - lanned N - one*
Martes americana	American pine marten	G5,S3,SE	C	Y	C
Accipiter gentilis	Northern goshawk	G5,S2N,S2S3B,SC	C	Y	C
Ammodramus leconteii	LeConte's sparrow	G4,S2B,SC	M	Y	C
Bartramia longicauda	Upland sandpiper	G5,S2B,SC	N	N	N
Buteo lineatus	Red-shouldered hawk	G5,S1N,S3S4B,ST	C	Y	C
Catharus ustulatus	Swainson's thrush	G5,S2B,SC	C	Y	C
Chlidonia niger	Black tern	G4,S3B,SC	M	Y	N
Cygnus buccinator	Trumpeter swan	G4,S1B,SE	C	Y	C
Dendroica cerulea	Cerulean warbler	G4,S2S3B,ST	M	Y	C
Falcipennis canadensis	Spruce grouse	G5,S2B,S1S2N,ST	C	Y	C,P
Oporornis agilis	Connecticut warbler	G4,S3B,SC	C	Y	C
Picoides arcticus	Black-backed woodpecker	G5,S2B,SC	C	Y	C
Tympanuchus phasianellus	Sharp-tailed grouse	G4,S2,SC	N	N	N
Clemmys insculpta	Wood turtle	G4,S3,ST	N	N	N
Acipenser fulvenscens	Lake sturgeon	G3,S3,SC	N	N	N
Moxostoma valenciennesi	Greater redhorse	G3,S2S3,ST	N	N	N
Notropis nogenus	Pugnose shiner	G3,S2S3,ST	N	N	N
Venustaconsha ellipsiformis	Ellipse mussel	G3G4,S2,ST	N	N	N
Gomphus viridifrons	Green-faced clubtail	G3,S3,SC	M	Y	N
Incisalia henrici	Henry's elfin butterfly	G5,S2,SC	M	Y	N
Lycaeides idas nabokovi	Northern blue butterfly	G5,S1,SE	N	N	N
Oeneis chryxus	Chryxus arctic	G5,S2,SC	N	N	N
Ophiogomphus anomalus	Extra-striped snaketail	G3,S1,SE	N	N	N
Ophiogomphus howei	Pygmy snaketail	G3,S3,ST	N	N	N
Phyciodes batesii	Tawny crescent spot	G4,S3,SC	N	N	N
Pieris virginiensis	West Virginia white	G4,S2,SC	N	N	N
Stylurus scudderi	Zebra clubtail	G3,G4,S3,SC	N	N	N
Plants					
Amerorchis rotundifolia	Small,round-leaved orchis	G5,S1,ST	N	N	N
Arabis missouriensis var deamii	Missouri rock cress	G4?QT3?Q,S3,SC	N	N	N
Asplenium viride or A. trichomanes-ramosum ***	Green spleenwort	G4,S1,SE	N	N	N
Astragalus alpinus	Alpine milk vetch	G5,S1,SE	N	N	N
Botrychium minganense	Mingan's moonwort	G4,S2,SC	N	N	C
Botrychium mormo	Goblin fern	G3,S2,SE	N	N	C
Botrychium oneidense	Blunt-lobed grapefern	G4Q,S2,SC	M	Y	C
Botrychium rugulosum (ternatum)	St. Lawrence(Ternate) grapefern	G3,S2,SC	N	N	N
Callitriche hermaphroditica	Autumnal water-starwort	G5,S2,SC	N	N	N
Calypso bulbosa	Calypso orchid - Fairy slipper	G5,S2,ST	M	Y	C
Carex assiniboinensis	Stoloniferous sedge	G4G5,S2,SC	M	Y	C
Carex backii	Rocky mountain sedge	G4,S2,SC	N	N	N
Carex crawei	Crawe's sedge	G5,S2,SC	N	N	N
Carex gynocrates	Northern bog sedge	G5,S2,SC	N	N	N
Carex livida v.radicaulis	Livid sedge	G5,S2,SC	N	N	N
Carex michauxiana	Michaux's sedge	G5,S1,ST	N	N	N
Carex sychnocephala	Many-headed sedge	G4,S2,SC	N	N	N
Carex vaginata	Sheathed sedge	G5,S1,SC	N	N	N
Ceratophyllum echinatum	Prickly hornwort	G4,S2,SC	N	N	N
Cynoglossum virginianum var boreale	Northern wild comfrey	G5T4	N	N	C

Cypripedium arietinum	Ram's head lady's slipper	G3,S1,ST	M	Y	C
Diplazium pycnocarpon	Glade fern	G5,S2,SC	N	N	N
Dryopteris expansa	Spreading woodfern	G5,S1,SC	M	Y	C
Dryopteris filix-mas	Male fern	G5,S1,SC	N	N	N
Dryopteris fragrans v.remotiuscula	Fragrant fern	G5T?,S2,SC	N	N	N
Eleocharis olivacea	Capitate spikerush	G5,S2,SC	N	N	N
Eleocharis quinqueflora	Few-flower spikerush	G5,S2,SC	N	N	N
Epilobium palustre	Marsh willow herb	G5,S2,SC	N	N	N
Equisetum palustre	Marsh horsetail	G5,S2,SC	N	N	N
Eriophorum chamissonis	Rusty cotton-grass	G5,S2,SC	N	N	N
Geum macrophyllum var macrophyllum	Large-leaved avens	G5T?,S1,SC	N	N	N
Juglans cinerea	Butternut	G3G4,S3,SC	N	N	N
Juncus stygius L.	Bog (moor) rush	G5,S1,SE	N	N	N
Leucophysalis grandiflora	Large-flowered ground cherry	G3?,S2,SC	N	N	N
Littorella americana	American shore-grass	G5,S2,SC	N	N	N
Malaxis brachypoda ***	White adder's mouth	G4Q,S2,SC	M	Y	C
Medeola virginiana	Indian cucumber-root	G5,S3,SC	N	N	N
Moehringia macrophylla	Large-leaved sandwort	G4,S1,SE	N	N	N
Myriophyllum farwellii	Farwell's water milfoil	G5,S2,SC	N	N	N
Oryzopsis canadensis	Canada mountain-ricegrass	G5,S1,SC	N	N	N
Panax quinquifolius	Ginseng	G4,S4,SC	M	Y	C
Parnassia palustris	Marsh grass-of-parnassus	G5,S1,ST	N	N	N
Polemonium occidentale ssp. lacustr	Western Jacob's ladder	G5?T1Q,S1,SE	N	N	N
Polystichum braunii v.purshii ***	Braun's holly fern	G5,S2,ST	M	Y	C
Potamogeton confervoides	Algae-like pondweed	G3G4,S1,ST	N	N	N
Potamogeton hillii	Hill's pondweed	G3,S1,SC	N	N	N
Pyrola minor	Lesser wintergreen	G5,S1,SE	M	Y	C
Ranunculus gmelinii v.hookeri	small yellow water crowfoot	G5TUQ,S1, SE	N	N	N
Rhynchospora fusca	Brown beakrush	G4G5,S2,SC	N	N	N
Streptopus amplexifolius	White mandarin	G5,SU,SC	N	N	N
Tiarella cordifolia	Foamflower	G5,S1,SE	N	N	N
Ulmus americana	American elm	G5?	N	N	N
Vaccinium cespitosum	Dwarf huckleberry	G5,S1,SE	N	N	N
Valeriana uliginosa ***	Marsh valerian	G4G5,S1,ST	N	N	N

<u>Additional species considered: "Likely to Occur"</u>

The Eastern Region of the Forest Service recently revised its Regional Forester Sensitive Species list, effective 2/29/2000. At the time of the updating, Forests were instructed to consider in project analyses only those species documented to occur within their respective Forest boundaries. Subsequently, additional direction was provided by the Office of Inspector General (OIG) to also consider those species that are "likely to occur", even if they are not currently documented to occur, if those species are listed as Sensitive by other Forests. Taxa are considered likely to occur on the Chequamegon-Nicolet National Forest if their range includes the Chequamegon-Nicolet, their preferred habitat is present, and occurrences are known in the general vicinity of the Forest. This list currently includes the following species, considered in this BE.

Scientific name	Common name	Rank and State status	Occur-rence*	Habitat potential	Survey activity
Animal species					
Myotis septentrionalis	Long-eared myotis	G4 S4	M	Y	N
Pipistrellus subflavus	Eastern pipistrelle	G5 S3S4	M	Y	N
Plethobasus cyphyus	Bullhead mussel	G2G3 S1 SE	N	N	N
Somatochlora forcipata	Forcipate emerald	G5 S2S3	N	N	N
Plant species					
Cardamine maxima	Large toothwort	G5 S1 ST	N	N	N
Carex lenticularis	Shore sedge	G5 S1 ST	N	N	N
Disporum hookeri	Hooker's mandarin	G4G5	N	N	N

Eleocharis engelmannii	Engelmann's spike-rush	G4? S2	N	N	N
Listera auriculata	Auricled twayblade	G3 S1 SE	N	N	N
Listera convallarioides	Broad-leaved twayblade	G5 S1 ST	N	N	N
Petasites sagittatus	Arrow-leaved sweet colt's-foot	G5 S2 ST	N	N	N
Platanthera flava var herbiola	Pale-green orchid	G4T4Q S1 ST	N	N	N
Poa paludigena	Bog bluegrass	G3 S1 ST	M	Y	C
Potamogeton pulcher	Spotted pondweed	G5 S1 SE	M	Y	N
Pterospora andromeda	Giant pinedrops	G5 S1 SE	N	N	N
Ranunculus lapponicus	Lapland buttercup	G5 S1 SE	M	Y	C

* Status Codes

Global Element Rank:

G1 - Critically imperiled globally

G2 - Imperiled globally

G3 - Very rare and local throughout range

G4 - Apparently globally secure, rare in parts of range

G5 - Demonstrably secure globally, rare locally

State Element Rank:

S1 - Critically imperiled

S2 - Imperiled

S3 - Rare or uncommon

SA - Accidental

SH - Historical occurrence

S#B - Long-distance migrant, breeding status

S#N - Long-distance migrant, non-breeding status

State Status:

SE - State endangered

ST - State threatened

SC - State special concern

** Categories:

1. **C**onfirmed: Species has been observed within or near (within 0.25 miles) the proposed project area; a documented occurrence is on file for uncommon or rare species.

2. **P**robable: Habitat is suitable; species has been documented on the Forest but not necessarily within project/proposed project area. Likelihood of occurrence is high. (Consideration is given to transient species such as eastern timber wolf.)

3. **M**inimal: Some habitat exists, species may or may not have been documented on Forest. Likelihood of occurrence within the project area or proposed project area is low.

4. **N**one: Species may occur within region, but has no recent record of occurrence on the Great Divide Ranger District, and/or suitable habitat in the project area does not exist.

*** Scientific name may not be uniformly accepted.

SUMMARY: The following species are known to occur in the project area, or have the potential to occur (potential habitat exists within the project area), as shown on the preceding tables. They will be evaluated in more detail below.

Regional Forester Sensitive Species

Martes americana – American pine marten

Accipiter gentilis – Northern goshawk

Ammodramus leconteii – LeConte's sparrow

Buteo lineatus – Red-shouldered hawk

Catharus ustulatus – Swainson's thrush

Chlidonia niger – Black tern

Cygnus buccinator – Trumpeter swan

Dendroica cerulea – Cerulean warbler

Falcipennis canadensis – Spruce grouse

Oporornis agilis – Connecticut warbler

Picoides arcticus – Black-backed woodpecker

Gomphus viridifrons – Green-faced clubtail

Incisalia henrici – Henry's elfin butterfly

Botrychium oneidense – Blunt-lobed grapefern

Calypso bulbosa – Calypso orchid (fairy slipper)

Carex assiniboinensis – Stoloniferous sedge

Cypripedium arietinum – Ram's head lady's-slipper

Dryopteris expansa – Spreading woodfern

Malaxis brachypoda – White adder's mouth

Panax quinquefolius – Ginseng

Polystichum braunii – Braun's holly fern

Pyrola minor – Lesser wintergreen

"Likely to occur" species

Myotis septentrionalis - Northern (long-eared) myotis

Pipistrellus subflavus - Eastern pipistrelle

Poa paludigena – Bog bluegrass

Potamogeton pulcher – Spotted pondweed

Ranunculus lapponicus – Lapland buttercup

III. SPECIES SURVEY RECORD

The following surveys within the project area have been completed:

Rare plant surveys in 1980 and 1981 by Stephen Solheim, Robbin Moran, William Alverson, Mark Jaunzems, and Donald Quintenz (under contract to Chequamegon National Forest). Surveys were Forest-wide, but included sites in the project area.

Field surveys were completed of the McCarthy Lake and Cedars RNA in 1986, in conjunction with preparation of the Establishment Record. A breeding bird survey and listing of vascular plants was completed.

Forest botany staff conducted sensitive plant surveys on approximately 3777 acres within the project area, during the 2001 field season. Ecological Land-type Phase maps were used to pre-screening potential habitat. Surveys were conducted on sites determined to have medium or high potential for listed plants, using an intuitive-controlled meander search method. Surveys were confined to areas potentially affected by project activities. One sensitive plant species was found, and an active goshawk nest was discovered during one of the surveys.

Songbird surveys were completed on approximately 1883 acres of potential habitat, during June of 2001. The surveys were completed by an experienced birder under contract to the Forest Service. Pre-screening of potential habitat was done using criteria established by Forest biologists, and included factors such as stand age, type, structure, patch size, and presence of within-stand or adjacent features. In addition to potential habitat, surveys were focused on stands proposed for harvest, or areas adjacent to proposed harvest areas. Surveys were conducted using a combination of a stand "walk-through" and 3-minute counts utilizing playback tapes. Identification of listed birds was by visual and/or audio confirmation.

Woodland hawk (northern goshawk, red-shouldered hawk) surveys were completed on approximately 2776 acres of potential habitat, in spring of 2001. The surveys were completed by a combination of Forest Service personnel and a private contractor. Pre-screening of potential habitat was done using criteria established by Forest biologists, and included factors such as stand age, type, structure, patch size, and presence of within-stand or adjacent features (such as conifer component or nearness to water). Surveys were conducted using a combination of a stand "walk-through" and a minimum of one extended stop with call playback for every 40 acres surveyed, and were limited to areas proposed for harvest activities.

Additional species-specific surveys conducted by the Wisconsin Department of Natural Resources (WDNR) or other agencies are listed as part of individual species discussions. The State Natural Heritage Program data, as well as district wildlife and TES records, were consulted for known species locations within the project area. The preparing biologist has visited the site, and conducted at a minimum a project area inspection for TES species and their habitat.

IV. STATUS OF SPECIES EVALUATED; POTENTIAL EFFECTS ON SPECIES

(Note: this section discusses status of species relative to project area only; for more detail on status of species Forest-wide and range-wide, see 2001 Biological Evaluation Reference Document, on file at Great Divide district offices)

***Martes Americana* – American pine marten**

Pine marten were recently reintroduced to the Chequamegon National Forest, starting in 1987. Three release sites were used, including one within the project area; the other two were nearby to the west. Since the release, marten have been slow to expand their population and range, and currently most marten on the Chequamegon National Forest are still found in the general area of the releases, in the northern portion of the Great Divide district. Recent trapping and telemetry work has identified several marten home ranges that include the northern portion of the project area.

Some of the primary needs for this species appear to be well-developed structural features and habitat continuity. Marten lack a strong dispersal capability; this can be aggravated by fragmentation of suitable habitat (Jon Gilbert, from a presentation at the Wisconsin Chapter of the Wildlife Society winter conference, 3/1/2001). Structural features, including large woody debris, abundant fine debris, large cavity trees, and tip-ups are important for cover, protection from predators, and maternal den trees. Any activity or natural process that removes or alters these features can make areas unsuitable for marten use.

Alternative 1 would have no effect on marten or marten habitat since no action would occur. Alternatives 2-4 could have varying effects on marten and marten habitat due primarily to proposed clearcutting, and the resulting effects on forest structure. As mentioned above, structural features, including many common to mature and old growth forests, are an important component of marten habitat. Clearcutting reduces many of these habitat features within the treated stand, due to whole tree removal, loss of at least some of the cavity trees and snags, and potential for loss of large woody debris. Forest plan guidelines that specify retention of snags and cavity trees would help maintain some of these features, but the major change in overall structure would likely make the stands unsuitable for marten until the stands regenerate. Such treatments can also affect dispersal routes.

Alternative 3 would have the greatest effect since it involves the most clearcutting. Another feature of this alternative is the greater use of clearcutting in the band of forest north of FR 184 and east of County Highway GG that is dominated by mature hardwoods. This area is considered a potential dispersal route because of the relatively continuous mature hardwood forest (Jon Gilbert, pers. comm.) This is also the general area where several marten home ranges were mapped during recent telemetry work. Alternative 3 proposes the clearcut harvest of eight stands within this area, potentially affecting marten dispersal routes. Neither Alternative 2 nor 4 propose any clearcuts within this area.

The southern portion of the project area does not appear to have the same use by marten as the northern portion, as evidenced by track surveys and research related trapping success. Although the reasons for this lack of use are not known, habitat factors are suspected. The southern portion of the project area contains a higher proportion of aspen, including regenerating aspen, which can affect marten use and dispersal. Current work indicates a preference by marten for large unbroken tracts of mature northern hardwoods (Jon Gilbert, pers. comm.). The action alternatives, particularly Alternative 3, would perpetuate the fragmented condition of this portion of the project area.

Other project area activities would not have noticeable effects on marten. Hardwood selection cutting is reported to have little effect, if suitable structural features are retained (SVE data). Road decommissioning proposed in all action alternatives would eventually reduce open-road densities, possibly benefiting the species from reduced disturbance and accidental take.

Cumulative effects: Past management within and near the project area activities would not have noticeable effects on marten. Hardwood selection cutting is reported to have little effect, if suitable structural features are retained (SVE data). Road decommissioning proposed in all action alternatives would eventually reduce open-road densities, possibly benefiting the species from reduced disturbance and accidental take.

Past management within and near the project area, combined with proposed activities and possible future activities, will likely maintain a fragmented condition, with a relatively high aspen component, in the southern portion of the project area. This would have the effect of making the area less suitable for marten use, and/or reducing the possibility of

dispersal to other areas further south and east. The northern portion of the project area however (roughly the northern half of the project area, but especially north of FR 184) has been managed recently to stress interior hardwood forest; all of the alternatives except Alternative 3 would maintain this emphasis. This would provide an extensive area of continued marten habitat, and would maintain the area as a potential dispersal corridor to the east.

Determination: May impact individuals but not likely to cause a trend towards Federal listing or a loss of viability.

***Myotis septentrionalis* - Northern (long-eared) myotis**

This species is nationally widespread but has irregular distribution. It is sparsely distributed in Wisconsin; possibly more abundant in the northern part of the state (Jackson County). There have been no documented occurrences on the Chequamegon-Nicolet National Forest, but one was reported to State Lab of Hygiene from the Minoqua area. This species has been found in mines in the Iron Mountain, MI area; since they can easily travel 50-70 miles in seasonal movements, it is likely to occur at least on the Nicolet. Northern (long-eared) myotis could occur anywhere on the Chequamegon-Nicolet that contains mature forest types.

This species is generally associated with forested communities, especially older age riparian and bottomland forests. It possibly uses small gaps and openings for foraging. Snags and loose-barked trees are important for summer roosting, especially in close proximity to water. They change their roosting sites often, so they appear to need a large number of suitable roost trees (Foster and Kurta, 1999).

One of the major threats to this species is loss of hibernacula, such as due to closure or disturbance of mine sites. There is the potential of threats from habitat disturbance, such as loss of roost trees due to logging. Suitable management would include maintaining forests that provide a large number of mature trees, snags, cavity trees, and loose-barked trees, especially in close proximity to water.

Alternative 1 would have no effect on Northern (long-eared) myotis or their habitat since no action would occur. Alternatives 2-4 could have varying effects on Northern (long-eared) myotis or their habitat due primarily to proposed clearcutting, and the resulting effects on forest structure. Clearcutting removes at least some of the cavity trees and snags in the harvest units. Forest plan guidelines that specify retention of snags and cavity trees would help maintain some of these features, but the major change in overall structure would likely make the stands unsuitable for Northern (long-eared) myotis until the stands regenerate. Alternative 3 would have the greatest effect since it involves the most clearcutting. Other project area activities would not have noticeable effects on Northern (long-eared) myotis.

Cumulative effects: Past management within and near the project area, combined with proposed activities and possible future activities, will likely maintain a fragmented condition, with a relatively high aspen component, in the southern portion of the project area. This would have the effect of making the area less suitable for Northern (long-eared) myotis. The northern portion of the project area (roughly the northern half of the project area, but especially north of FR 184) has been managed recently to stress interior hardwood forest; all of the alternatives except Alternative 3 would maintain this emphasis. This would provide an extensive area of continued Northern (long-eared) myotis habitat.

Determination: May impact individuals but not likely to cause a trend towards Federal listing or a loss of viability.

***Pipistrellus subflavus* - Eastern pipistrelle**

The Eastern pipistrelle is one of the most commonly encountered bat species in the Ohio River valley. It is consistently found in several mines in the Upper Peninsula of Michigan in small numbers (Jackson, 1961) and is likely present on the Chequamegon-Nicolet National Forest in low numbers. As of 1998 there were records of only 24 individuals in Michigan; however, their small size and habit of roosting individually probably result in undercounting (Unger and Kurta, 1998). In summer they are generally solitary except for small nursery groups.

Eastern pipistrelles migrate the shortest distance of all area bats, but would still be within migrating range of both the Nicolet and Chequamegon. They are thought to be very local, not moving more than 30 miles on a seasonal basis. They are at the northern edge of their range on the Chequamegon-Nicolet National Forest, and are more common in southwestern Wisconsin, where they occur regularly.

The Eastern pipistrelle prefers partly open country with large trees, or woodland edges. They avoid deep woods and

open fields (NatureServe). The presence of snags and hollow trees is important. They prefer hibernacula with stable moisture and temperature conditions. The biggest threats are loss of hibernacula, due to closure of mines, and loss of individual bats during hibernation due to disturbance. Mines are important in providing suitable hibernation conditions. This species probably didn't occur in this area historically except for occasional vagrants, because natural caves suitable as hibernacula for this species apparently do not exist in northern Wisconsin or upper Michigan (Unger and Kurta, 1998). Any activity that results in reduction of large snags and hollow trees could impact summer roosting habitat.

Alternative 1 would have no effect on Eastern pipistrelles or their habitat since no action would occur. Alternatives 2-4 could have varying effects on Eastern pipistrelles or their habitat due primarily to proposed clearcutting, and the resulting effects on forest structure. Clearcutting removes at least some of the cavity trees and snags in the harvest units. Forest plan guidelines that specify retention of snags and cavity trees would help maintain some of these features, but the major change in overall structure would likely make the stands unsuitable for Eastern pipistrelles until the stands regenerate. Alternative 3 would have the greatest effect since it involves the most clearcutting. Other project area activities would not have noticeable effects on Eastern pipistrelles.

Cumulative effects: Past management within and near the project area, combined with proposed activities and possible future activities, will likely maintain a fragmented condition in the southern portion of the project area. This would have little effect on Eastern pipistrelles, since they prefer partly open habitats.

Determination: May impact individuals but not likely to cause a trend towards Federal listing or a loss of viability.

***Accipiter gentilis* – Northern goshawk**

There were no active goshawk territories known in the project area until recently. In the summer of 2001 a plant surveyor discovered an active goshawk nest in a stand of mixed hardwood/hemlock, close to a stand of mixed lowland conifers. When the nest was located, there was an adult with one fledgling nearby. Shortly after that the birds were seen by the contract bird surveyor. There is an old road adjacent to the nest; it is grown in and impassable by even four-wheel drive trucks, but it does get intermittent ATV use, probably during fall hunting seasons.

Alternative 1 would have no effect since no action would occur. Alternatives 2-4 include selection harvest of some hardwood stands adjacent to the nest area, including a stand within 250 feet of the nest. Alternative 3 includes selection harvest of the stand containing the nest. In addition, the woods road that goes past the nest is proposed for maintenance to allow timber hauling from nearby stands.

The activities as originally proposed would have detrimental effects on the territory, likely leading to abandonment of the nest. The greatest impacts would come from improvement of the woods road adjacent to the nest, and from the harvest of the stand containing the nest. There would be direct effects if any of the activities within the territory occurred during the nesting or brood-rearing season, approximately mid-February to early August. There could also be indirect effects due to timber harvest within the territory. Most of the hardwood stands within the Compartment proposed for harvest are far enough from the nest to avoid adverse effects; however, harvest in the closest stands would potentially affect the quality of the nesting area habitat. Nesting goshawks seem to prefer dense cover in the nesting area, with mature continuous canopy and mature conifer providing protection for foraging adults and for fledgling birds. Transitions between uplands and lowland conifer types are particularly important for protection and foraging.

The improvement of the road could also cause longer-term indirect effects, by increasing human use of the area, leading to increased disturbance during the nesting and brood-rearing season. Excess disturbance can cause birds to leave their nests long enough for eggs or young to be susceptible to exposure or predation.

A number of other stands were surveyed for goshawks, but no activity was noted. Most of the stands surveyed, although they met the current Forest criteria for potential habitat, were determined during field work to be low potential for nesting and foraging by goshawk, due to general stand structure and lack of conifer cover. There were some stands however that appeared to have moderate or high potential for goshawk use. Selection cutting activities as proposed in Alternatives 2-4 could have temporary effects on potential habitat, by opening up the canopy of these stands sufficiently to reduce cover and increase competition or predation from great horned owls or red-tailed hawks. Within a few years though the canopy would return to a closed condition, providing more secure conditions.

A conifer component is a very important aspect of potential habitat. None of the proposed selection harvests would

involve removal of mature, long-lived conifer.

Clearcutting can reduce habitat quality at a landscape scale if it produces a highly fragmented condition. The majority of clearcutting proposed, with the exception of Alternative 3, would not result in substantial fragmentation of larger hardwood blocks in the project area. Some regenerating stands in the landscape can help provide a diversity of prey species important for fledgling and adult birds.

Due to the reasons described above, no long-term adverse effects are predicted for potential habitat.

Cumulative effects: There has been some disagreement over the status of the goshawk in northern Wisconsin. One study (Erdman et al., 1998) expressed concern over falling productivity, with predation by fisher considered a major factor, accounting for most of the productivity loss of studied nest sites. Another study (Rosenfield et al., 1998) found goshawks nesting in a wide range of habitats, including more heavily fragmented forests to the south, with no evidence of range contraction as might be expected if the state's breeding population was decreasing.

There does seem to be general agreement that certain habitat characteristics are important, including conifer component (which provides cover especially in harsh spring weather), a fairly high degree of canopy closure, and protection of the actual nest site (to prevent abandonment through disturbance, and to avoid increasing the potential for predation).

Although one active territory was discovered during the 2001 season, many of the stands thought to have the highest potential for goshawk activity were found to be relatively low quality habitat, due to lack of species diversity (primarily lack of mature conifer component) and lack of structural features (report from Tom Doolittle, Bad River Band of Lake Superior Chippewa biologist and contract surveyor). Much of the hardwood forest within the project area, while considered silviculturally mature, is still a relatively young, recovering forest, with even-age structure, and lacking quality cover, nest sites, and foraging habitat. In time, these forests should grow to be better nesting habitat. Proposed hardwood management, together with future management, can have the effect of temporarily reducing habitat quality further; however, the increased growth and species diversity that can result from management should have a long-term effect of at least maintaining habitat quality, or improving it. Any known nest sites have been, and will continue to be protected from disturbance.

Portions of the project area have been heavily managed towards aspen. These same areas are also proposed for more clearcutting in this project. For this reason these areas may continue to be less than optimal habitat, due to the lower percentage of mature forest type, and the general fragmentation of habitat.

Determination: May impact individuals but not likely to cause a trend towards federal listing or loss of viability.

Ammodramus lecontei – LeConte's sparrow

This species prefers open grassland, sedge meadow, and shallow marsh. It has not been recorded in the project area although potential habitat exists in some open wetlands. None of the proposed activities would impact these wetland habitats, therefore there would be no direct, indirect, or cumulative effects on this species.

Determination: No impact.

Buteo lineatus – Red-shouldered hawk

There is only one record of a red-shouldered hawk from recent years within the project area, seen during breeding bird surveys in 1986, during assessment of the McCarthy Lake area for potential RNA designation. Project related woodland hawk surveys included 1921 acres of stands considered potential habitat for this species; no activity was noted. Habitat needs for this species are somewhat similar to that for northern goshawk, with important features being continuous mature forest canopy, presence of conifer, open understory, and wetland interspersion. The availability of wetlands is particularly important for this species, with nests generally being found near water. Telemetry studies indicate red-shouldered hawks spend most of their time in forested landscapes associated with water, with small non-forest wetlands being primary foraging sites (Jacobs et al., 2001).

Potential threats to this species include habitat alterations, predation, competition, and disturbance. Availability of nest site habitat appears to be the greatest limiting factor for red-shouldered hawks (Jacobs et al., 2001). Timber cutting in particular can affect nesting habitat, if it removes suitable mature forest, or affects the quality of habitat by fragmentation of continuous forest. Clearcutting or heavy selection cutting can also increase the potential for predation by species such

as raccoon or great horned owl, or competition from species such as red-tailed hawk. A small amount of open area can be tolerated, and can help provide a diversity of prey.

Alternative 1 would have no effect on red-shouldered hawks or potential habitat since no activity would occur. Alternatives 2-4 would not have any direct effects since no red-shouldered hawks are known to inhabit the project area. These alternatives could have temporary indirect effects by selection cutting of stands considered potential habitat, due to reduction of canopy closure. Information provided as part of the Species Viability Evaluation for the Chippewa, Superior, and Chequamegon-Nicolet National Forest Plan Revisions (SVE data) indicates that reducing the canopy closure below 70% can be detrimental; typical selection cuts on the Forest do not reduce the canopy to this level. Clearcutting as proposed in Alternative 3 could fragment some larger areas of mature hardwood/lowland conifer mix, reducing the quality of these areas as potential habitat. Alternatives 2 and 4 do not propose the same level of clearcutting, and therefore maintain some large continuous blocks of habitat, in particular north of FR 184, and northwest of Spillerberg Lake.

Cumulative effects: There are even fewer records of red-shouldered hawk activity on the Great Divide district than goshawk activity, with the reasons not fully known. This area is reaching the edge of the range for the bird, with known nest sites within the Forest dropping off from south to north, and more sites known from the Nicolet than the Chequamegon land base. SVE data suggests that a viable population is likely on the Nicolet, but not on the Chequamegon.

With this background, it is difficult to assess the cumulative effects of any project on the red-shouldered hawk. What can be said is that the quality of habitat from this project and other similar projects in the area will essentially maintain the necessary habitat requirements in the short-term, and possibly improve habitat over the long term, due to potential for reduction of aspen management in the northern portion of the project area, and gradual growth and maturing of the hardwood forests, with resulting improved structure.

Determination: No impact (compared to existing condition).

Catharus ustulatus – Swainson's thrush

Indirect effects from all action alternatives would probably be minor. Swainson's thrush is generally found in extensive areas of northern hardwood/conifer or lowland conifer. These forest types would not be heavily affected by clearcutting or other fragmentation. An exception is Alternative 3, which proposes a greater degree of clearcutting, including some clearcuts within larger hardwood blocks. A conifer understory within hardwood stands could be temporarily affected by selection cutting, but the long-term effect could be an improvement in understory development, due to greater light penetration.

Cumulative effects: There are two general habitat types favored by Swainson's thrush, mature mixed hardwood/conifer, and mature lowland conifer. Lowland conifer escaped the massive disturbance that affected most upland areas at the turn of the century, and remains relatively unaltered, with natural features and species assemblages basically in place. The trend will likely continue for this type, providing secure nesting habitat for this species and others. The mature mixed hardwood/conifer type has typically been managed by selection harvest, and this is likely to remain the case for most stands of this type within the project area. This type of harvest has minimal long-term impacts to the forest compared to clearcutting, while encouraging increased growth of remaining trees, and encouraging growth of understory species. The cumulative effects of this project and other similar projects therefore include the potential for some short-term direct effects from disturbance, together with a long-term maintenance of suitable habitat for this species.

Determination: May impact individuals, but not likely to cause a trend towards Federal listing or a loss of viability.

Chlidonia niger – Black tern

This species is not known to inhabit the project area, and is not known from any other area within the Great Divide district. These birds prefer large areas of shallow protected water with abundant aquatic vegetation. The Day Lake area could be considered marginal potential habitat, because of some relatively isolated bays with interspersed vegetation. None of the proposed activities would affect water quality, recreation use, or vegetation on Day Lake, therefore there would be no direct, indirect, or cumulative effects on this species from project activities.

Determination: No impact

Cygnus buccinator – Trumpeter swan

There has been trumpeter swan activity within the project area since 1997. In that year, a total of six birds were released on district water bodies as part of a larger effort to reintroduce the swan to northern Wisconsin. That same year a pair relocated on their own from elsewhere in Wisconsin, to Chippewa Lake, just west of the project area. One of the release sites was on Iron River, north of McCarthy Lake. This past summer, a pair of birds nested on a large beaver pond on Edies Creek, a tributary of Iron River, and hatched 5 cygnets. Later in the summer the group of seven swans moved to the south and spent time along Iron River and in McCarthy Lake.

Threats to area swans include any activity that could affect water quality or water levels in nesting areas; disturbance, from any activity within hearing or sight distance; or major changes to the landscape within sight distance, such as clearcutting of a riparian stand (from phone conversation with Pat Manthey, swan recovery coordinator, WDNR).

Alternative 1 would have no effect on trumpeter swans since no activity would occur. Alternatives 2-4 do not propose any activities that would have long-term impacts on water quality or water levels. Several of the watershed improvement proposals could have short-term effects on water quality due to replacement of culverts, but this would be reduced by mitigation measures; the long-term effect would be improved water quality.

There are several stands in Compartment 178 proposed for harvest that could result in disturbance near McCarthy Lake and the section of Iron River where swans have nested and raised young. These are stands 20 (hardwood stand proposed for thinning); 21 and 23 (red pine stands proposed for thinning); and 25 (mixed aspen/white spruce stand proposed for thinning to manage for white spruce). None of these harvests would result in major visual alterations, however they are close enough to result in disturbance if the harvest was done during the summer months.

Cumulative Effects: Recent activities and current proposals are aimed at improving the water quality of the Iron River watershed through reduction of erosion and sedimentation. Designation of the McCarthy Lakes and Cedars RNA has helped provide a remote, undisturbed nesting and brood raising area. There are some current harvest activities that could create disturbance in that area, but this can be easily mitigated. The large wetlands and beaver ponds further north in the Iron River watershed (located within a Forest Plan Revision inventoried potential wilderness area, or IPWA) will not have any activity as a result of this proposal or in the near future. None of the Iron River watershed is subject to beaver control or dam removal for trout habitat, which will help to maintain suitable nesting habitat. Cumulative effects therefore will result in a continuation of suitable habitat for swans.

Determination: May impact individuals but not likely to result in trend towards federal listing or loss of viability.

Dendroica cerulea – Cerulean warbler

This species has not been recorded within the project area or on the district in recent years. Approximately 1200 acres of potential harvest areas were considered potential habitat according to parameters discussed by Forest biologists, including stand type and age, patch size, site productivity, and basal area. Surveys were conducted in summer of 2001 on sites involved, but no cerulean warblers were recorded. Cerulean warblers have been documented within the Chequamegon and Nicolet land bases several times but they have probably never had more than a marginal presence here. The species does seem to have expanded its range northward somewhat (Islam 2001, Robbins 1991, SVE data).

Ceruleans are often associated with small canopy gaps, nesting in some of the larger trees in the forest, but near or next to canopy gaps. For this reason, they have even been termed a disturbance dependent species (Hunter et al., 2001). A study in southern Indiana found canopy gaps to be present in all 23 territories studied, with many territories having a history of logging activity. Threats to the species in breeding grounds include habitat loss and fragmentation, disturbance to nesting habitat, and possibly competition from black-throated green warbler. No details are known about threats from parasitism (SVE data).

Its unknown whether this species is even found within the project area; however, at least marginal potential habitat is available. The best habitat in terms of large patch size is probably in the northern tier of the project area, north of FR 184. Alternative 1 would have no impact on habitat since no activity would occur. Habitat could slowly improve with age, and if individual windthrow maintained some canopy gaps. Alternatives 2-4 would affect similar quantities of potential habitat, through selective logging of northern hardwoods. Since no birds are known to inhabit the area, direct effects are unlikely. There could be at least temporary effects on habitat from the selection cutting, due to changes in the forest structure and canopy. There could be improvements over the long term due to management.

Cumulative effects: Proposed management activities together with other similar northern hardwood management will likely maintain or possibly improve potential habitat for ceruleans, although it is questionable whether viable populations

will ever exist on the Chequamegon, except for possibly in the southernmost portion (SVE data). Aspen management could have some negative effects from fragmentation of larger habitat patches, however likely management trends would maintain many larger habitat patches, both within the project area and elsewhere on the Forest.

Determination: No impact.

Falcipennis canadensis – Spruce grouse

There have been scattered reports of this bird in the Great Divide district, however there are only three sites within the project area where they have been sighted recently. Populations in the project area are likely small and widely scattered, as is the case throughout northern Wisconsin, even in areas of suitable habitat. This species appears to require large blocks of dense conifer cover, including lowland black spruce and upland types such as balsam fir and jack pine. Stands with a well- developed mid-canopy layer are especially important (SVE data).

Threats to the species include fragmentation of habitat due to development or stand conversions, and accidental shooting. Although spruce grouse have been protected in the state since 1929, incidental hunting mortality could still be an important factor limiting population expansion (Gregg, 1994). Any expansion of road networks can increase accidental shooting by increasing public hunting use.

Alternative 1 would have no effect on spruce grouse since no activity would occur. Under Alternatives 2-4, a site where spruce grouse have been observed could be impacted by project activities. The general area of observation was at or near Compartment 178, Stand 25, a mixed white spruce/aspen stand that is proposed for thinning to encourage the spruce. Harvest of this stand could have at least temporary effects on any spruce grouse still occupying the site, due to disturbance from logging activity, and temporary loss of cover. In time, the amount of cover would increase again as the understory responded to increased sunlight.

The construction of temporary roads could have short-term impacts if there was increased public use of the local area; these impacts would be reduced with the use of effective closures or decommissioning after the roads are no longer needed. Clearcutting balsam fir stands could impact potential spruce grouse habitat, however the long-term effect would be to help maintain a varied age class of an important upland habitat type. Over-mature balsam fir is more susceptible to windthrow and spruce budworm mortality, which would also reduce the quality of the stand for spruce grouse. The large areas of lowland confer within the project area would be essentially unaffected by project activities, except for a small amount of disturbance from construction of temporary winter road corridors.

Cumulative effects: Two of the most critical items necessary for maintaining spruce grouse populations are providing large blocks of quality conifer habitat, and reducing accidental shooting. None of the proposed project area activities, or other foreseeable area activities, would involve a reduction of conifer type, either though conversion of conifer, or loss of lowland conifer areas. Typical balsam fir/aspen management involves clearcutting. This results in a temporary loss of habitat but has the advantage of maintaining the type over the long term, in a variety of age classes. Project area activities combined with other foreseeable activities, would also have the effect of gradually reducing open road density, potentially reducing the loss of birds through accidental shooting.

Determination: May impact individuals, but not likely to cause a trend to federal listing or a loss of viability.

Oporornis agilis – Connecticut warbler

There have been observations of this species at several different breeding bird survey sites on the district. In addition, it was recorded in two locations during contracted bird surveys within the project area in 2001. Both locations were in Compartment 179, stand 1, on the edge of a large semi-open lowland spruce bog. It was not recorded in any of the upland stands surveyed. Connecticut warblers in general are described as utilizing a fairly wide variety of forest types, including lowland conifer, bogs, jack pine, aspen parklands, and moist deciduous forest. In northern Wisconsin, they are most often associated with lowland conifer and jack pine. There is a notable population centered in the jack pine belt in the northwest portion of the state. A well-developed shrub layer is considered by some to be the most important habitat feature for this bird (Kudell-Ekstrum, 2001).

Threats to this species, according to recent SVE work, include fire suppression, conversion of jack pine barrens, fragmentation, and habitat loss on wintering grounds. This species is a ground nester, which could make it more vulnerable to predation. Parasitism by cowbirds is listed as a concern, however there appears to be limited information on susceptibility to parasitism.

Alternative 1 would have no effect since no activity would occur. Alternatives 2-4 would not cause any direct effects on the known location since the lowland conifer site would not be affected; indirect effects at that site would be unlikely since the adjacent uplands are proposed for selection cutting only, rather than clearcutting. There could be direct effects if any Connecticut warblers were nesting in aspen stands proposed for clearcutting. As mentioned previously however, the species seems to be tied more to lowland conifer and jack pine habitat in this portion of the state. There are two jack pine stands proposed for clearcutting; however, those stands do not have the structure that appears to be favored by Connecticut warblers and were not surveyed as potential habitat. If there were additional populations in lowland conifer adjacent to aspen clearcuts, there could be indirect effects due to increased predation and/or parasitism.

Cumulative effects: One of the primary habitat types for this species (lowland conifer) is not generally affected by project activities anywhere on the district. The other primary habitat type (jack pine) is not found to any degree in or adjacent to the project area. The aspen stands proposed for harvest under this project, and in similar projects, could be considered potential habitat, but the harvest of this type was not identified as a viability concern by the SVE panel of experts. In general, although there could be some indirect effects from harvest, the cumulative effects of this project together with similar projects would involve maintenance of habitat quality and quantity.

Determination: May impact individuals, but not likely to cause a trend towards federal listing or a loss of viability.

Picoides arcticus – Black-backed woodpecker

There has been one recent observation of this species within the project area. Another recent observation was just outside the project area, immediately to the west of the Day Lake area. A black-backed woodpecker was also seen at the time of the McCarthy Lake and Cedars RNA evaluation. This species is typically found at low densities, although it may be common in large areas of suitable habitat. Since it depends on recently killed confer, it is considered an irruptive species, and has the ability to quickly colonize any new areas of habitat. Habitat is generally provided by disturbance agents such as fire, beaver flooding, windthrow, and insect damage.

Threats to the species include any removal or salvage of dead and dying conifer, or activities that alter the disturbance regime, such as fire suppression. A reduction in areas of habitat can reduce the potential for interaction between colonies, or colonization of new areas.

Alternative 1 would not have any direct effects on the species since no action would occur. There could be some indirect benefits from this alternative since there would not be any project-related harvest of mature conifer, including balsam fir and jack pine. This would increase the possibility of mortality in these stands, resulting in creation of suitable habitat. Alternatives 2-4 would not involve any direct disturbance or removal of habitat, but they could affect potential habitat. Alternatives 2 and 3 would involve removal of decadent jack pine in the stands surrounding the Day Lake campground. If left, these trees could provide foraging and nest sites for the black-backed woodpecker, although the dead and dying trees would be at a fairly low density. Dead trees have been removed in the past, singly and in small groups, for safety reasons in the campground. Alternatives 3 and 4 would involve clearcutting of two jack pine stands near the Day Lake boat landing. These stands do not currently provide habitat, but could if allowed mature and degenerate. A nearby jack pine stand adjacent to Day Lake (stand 38) is not proposed for harvest under any alternative, and will provide dying jack pine as the stand continues to age and deteriorate. The clearcutting of mature balsam fir stands could likewise reduce potential habitat by regenerating balsam fir rather than allowing it to die (mature balsam fir that is attacked by spruce budworm can provide excellent black-backed woodpecker habitat).

Cumulative effects: Forest-wide fire suppression has reduced the potential for creation of suitable habitat for this species. Habitat is still created intermittently by beaver flooding, insect and disease, and windthrow. These factors will likely continue to create habitat in the future. Harvest of mature conifer stands has reduced the amount of habitat created by natural mortality; proposed activities would result in similar reductions within the project area. Some areas within the project area however are not proposed for harvest. There is another mature jack pine stand in the Day Lake area that is not proposed for harvest; this may provide dying jack pine in the future. There are a number of mature balsam fir stands that are not being proposed for harvest due to poor access or other concerns, especially in Alternatives 2 and 4. There are not any plans to harvest areas of lowland conifer. None of the stands within the Iron River IPWA are proposed for harvest at this time. The Iron River IPWA contains many stands of mature and overmature balsam fir and mixed aspen/fir. In summary, although there are concerns over the quantity of large habitat patches suitable for this species, the proposed project will likely maintain current levels of habitat development, and will not result in direct loss of suitable habitat.

Determination: No impact.

Gomphus viridifrons – Green-faced clubtail

This species has not been observed within the project area, but it has been documented in nearby townships. This species appears to be much more abundant and common than once thought. It has been found in 41 locations on 26 streams in northern half of Wisconsin with a small outlier population in the west-central part of the state. Wisconsin is on the western edge of the range of green-faced clubtail which is found all the way to the East Coast.

Green-faced clubtails like warm water, medium (>100'), fast streams with fairly clean gravel/sand substrate. It is found close to shore and in fast current areas of streams. Is not found in big rivers or trout streams. This species population does not appear to be vulnerable at this time.

Alternative 1 would have no direct effects since no action would occur. There could be indirect effects from no action if there was continued sedimentation from the road/stream crossings proposed for improvement under the other alternatives. Alternatives 2-4 could have short-term effects from implementation of the watershed improvement activities, since some sedimentation is normally involved with culvert replacement. The long-term effects of these alternatives however would be reduced sedimentation and erosion and improved water quality.

Cumulative effects: Other watershed improvement activities have occurred within the project area; additional sites in addition to the proposed projects may be implemented in the future as problems are identified. Therefore the long-term cumulative effects would be improved water quality and therefore improved habitat. Effects on water bodies due to activities such as timber harvest or road building are unlikely due to implementation of Best Management Practices.

Determination: May impact individuals but not likely to cause a trend to federal listing or a loss of viability.

Incisalia henrici – Henry's elfin butterfly

This species has not been observed within the project area, although there has been a lack of survey work Forest-wide that could identify butterfly populations. Although it is difficult to associate this species with particular habitat types, it has been found in bog areas, forest edges, clearings, brushy areas, and forest roads and trails. These are all habitat types that can be found within the project area.

Since this species is found in such a wide variety of open and semi-open habitats, it is unlikely that disturbance of forested areas would cause a direct loss of habitat. Any activities that affected host plant such as blueberry, wild plum, or mapleleaf viburnum could potentially affect the species. This can be a concern in large areas of barrens or bog areas managed by prescribed fire.

Project area activities are not expected to affect this species, since there would not be any reduction in areas of host plants, or alterations of barrens or bog areas. There is a potential for disturbance to any populations that might exist within the project area, due to timber harvest or road maintenance, but substantial direct, indirect, or cumulative effects on overall area populations or habitat quality are not expected.

Determination: May impact individuals but not likely to cause a trend to federal listing or a loss of viability.

Botrychium oneidense – Blunt-lobed grapefern

This species occurs in low, wet, shady woods and swamps including the edges of woodland ephemeral ponds. No plant locations were found in surveys of potential habitat, however a limited amount of suitable habitat does exist within the project area. The closest known site is 12 miles south of the project area.

Potential threats for this species include drought, fire, collecting, herbivory, and exotic earthworms. Timber harvest is also a potential threat although like many Botrychiums, it is associated with slight, well-healed past disturbance (SVE data).

Alternative 1 would have no effect since no activity would occur. Alternatives 2-4 could have potential effects due to timber harvesting and temporary road construction. Due to its habitat association, any population of this species within the project area would most likely be affected by hardwood selection cutting. This could be by disturbance from equipment use and tree removal, or by increased light levels following harvesting (this would be a temporary effect). There could also be potential effects from deer herbivory if feeding activity increased in harvested areas (also a

temporary effect).

Cumulative effects: The rarity and lack of information for this species currently places limits on effective management. In general, however, the cumulative effects of this project in combination with other similar projects would be a continuation of current and recent conditions and would not represent a major change in potential threats or habitat quality.

Determination: No impact.

Calypso bulbosa – Calypso orchid; *Cypripedium arietinum* – Ram's head lady's-slipper; *Maxaxis brachypoda* – White adder's mouth

These species are all found in similar habitat: primarily cool, shaded swamp conifer forest. The calypso orchid prefers slightly drier sites, such as drier islands within cedar stands, or close to the slightly raised areas surrounding cedar trunks. None of the species were found in surveys of potential habitat, although potential habitat does exist within the project area. Threats to these species include deer herbivory, ground disturbance, canopy removal, and collection.

Alternative 1 would have no effect since no activity would occur. The greatest threats from activities in Alternatives 2-4 are probably from deer herbivory and disturbance from construction of temporary roads through potential habitat. There are not any plans for timber harvest in areas that could harbor these plants. Some of the proposed clearcuts, however, particularly in Alternative 3, would require temporary winter-use roads across lowland conifer swamps to access the stands. These roads would not involve any fill material, but they would require the clearing of a corridor, which would not be expected to recover for many years. This corridor could also act as a travel route for deer, further increasing the potential for deer herbivory adjacent to the clearcut stands.

Cumulative effects: The cumulative effects of any clearing or disturbance in lowland conifer stands should be minimal, since this habitat type is rarely directly affected by management activities. The cumulative effects of activities on deer populations and deer activity has been discussed in the Environmental Impact Statement under clearcutting effects, and Management Indicator Species summary. To summarize, project area management activities, combined with other similar activities, can have local effects on deer populations, including concentration of deer near areas of harvested areas and regeneration, however, overall populations are more heavily influenced by winter severity, hunting success, and baiting and feeding activity.

Determination: No impact.

Carex assiniboinensis – Stoloniferous sedge

This species occurs under shade in rich, mesic hardwood forest including floodplains. This species was not found in the project area during surveys of potential habitat; however, marginal habitat does exist in the project area. The closest known site is 15 miles northwest of the project area.

Threats to this species include logging and canopy removal, disturbance, and deer herbivory.

Alternative 1 would have no effect since no activity would occur. Alternatives 2-4 could have varying effects on this species if it occurred within the project area, primarily due to the varying amounts of hardwood selection cutting proposed. Summer harvest in stands containing the plant could directly affect the plant through disturbance from equipment use and tree removal. Harvest during any time of the year could have indirect effects on any plant sites due to the partial canopy removal, and increased light conditions, and potential for increase deer herbivory.

Cumulative effects: Although there could be direct and/or indirect effects on this plant species if it existed within the project area, there is only marginal potential for occurrence in the project area due to habitat considerations. The cumulative effect of this project and other similar projects is therefore a low potential for any adverse impacts.

Determination: No impact.

Dryopteris expansa – Spreading woodfern; *Panax quinquefolius* – Ginseng; *Polystichum braunii* – Braun's holly fern

These species are all found under full shade of mixed northern hardwood forests. Ginseng is often found in forests dominated by sugar maple and basswood; spreading woodfern and Braun's holly fern are often found in close proximity to exposed bedrock or talus and areas of high moisture content, such as seeps or running water. Moderately suitable

habitat exists in the project area for ginseng. The project area contains a limited amount of suitable habitat for spreading woodfern and Braun's holly fern. None of these species were found in the project area during surveys of potential habitat. Threats to these species include logging and canopy removal, disturbance, and in the case of ginseng, harvest of the plant itself, for the root.

Alternative 1 would have no effect since no activity would occur. Alternatives 2-4 could have varying effects on these species if they were to occur within the project area, primarily due to the varying amounts of hardwood selection cutting proposed. Summer harvest in stands containing the listed plants could directly affect the plants through disturbance from equipment use and tree removal. Harvest during any time of the year could have indirect effects on any plant sites due to the partial canopy removal, and increased light conditions, since all three species are believed to require full shade or close to full shade (SVE data indicates that ginseng needs >80% canopy closure). Any activity that increased the potential for introduction of exotic plants could also have a detrimental effect.

Cumulative effects: Although there could be direct and/or indirect effects on these plant species if they existed within the project area, there is only moderate potential for finding them due to habitat considerations. This project, combined with other similar projects, would have minor effects on the specific habitat required for spreading woodfern and Braun's holly fern. Due to the larger acreage of suitable habitat for ginseng, there could be more noticeable cumulative effects for this species. One of the primary concerns for ginseng though is harvesting, and that activity is not affected by the proposed activities.

Determination: No impact.

Poa paludigena – Bog bluegrass

Bog bluegrass is found growing in lowland swamp conifer and mixed conifer/black ash swamp, usually near springs or spring fed streams. Suitable habitat exists in the project area. This species was actively searched for during the summer of 2002 in stands that were also visited while searching for Calypso, ram's-head lady-slipper, and white adder's-mouth. No plants were found and there are no anticipated impacts to this species or its habitat.

Potamogeton pulcher – Spotted pondweed

This aquatic plant is found in acidic lakes and ponds. It is mainly an eastern coastal plain species with highly scattered and isolated sites west to eastern Minnesota. In Wisconsin, it is known from a site near the Great Divide Ranger District's western boundary in Sawyer County. Suitable habitat exists in the project area. This habitat will not be impacted by planned activities and the project area lies approximately 15 miles east of this species nearest known site. Surveys are not called for and there are no anticipated impacts to this species or its habitat.

Pyrola minor – Lesser wintergreen

This species grows in cool soils under boreal-like forest (balsam fir/white cedar/spruce), and at the edge of alder thickets. The project area contains suitable habitat for this species; however, none were found in surveys of potential habitat. There is not a lot of information about this species, but threats appear to be primarily loss of canopy due to logging or other disturbance and changes in hydrology.

Alternative 1 would have no effect on this species since no activity would occur. Alternatives 2-4 could have potential effects on any populations of this plant located within balsam fir stands proposed for clearcutting, due to ground disturbance and canopy removal. Other forest types considered suitable habitat are essentially lowland types and would not be directly affected by management activities. An exception would be the small amount of temporary road construction that could occur in lowland conifer areas, particularly in Alternative 3.

Cumulative effects: The cumulative effects of any clearing or disturbance in lowland conifer stands should be minimal, since this habitat type is rarely directly affected by management activities. The cumulative effects of harvest in balsam fir stands could be more noticeable, since this type is commonly managed by clearcutting. Many of the balsam fir stands in the project area that meet the definition of suitable habitat are being deferred from cutting due to concerns about access or hydrology issues, reducing the potential for effects to this species.

Determination: No impact.

Ranunculus lapponicus – Lapland buttercup

Lapland buttercup is found in cold white cedar swamps, often near springs or spring fed streams. In Wisconsin, this boreal species has only been found in several sites in Douglas County west of the Forest boundary. Suitable habitat exists in the project area. This species was actively searched for during the summer of 2002 in stands that were also visited while searching for Calypso, ram's-head lady-slipper, and white adder's-mouth.

Determination: No plants were found and there are no anticipated impacts to this species or its habitat.

V. DETERMINATION OF EFFECTS SUMMARY

No impact

Ammodramus lecontei – LeConte's sparrow

Buteo lineatus – Red-shouldered hawk

Chlidonia niger – Black tern

Dendroica cerulea – Cerulean warbler

Picoides arcticus – Black-backed woodpecker

Botrychium oneidense – Blunt-lobed grapefern

Calypso bulbosa – Calypso orchid

Carex assiniboinensis – Stoloniferous sedge

Cypripedium arietinum – Ram's head lady's-slipper

Dryopteris expansa – Spreading woodfern

Malaxis brachypoda – White adder's mouth

Panax quinquefolius – Ginseng

Poa paludigena – Bog bluegrass

Polystichum braunii – Braun's holly fern

Potamogeton pulcher – Spotted pondweed

Pyrola minor – Lesser wintergreen

Ranunculus lapponicus – Lapland buttercup

May impact individuals but not likely to cause a trend to federal listing or loss of viability

Martes americana – American pine marten

Myotis septentrionalis - Northern (long-eared) myotis

Pipistrellus subflavus - Eastern pipistrelle

Accipiter gentilis – Northern goshawk

Catharus ustulatus – Swainson's thrush

Cygnus buccinator – Trumpeter swan

Falcipennis canadensis – Spruce grouse

Oporornis agilis – Connecticut warbler

Gomphus viridifrons – Green-faced clubtail

Incisalia henrici – Henry's elfin butterfly

VI. RECOMMENDATIONS, MITIGATION

Northern goshawk:

Establish a 40-acre protection area surrounding the known nest site. No timber harvest or other major activities should occur in this area. Draft Forest Plan guidelines call for a minimum of a 20-acre protection area, however recent draft guidelines proposed for the Bad River Indian Reservation, based on extensive telemetry work at known nest sites, propose the larger area. This larger protection area would also help assure that any alternative nests near the primary nest would be protected.

Discontinue plans for any improvement or maintenance of the existing woods road adjacent to the nest; this would follow guidance of draft Forest Plan standards, which call for closure of roads within 300 feet of a nest site.

Restrict harvest within ¼ mile (20 chains) of the nest to the period of August 1 to February 15, to prevent disturbance to nesting birds (follows draft Forest Plan guidelines).

Reserve all long-lived conifers from cutting in stands adjacent to the nest area (follows draft Forest Plan guidelines).

Maintain conifer transition zones and/or areas of mixed hardwood/conifer near the nest area for foraging habitat.

Note: Specific stand locations affected by mitigation for northern goshawk can be found in the project file document "Threatened, Endangered, and Sensitive Species Mitigation for Cayuga Project".

Trumpeter swan:

Utilize winter harvest only for Compartment 178, Stands 20, 21, 23, and 25, to avoid disturbance to nesting swans or groups of adults and cygnets.

Spruce grouse:

Survey Compartment 178, Stand 25 prior to sale layout to try to determine if any grouse or evidence of grouse are present; design the harvest unit to retain several pocket of dense mid-level conifer cover from 1/8 to ½ acre in size.

Restrict the harvest within Stand 25 to winter only, to avoid disruption of the nesting season (this stand is also recommended for winter harvest to reduce impacts on trumpeter swan).

Decommission or close all temporary roads to public motorized use following use for timber hauling, to reduce the chances for increased incidental hunting mortality.

Black-backed woodpecker:

Reserve mature live jack pine and snags within Compartment 124, Stands 53 and 56, to provide future foraging habitat for black-backed woodpecker and other bark foragers. Reserve trees should be left primarily in groups (3-5 groups per stand), to reduce the potential for windthrow. Location of reserve groups should consider visual impact due to location adjacent to boat landing road.

Swainson's thrush:

Within Compartment 188, Stand 18, and Compartment 202, Stand 1, limit harvest activity to the period from August 1 to May 15, to avoid disturbance of nesting birds and/or loss of nests and young.

Calypso orchid, ram's head lady's-slipper, white adder's mouth:

Survey for sensitive plants in suitable habitat (mature lowland conifer) along proposed routes for temporary roads prior to any construction. Alter road location if necessary to protect any sensitive plant sites.

VII. RECORD OF CONSULTATION

Note: Consultation with U.S. Fish and Wildlife Service is not required for analysis of impacts to Regional Forester Sensitive Species. Consultation listed below is with species experts outside the FWS.

Thomas Doolittle, Bad River Band of Lake Superior Chippewa, Reservation Biologist: northern goshawk, spruce grouse.

Jon Gilbert, Great Lakes Indian Fish and Wildlife Commission biologist: American pine marten.

Patricia Manthey, WDNR, Non-game wildlife specialist: trumpeter swan.

VIII. REFERENCES

Alverson, W.S, S.Solheim. 1981. Field survey report on endangered, threatened and rare vascular plants of the Chequamegon National Forest, Wisconsin. 138 pp.

Erdman, T. C., D. F. Brinker, J. P. Jacobs, J. Wilde, and T. O. Meyer. 1998. Productivity, population trend, and status of northern goshawks, Accipiter gentilis atricapillus, in Northern Wisconsin. Canadian Field-Naturalist, Vol. 112: 17-27.

Foster, Rodney W., and A. Kurta, 1999. Roosting ecology of the northern bat (Myotis septentrionalis) and comparisons with the endangered Indiana bat (Myotis sodalis). Journal of Mammalogy, 80(2): 659-672.

Gregg, L. 1994. Spruce grouse status in Wisconsin's National Forests. Unpublished report, under contract to USDA Forest Service. Wisconsin Department of Natural Resources.

Hunter, W. C., D. A. Buehler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. Wildlife Society Bulletin 29(2): 440-455.

Islam, K. 2001. Status of the cerulean warbler (Dendroica cerulea) on its breeding grounds. Abstract from July 2001 Caribbean Ornithological Society conference.

Jacobs, J. P., and E. A. Jacobs. 2001. Conservation Assessment for Red-shouldered Hawk (Buteo lineatus) in National Forests of Northcentral States. September 2001 draft. USDA Forest Service, Eastern Region, Milwaukee, WI.

Jackson, Hartley H.T., 1961. Mammals of Wisconsin. University of Wisconsin Press, Madison, WI.

Kudell-Ekstrum, J. 2001. Conservation Assessment for Oporornis agilis – Connecticut Warbler. September 7, 2001 draft. USDA Forest Service, Ottawa National Forest.

NatureServe Explorer: An online encyclopedia of life (web application). 2001. Version 1.6. Arlington, VA, USA: NatureServe. Available: http://natureserve.org/explorer. (Accessed: 4/30/02).

SVE Data. Species Viability Evaluation process in Forest Plan Revision. Unpublished (draft) USDA Forest Service documents; species reports.

Robbins, S. D. 1991. Wisconsin Birdlife; Population and Distribution, Past and Present. University of Wisconsin Press, Madison, WI. 702 pp.

Rosenfield, R. N., J. Bielefeldt, D. R. Trexel, and T. C. J. Doolittle. 1998. Breeding distribution and nest-site habitat of northern goshawks in Wisconsin. The Journal of Raptor Research, 32(3): 189-194.

Unger, Cynthia A., and A. Kurta, 1998. Status of the eastern pipistrelle (Mammalia: Chiroptera) in Michigan. Michigan Academician XXX, 423-37.

USDA Forest Service. Draft working copy of Forestwide Standards and Guidelines, 11/30/99. Chequamegon-Nicolet National Forest.

Wisconsin Department of Natural Resources. 1999. Natural Heritage Inventory database printouts; provided through yearly Memorandum of Understanding.

Also: unpublished USDA Forest Service documents from personal communication with numerous species experts outside the agency, related to Forest staff during process of developing species risk evaluations (part of the process of revising the Forest and Regional Forester Sensitive Species lists).

For additional sources used in preparation of the 2000 Biological Evaluation Reference Document, see that document, on file at Great Divide district offices.

6.5 Appendix E- List of Agencies, Organizations, and Persons to Whom Copies of the Statement were Sent

Anderson, David

Bad River Tribe

Bartz, David

Bird, Bryan, Forest Conservation Council – Southeastern Regional

Bondioli, Joe

Books, Raymond & Lillian

Brunner, Kenneth

Bruse, Henry, Wisconsin Audubon Council

Bungo, Gregory

Chandler, Bill, Ashland County Snowmobile Alliance (ACSA)

Churchill, Mary Ann

Dahl, James

Dahlke, Rosalyn

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6.6 Appendix F- References

Ahlgren, C.E.and I. F.Ahlgren. 1983. The human impact on northern forest ecosystems. In: Flader, S.L. ed., The Great Lakes forest, an environmental and social history. Minneapolis, MN: University of Minnesota Press,. p 33-51.

Alban, D.H. and D.A. Perala. 1990. Impact of aspen timber harvesting on soils. In: Gessel, S.P.; Lacate, D.S.; Weetman, G.F.; Powers, R.F. eds. Sustained productivity of forest soils: 7th North American forest soils conference; 1988 July 24-28. Vancover, BC: University of British Columbia. p 377-391.

Armentano, T.V. and C.W. Ralston. 1980. The role of temperate zone forests in the world carbon cycle. Can. J. For. Res. 10:53-60.

Askins, R. A.1993. Population trends in grassland, shrubland, and forest birds in eastern North America. Current

Ornithology. Volume 11.

Askins, R. A.. 2001. Sustaining biological diversity in early successional communities: the challenge of managing unpopular habitats. Wildlife Society Bulletin 29(2): 407-412.

Benyus, J. M.. 1989. Northwoods Wildlife: A Watcher's Guide to Habitat. USDA Forest Service, North Central Forest Experiment Station. St. Paul, MN.

Benzie, John W. 1977. Manager's handbook for jack pine in the north central States. USDA Forest Service General Technical Report NC-32. 18 p. St. Paul, Minnesota. North Central Forest Experiment Station.

Birdsey, R.A. and L.S. Heath. 1997. A forest carbon budget of the United States. In: Birdsey, R.; Mickler, R.; Sandberg, D.; Tinus, R.; Zerbe, J.; O'Brian, K. eds. USDA Forest Service global change research program highlights 1991-1995. GTR-NE-237. Radnor, PA. USDA Forest Service, Northeastern Forest Experiment Station.

Bouwman, A.F. and R. Leemans. 1995. The role of forest soils in the global carbon cycle. In: Mcfee; Kelly eds. Carbon forms and functions in forest soils. Soil Science Society of America. Madison, WI.

Bremner, J. M. 1967. Nitrogenous compounds. In A. D. McLaren and G. H. Peterson (eds.), Soil Biochemistry, p. 19-66. New York. Marcel Dekker, Inc.

Chequamegon National Forest Land and Resource Management Plan; Final Environmental Impact Statement. 1986. Park Falls, WI.

Chequamegon National Forest Land and Resource Management Plan; Forest Plan. 1986. Park Falls, WI.

Cleland, D. T., L. A. Leefers, and D. I. Dickmann. 2000. Ecology and management of aspen: a Lake States perspective. Published in Proceedings of a Conference- Sustaining Aspen in Western Landscapes. General Technical Report RMRS-P-18.

Cordone, A. J. and D. W. Kelly, 1961. The Influences of Inorganic Sediment on the Aquatic Life of Streams. California Fish and Game 47:189-228.

Crow, T. R., A. Haney, and D. M. Waller. 1994. Report on the Scientific Roundtable of Biological Diversity Convened by the Chequamegon and Nicolet National Forests. General Technical Report NC-166. St. Paul, MN. USDA Forest Service, North Central Forest Experiment Station.

Dahir, S. E., and C. G. Lorimer. 1996. Variation in canopy gap formation among developmental states of northern hardwood stands. Canadian Journal of Forest Research 26: 1875-1892.

Dessecker, D. R., and D. G. McAuley. 2001. Importance of early successional habitat to ruffed grouse and American woodcock. Wildlife Society Bulletin 29(2): 456-465.

Detweiler, R.P. 1986. Land use change and the global carbon cycle: The role of tropical soils. Biogeochemistry 2:67-93.

Dissmeyer, G.E. and G.R. Foster. 1980. A guide for predicting sheet and rill erosion on forest land. Tech. Pub. SA-TP 11. Atlanta, Georgia.USDA Forest Service.

Dobiesz, N. 1998. Nicolet National Forest Bird Information Retrieval and Display program. V3.04. Corel Paradox Version 7.0. Paradox Runtime.

Duguay, J. P., P. B. Wood, and G. W. Miller. 2000. Effects of timber harvests on invertebrate biomass and avian nest success. Wildlife Society Bulletin 28(4): 1123-1131.

Dunn, C. P., and F. Stearns. 1993. Landscape Ecology in Wisconsin: 1830-1990. From Fralish, J. S., R. P. McIntosh, and O. L. Loucks, Eds. 1993. John T. Curtis: 50 years of Wisconsin Plant Ecology. Wisconsin Academy of Sciences.

ECOMAP. 1993. National Hierarchical Framework of Ecological Units. Washington, DC: USDA-Forest Service. 21 p.

"Great Divide Timber Sale Review". 2001. Documents soil resource impact findings for the Star and Camp 15 Sale areas on the Great Divide Ranger District. USDA Forest Service, Glidden, WI.

"End-of-Decade Monitoring Report for the Chequamegon-Nicolet National Forest 1986-1996". Hayward, WI.

Environment Canada; Wildlife Habitat Conservation - Canadian Wildlife Service. 1999.

Leafy Spurge web site. http://www.cws-scf.ec.gc.ca/habitat/inv/p9_e.html

Flaspohler, D. J., S. A. Temple, and R. N. Rosenfield. 2001. Effects of forest edges on ovenbird demography in a managed forest landscape. Conservation Biology, 15(1): 173-183.

Flaspohler, D. J., S. A. Temple, and R. N. Rosenfield. 2001. Species-specific edge effects on nest success and breeding bird densities in a forested landscape. Ecological Applications 11(1): 32-46.

Great Lakes Ecological Assessment, North Central Research Station web page, at http://www.ncrs.fs.fed.us/gla/histveg/. USDA Forest Service. Accessed 12/17/2001.

Green, J. C. 1995. Birds and Forests; a Management and Conservation Guide. State of Minnesota, Department of Natural Resources.

Grigal, D.F. and L. F. Ohmann. 1992. Carbon storage in Upland Forests of the Lake States. Soil Science Society of America Journal 56:935-943.

Gullion, G. W. 1984. Managing Northern Forests for Wildlife. Ruffed Grouse Society, Coraopolis, PA. Publication #13,442, Minnesota Agricultural Experiment Station, St. Paul.

Heede, G. H., 1980. Stream Dynamics: An Overview for Land Managers. USDA Forest Service

General Technical Report RM-72, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 26 p.

Hendrickson, O.Q., L. Chatarpaul, and D. Burgess. 1989. Nutrient cycling following whole-tree and conventional harvest in northern mixed forest. Canadian Journal of Forest Resources 19: 725-735.

Hewlett, J. D. and W. L. Nutter, 1969. An Outline of Forest Hydrology. University of Georgia Press, Athens, GA. 137 p.

Hindall, S. M., 1976. Measurement and Prediction of Sediment Yields in Wisconsin Streams. U.S. Geological Survey Water-Resources Investigations 54-75. 33 p.

Hindall, S. M., 1972. Sediment Yields of Wisconsin Streams. Open-File Report, USDI Geological Survey, Madison, WI.

Hindall, S. M. and R. F. Flint, 1970. Sediment Yields of Wisconsin Streams. Hydrologic Investigations

Howe, R. W., G. Niemi, and J. R. Probst. 1996. Management of western Great Lakes forests for the conservation of neotropical migratory birds. From Management of Midwestern Landscapes for the Conservation of Neotropical Migratory Birds. Edited by Frank R. Thompson III, North Central Forest Experiment Station, General Technical Report NC-187.

Howe, R. 1996. Birds of the Nicolet National Forest; a summary of investigations at the University of Wisconsin- Green Bay. Submitted to the Nicolet National Forest, Rhinelander, WI.

Hunter, W. C., D. A. Buehler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. Conservation of disturbance dependent birds in eastern North America. Wildlife Society Bulletin 29(2): 440-455.

Johnson, C.E. 1995. Soil nitrogen status 8 years after whole-tree clear-cutting. Can. J. For. Res. 25: 1346-1355

Johnson, D.W. 1992. Effects of forest management on soil carbon storage. Water Air Soil Pollution. 64:83-120.

Judy, R. D., Jr., P. N. Seeley, T. M. Murray, S. C. Svirsky, M. R. Whitworth, and L. S. Ishcinger, 1984.

1982 National Fisheries Survey, Volume I. Technical Report: Initial Findings. U.S. Fish and Wildlife Service FWS-OBS-84/06.

Katovich, Steven, Dennis McDougall, and Quinn Chavez. 1998. Impact of Forest Stressors on the Tree Species of the Nicolet National Forest-Past, Present and Future. USDA-Forest Service Northeastern Area State and Private Forestry NA-TP-02-98.

Kelley, F. R. 2001. American Woodcock Population Status, 2001. U. S. Fish and Wildife Service, Laurel, MD. 15 pp.

Kotar, J., J. A. Kovach, and C. T. Locey. 1988. Field Guide to Forest Habitat Types of Northern Wisconsin. Department of Forestry, University of Wisconsin, Madison, and Wisconsin Department of Natural Resources.

Kotar, J., J. A. Kovach, and T. L. Burger. 2002. A Guide to Forest Communities and Habitat Types of Northern Wisconsin, Second Edition. Department of Forest Ecology and Management, University of Wisconsin-Madison, and Wisconsin Department of Natural Resources.

Leitch, Jay A., F. Larry Leistritz, and Dean A. Bangsund. 1994. Economic Effect of Leafy Spurge in the Upper Great Plains: Methods, Models, and Results. Agricultural Economics Report No. 316. North Dakota State University.

Lind, J., N. Danz, M. T. Jones, J. M. Hanowski, and G. J. Niemi, 2001. 2000 Annual Update Report: Breeding bird monitoring in Great Lakes National Forests: 1991-2000. Natural Resources Research Institute Technical Report: NRRI/TR-2001/04. Duluth, MN.

Lorimer, C. G. 1989. Relative effects of small and large disturbances on temperate hardwood forest structure. Ecology 70(3): 565-567.

Lorimer, C. G., 2001. Historical and ecological roles of disturbance in eastern North American forests: 9,000 years of change. Wildlife Society Bulletin 29(2): 425-439.

Lorimer, C. G., and L. E. Frelich, 1994. Natural disturbance regimes in old-growth northern hardwoods. Journal of Forestry, January 1994: 33-38.

Lym, Rodney G., Denise L. Olson, and Donald A. Mundal. 1999. Leafy Spurge Control Using Flea Beetles. North Dakota State University. NDSU Extension Service Bulletin W-1183.

Manolis, J. C., D. E. Andersen, and F. J. Cuthbert, 2000. Patterns in clearcut edge and fragmentation effect studies in northern hardwood-conifer landscapes: retrospective power analysis and Minnesota results. Wildlife Society Bulletin 28(4): 1088-1101.

Marinelli, J.. 2001. Rest stops for the weary. Audubon 103(5): 96-101.

Mason, D. J., and T. C. Moermond. 1992. Changes in hardwood communities along aspen edges: the effect of aspen succession. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at the University of Wisconsin, Madison.

McCaffery, K. R.. 1990. Forest openings for deer in northern Wisconsin. From the Fragmentation Workshop, Dubuque, IA.

McRae, B. 1995. Effects of landscape composition on edge-sensitive songbirds in a forest-dominated landscape. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science (Land Resources) at the University of Wisconsin, Madison.

McShea, W. J., and J. H. Rappole. 1992. White-tailed deer as keystone species within forest habitats of Virginia. Virginia Journal of Science Vol. 43, Number 1B (Spring).

Miller, R.O.; R. Heyd, R. Rummer; and D. Jerome, D. 2001. Gentle Logging System Evaluation (Quantitative Measurement Report). Michigan State University, Upper Peninsula Tree Improvement Center. Escanaba, MI.

Mladenoff, D. J., M. A. White, J. Pastor, and T. R. Crow. 1993. Comparing spatial pattern in unaltered old-growth and disturbed forest landscapes. Ecological Applications 3(2): 294-306.

Mortensen, C. E. 2000. Weeds of the Northern Lakes States. Leech Lake Band of Ojibwe and USDA Forest Service, Region 9.

Mossman, M. J., J. R. Sauer, G. A. Gough, L. M. Hartman, and R. Hay. 1998. The Wisconsin frog and toad survey home page (http://www.mbr-pwrc.usgs.gov/wifrog/frog.htm). Wisconsin Department of Natural Resources (Madison) and Patuxent Wildlife Research Center, Laurel, MD.

NatureServe: An online encyclopedia of life, 2000. Version 1.0. Arlington, VA: Association for Biodiversity Information (http://natureserve.org). Accessed: November 24, 2000.

Niemi, G. J., and J. M. Hanowski. 1992. Forest Wildlife, Forest Birds Section. Technical paper for Generic

Environmental Impact Statement on timber harvesting and forest management in Minnesota. Prepared by Jaakko Poyry, consulting for Minnesota Environmental Quality Board. Found at: www.nrri.umn.edu/mnbirds/speciesaccounts.htm.

Oschwald, W. R., 1972. Sediment-Water Interactions. J. of Environmental Quality 1:360-366.

Padley, E. 1999. Analysis of forest type composition and landscape pattern in northern Wisconsin using classified Landsat Thematic Mapper satellite data collected in 1992 and 1993. Data courtesy of USGS Biological Research Division, Upper Midwest Gap project, WISCLAND consortium. USDA Forest Service, Eastern Region, Milwaukee, WI (unpublished).

Parker, L., and T. Matthiae. 2000. "Analysis of the mangement situation for landscape pattern", a draft document prepared for the Forest Plan revision process. September 19, 2000 draft.

Patric, J.H. 1976. Soil erosion in the eastern forest. J. of Forestry. 74 (10):571-577

Perala, D.A.; J.L. Rollinger, and D.M. Wilson. 1995. Comparison between soil and biomass carbon in adjacent hardwood and red pine forests. In: The proceedings of Global Warming 6 Conference. World Resources Review. 7(2): 231-243

Perala, Donald A. 1977. Manager's handbook for aspen in the north-central States. USDA For. Ser. Gen. Tech. Rep. NC-36, 30 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

Pils, A. C. 2000. Management Plan and Environmental Assessment for the Clam Lake Elk Herd. Bureau of Wildlife Management, Wisconsin Department of Natural Resources.

Powers, P.F.; A.T. Tiarks, and J.R. Boyle. 1998. Assessing soil quality: practicable standards for sustainable forest productivity in the United States. Soil Sci. Soc. Am. Special Publication no. 53. Madison, WI. 28p

Pritchett, W.L. 1979. Properties and Management of Forest Soils. John Wiley and Sons. New York.

Probst, J. R., D. S. Rakstad, and D. J. Rugg. 1992. Breeding bird communities in regenerating and mature broadleaf forests in the USA Lake States. Forest Ecology and Management, 49: 43-60.

Rich, A. C., and D. S. Dobkin. 1994. Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest nesting birds in southern New Jersey. Conservation Biology 8(4): 1109-1121.

Ritchie, J. C., 1972. Sediment, Fish, and Fish Habitat. J. of Soil and Water Conservation 27:124-125.

Robinson, S. K. 1996. Threats to breeding neotropical migratory birds in the Midwest. From Management of Midwestern Landscapes for the Conservation of Neotropical Migratory Birds. Edited by Frank R. Thompson III, North Central Forest Experiment Station, General Technical Report NC-187.

Robinson, S. K., F. R. Thompson III, T. M. Donovan, D. R. Whitehead, and J. Faaborg, 1995. Regional forest fragmentation and the nesting success of migratory birds. Science, Volume 267 (March 1995): 1987-1990.

Rollinger, J.L. and T.F. Strong. 1995. Carbon storage in managed forests of the northern Great Lake States. In: Hom, J.; Birdsey, R.; O'Brian, K. eds. Proceedings, 1995 meeting of the Northern Global Change program; Gen. Tech. Rep. NE-214. Radnor, PA: USDA-Forest Service, NE Forest Experiment Station: 203-207.

Rosenberg, K. V., R. W. Rohrbaugh, Jr., S. E. Barker, J. D. Lowe, R. S. Hames, and A. A. Dhondt. 1999. A Land Managers Guide to Improving Habitat for Scarlet Tanagers and Other Forest-interior Birds. The Cornell Lab of Ornithology.

Rosgen, D. L., 1994. A Classification of Natural Rivers. Catena 22:169-199. Atlas HA-376, USDI Geological Survey, Washington, D.C, pages 186, 193-195.

Runkle, J. R.. 1982. Patterns of disturbance in some old-growth mesic forests of eastern North America. Ecology 63(5): 1533-1546.

Schimel, D.S.; B.H. Braswell, E.A. Holland, R. Mckeown, D.S. Ojima, T.H. Painter, W.J. Parton, and A.R., Townsend. 1994. Climatic, edaphic, and biotic controls over storage and turnover of carbon in soils. Global Biogeochemical Cycles. 8(3):279-293.

Schneider, T. M. 1992. Effects of logging roads on birds in the Nicolet National Forest. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at the University of Wisconsin, Green Bay.

Schulte, L. A., and D. J. Mladenoff. 2001. The original U.S. Public Land Survey records; their use and limitations in reconstructing presettlement vegetation. Journal of Forestry, October 2001: 5-10.

Schumacher, P. 2002. Personal field observations memo. Observations and measurements made in the field while performing USDA Forest Service timber sale administration duties from 1992 through present.

Silkworth, D.R. and D.F. Grigal. 1982. Determining and evaluating nutrient losses following whole-tree harvesting of aspen. Soil Sci. Soc. Am. J. 46:626-631

Smith, C. R., D. M. Pence, and R. J. O'Connor. 1993. Status of neotropical migratory birds in the Northeast: a preliminary assessment. From proceedings: Status and Management of Neotropical Birds, Estes Park, CO (1992). Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. GTR RM-229.

Spangenberg, N. E. and R. McLennan, 1983. Effect of Silvicultural Practices on Water Quality in Northern Wisconsin. Technical Report WIS WRC 83-07, Water Resources Center, University of Wisconsin, Madison, WI. 17 p.

Stone, D.M. and J.D. Elioff. 1998. Soil properties and aspen development five years after compaction and forest floor removal. Can. J. Soil Sci.78:51-58.

Stone, D.M.; J.A. Gates, and J.D. Elioff. 1999. Are we maintaining aspen productivity on sand soils? In proceedings: Zumbahlen, B.; Ek, A.R. (comp.) Improving Forest Productivity for Timber – A Key to Sustainability. Dec. 1998; Duluth, Mn. St. Paul, Mn: Department of Forest Resources, University of Minn.:177-184

Strong, Terry F. 1997 Harvesting intensity influences the carbon distribution in a northern hardwood ecosystem. Res. Pap. NC-329. St. Paul, MN: U.S. Dept. of Agri., Forest Service, North Central Forest Experiment Station. 7 p.

Suarez, A. V., K. S. Pfennig, and S. K. Robinson. 1997. Nesting success of a disturbance dependent songbird on different kinds of edges. Conservation Biology 11(4): 928-935.

Terres, J. K. 1980. The Audubon Society Encyclopedia of North American Birds. Alfred A. Knopf, Inc., New York.

Thompson, F. R. III, and R. M. DeGraaf. 2001. Conservation approaches for woody, early successional communities in the Eastern U.S. Wildlife Society Bulletin 29(2): 483-494.

Thompson, F. R. III, J. R. Probst, and M. G. Raphael. 1995. Impacts of silviculture: overview and management recommendations. From: Ecology and management of neotropical migratory birds: a synthesis and review of critical issues. Edited by Thomas E. Martin. Oxford University Press, NY, NY. Pp. 201-219.

Thompson, F. R. III, S. J. Lewis, J. Green, and D. Ewert. 1993. Status of neotropical migrant landbirds in the midwest: identifying species of management concern. From proceedings: Status and Management of Neotropical Birds, Estes Park, CO (1992). Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. GTR RM-229, pp. 145-158.

Timber Sale Activity Review Report for the Great Divide Ranger District, 2001. USDA Forest Service, Hayward, WI.

Tyrrell, Lucy E., and Thomas R. Crow. 1994. Structural characteristics of old-growth hemlock-hardwood forests in relation to age. Ecology 75(2): 370-386.

University of Wisconsin – Madison. 2001. Herbarium Vascular Plant web site. http://wiscinfo.doit.wisc.edu/herbarium/index.html.

University of Wisconsin- Madison, 1995. Comparison of forest habitat characteristics, productivity, and biological diversity in managed and unmanaged northern hardwood forests; 1995 progress report. Department of Forestry, School of Natural Resources, College of Agricultural and Life Sciences. September 21, 1995.

USDA – Agricultural Research Service. 2000. Biological Control of Leafy Spurge. 23 pp.

USDA – Animal and Plant Health Inspection Service. 1999. Invasive Species Factsheet. http://www.aphis.usda.gov/oa/pubs/invasive.html.

U. S. Environmental Protection Agency, 1990. The Quality of Our Nation's Water: A Sum-

mary of the 1988 Water Quality Inventory. U.S. Environmental Protection Agency, EPA REPORT 440/4-90-005, Washington, DC.

USDA – Forest Service. 2001. Guide To Noxious Weed Prevention Practices. Version 1.0. 25pp.

USDA Forest Service Manual. 1995. Series 2000 – National Forest Resource Management. 2080 – Noxious Weed Management. Section 2080.5. http://www.fs.fed.us/im/directives/dughtml/fsm2000.html

USDA Forest Service. 1998. "Soils Assessment of the Chequamegon-Nicolet National Forest." Unpublished. Chequamegon-Nicolet NF, Rhinelander, WI. 18p.

USDA Forest Service. 1991. Soil Quality Monitoring. In: Soil Management Handbook, FSH 2509.18 Sec. 2.05. USDA Forest Service, Washington, DC.

USDA Forest Service. 2001 Draft. Soil Quality Monitoring. In: Soil Management Handbook, R9 Supplement, FSH 2509.18 Sec. 2.2. USDA Forest Service, Milwaukee, WI.

Van Cleve, Jerry. 2001. "Management Options for Northern Hardwoods", Project Paper for Silviculturist Certification. USDA, Forest Service, Chequamegon-Nicolet National Forest

Verry, E.S. 1972. Effect of an aspen clearcutting on water yield and quality in northern Minnesota. In:Watersheds in Transition Symp. Proc. Am. Water Resource Assoc., Urbana, Ill.

Voss, Edward G. 1985. Michigan Flora, Part II, Dicots (Sauraceae – Cornaceae). Cranbrook Institute of Science Bulletin 59 and University of Michigan Herbarium. p. 579.

Voss, Edward G. 1996. Michigan Flora, Part III, Dicots (Pyrolaceae – Compositae). Cranbrook Institute of Science Bulletin 61 and University of Michigan Herbarium. p. 400.

Waters, T. F., 1995. Sediment in Streams: Sources, Biological Effects, and Control. Monograph 7, American Fisheries Society, Bethesda, Maryland. 251 p

Weeden, Catherine R., Anthony M. Shelton, and Michael P. Hoffmann. 2000. Biological Control: A Guide to Natural Enemies in North America. Cornell University. http://www.nysaes.cornell.edu/ent/biocontrol/.

Wisconsin Department of Natural Resources. 1995. Wisconsin Forestry Best Management Practices for Water Quality. Publication number FR093.

Wisconsin Department of Natural Resources. 1996. Aspen management for wildlife. An issue paper developed by the Ruffed Grouse Advisory Committee.

Wisconsin Department of Natural Resources. 1997. A comparison of old growth and managed forests in the Great Lakes states. An update of studies conducted under the Old Growth- Managed Forests Research Project.

Wisconsin Department of Natural Resources. 1999. Wisconsin Wolf Management Plan. Compiled by the Wisconsin Wolf Advisory Committee for the Division of Land of the Wisconsin Department of Natural Resources. Madison, WI

Wisconsin Department of Natural Resources. 1999. Wisconsin's forestry best management practices for water quality – the 1995-1997 BMP monitoring report. WDNR B. For. PUB-FR-145-99. WDNR, Madison, WI.

Wisconsin Dept. of Natural Resources – Bureau of Endangered Resources. 1999. "Invasive Species web site". http: //www.dnr.state.wi.us/org/land/er/invasive/index.htm.

Wisconsin Statute. 2001. Chapter 66, General Municipality Law, 66.0407; Noxious Weeds. p. 34-35.

Wisconsin's Biodiversity as a Management Issue. 1995. A Report to Department of Natural Resources Managers. Department of Natural Resources, Madison, WI.

Wisconsin-Madison.

Wollum A. G., II and Davey, C. B. 1975. Nitrogen accumulation, transformation, and transport in forest soils. In B. Bernier and C. H. Winget (eds.) Forest Soils and Forest Land Management, Proceedings of the Fourth North American Soils Conference, August 1973. University of Laval Press, Quebec, Canada.

World Resources Institute. 1992. Global trends in environment and development. World Resources Institute,

Washington, DC.

Wydeven, A. 1989. "Openings in the pre-settlement forest of northern Wisconsin and implications on current management". Unpublished Wisconsin Department of Natural Resources report.

6.7 Appendix G- Glossary

Basal Area (BA) – Measurement of how much of a site is occupied by trees. It is determined by estimating the cross-section area of all the trees in an area at breast height (4.5 feet).

Biological Control: The use of natural enemies such as parasites, predators, or pathogens to control or reduce the abundance or competitiveness of a non-native species.

Biological Opinion: An official report by the U.S. Fish and Wildlife Service issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modification of its critical habitat.

Biomass: The total weight or quantity of a specific life form in a given area, for example the biomass of woody plants per acre, or the biomass of small mammals in a forest stand.

Boreal: Refers to the vast conifer dominated forest region found across much of Canada and the northern U.S. The Chequamegon-Nicolet National Forest is generally considered to be at the transition zone between the boreal forest to the north and the hardwood forests to the south. A number of plant and animal species common to the boreal area are found on the National Forest.

Canopy – The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Cavity Nesters: Birds that nest in cavities of live trees or snags. They may be primary cavity nesters, that excavate their own holes (woodpeckers), or secondary cavity nesters, that use holes excavated by other birds (black-capped chickadee, eastern bluebird).

Channel Morphology: The physical characteristics of a stream channel, including factors such as slope, width:depth ratio, and substrate material.

Class I Trout Water: High quality trout waters, with sufficient natural reproduction to sustain populations of wild trout at or near carrying capacity.

Class II Trout Water: Streams with some natural reproduction, but not enough to fully utilize available habitat. Artificial stocking is sometimes required to maintain a desirable sport fishery.

Class III Trout Water: Marginal trout habitat with no natural trout reproduction occurring. These streams require regular stocking if a sport fishery is desired.

Clearcut -This practice is used to remove a mature stand of trees so that another stand can regenerate either through natural seeding, sprouting or planting. It is used to establish those types of tree species that are intolerant of shade and require full sunlight to grow. In clearcutting, all merchantable trees are designated for cutting except those that are reserved for wildlife and visual reasons.

Conifer – Any of predominantly evergreen, cone bearing trees, such as pine, spruce, hemlock or fir.

Cord – A unit of growth volume measurement for stacking round or split wood. A standard cord is 4' x 4' x 8' or 128 cubic feet. A standard cord may contain 60 – 100 cubic feet of solid wood depending on the size of the pieces and the compactness of these stacks.

Critical Habitat: Those areas designated as critical by the Secretary of the Interior or Commerce, for the survival and recovery of federally listed threatened or endangered species.

Cubic Foot – A common unit of measure for wood volume equivalent to a cube 12" on all sides. (Common cubic unit is CCF or 100 Cubic Feet)

Disturbance Regime: This refers to the natural or artificial processes that affect and shape a particular ecosystem. Examples are crown fires in jack pine, individual tree blowdown in northern hardwood forests, beaver flooding in low gradient stream systems, and clearcutting of mature aspen forests.

Ecosystem: A community of living plants and animals interacting with each other and with their physical environment.

Edge: The places where two ecosystems meet; it can also refer to the meeting of two similar communities of differing ages, such as the edge between young aspen and old aspen.

Ephemeral Ponds: Small forest ponds that only hold water during spring snowmelt, or after heavy rains. In some cases their duration is short enough that the entire pond area is forested with species that are not considered tolerant of flooding.

Even-aged Management – The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Environmental Assessment(EA): Documents the results of an environmental analysis and discloses the environmental consequences for which the proposed action(s) that are not categorically excluded from documentation and for which the need for an environmental impact statement (EIS) has not been determined.

Fragmentation: The process by which larger areas of similar community type or age are broken into smaller fragments of that type or age, with varying degrees of isolation from each other. Examples include areas of extensive hardwood forests being broken into small woodlots by agricultural and urban development, or extensive native prairie being lost to cropland.

Forest Type – A descriptive term used to group stands of similar character of developed and species composition, due to given ecological factors, by which they may be differentiated from other groups of stands.

Gap: A small opening created in a forest canopy, generally from wind throw. Gaps may result from loss of a single tree, or from a larger group of downed trees. Gap formation is an important aspect of change and regeneration in many forests.

Hardwood – A broad-leaved flowering tree, as distinguished from a conifer. Trees belonging to the botanical group of angiospermae.

Harvest (Timber Harvest) – Cutting and removal of trees from the forest for utilization.

Heterogeneity: The degree of variety across a landscape. An area might be described as having a high degree of heterogeneity if there is a number of different forest types and ages well interspersed with each other. An area of extensive closed canopy hardwood forest would be described as having a low degree of heterogeneity.

Improvement Cut – Under improvement harvesting, only selected trees are marked to be cut. Trees marked are those that are competing with trees that are or have the potential to develop into high quality log trees. Some poor form and quality trees are also harvested. Harvesting will improve growth and quality development on the remaining trees. Improvement harvesting is designed to develop a stand that has a range of tree ages or sizes. To get this tree size range, some holes in the canopy will be made through harvesting to create the right environmental conditions for seedlings to regenerate, survive and grow. After the stand reaches the right size distribution of seedlings, saplings, poletimber and sawtimber, the stand is selectively logged on about a 10 to 15 year interval to maintain the size distribution. There is no rotation age. Wildlife and visual concerns and harvesting techniques are generally the same as in the commercial thinning practice.

Interior Forest: An area of late-successional or old growth forest that is large enough, and of an appropriate shape to provide conditions that minimize predation, parasitism, and microclimate fluctuations associated with forest edges.

Intolerant Species – Those plant species that do not grow well in shade.

Landscape Analysis and Design (LAD): An ecological assessment at various scales, used to recommend the best opportunities for community restoration, protection, compatible management, or traditional management. The original concept has been modified for use on the National Forest. Areas identified through this process are sometimes referred to informally as "LAD" areas, although final decisions regarding the management of these areas will only be made with the completion of the Forest Plan revision.

Landscape Pattern: The spatial arrangement of forest patches composed of different species or successional stages. The term may also be applied to patches of different land uses, such as residential, commercial or agricultural.

MBF – One thousand board feet of timber.

Neotropical Migratory Birds (NTMB): Locally nesting birds that migrate seasonally to the tropical regions of the New World (central and South America).

Non-native Invasive Species: Species that are not native to a particular place and are causing disruption of the natural process of that place, displacing native plant and animal species, degrading natural communities, etc.

Old Growth: A community with dominant trees at or near their biological maturity. The age and structure of an old-growth community varies with species and site. Old growth stands are sometimes characterized by a multi-layered, uneven-age size class structure; a high degree of compositional and structural patchiness and variety; and significant amounts of woody debris and tip-up mounds.

Patch: An area of similar vegetation type and age, such as a mature white/red pine patch, or a regenerating aspen patch. This term is sometimes but not always analogous to the term "stand" as used for Forest Service purposes.

Pit and Mound Topography: A small-scale landform that is created over a long period of time by individual tree fall in mature forests. Mounds are composed of the root balls of fallen trees, and the pits are left where the root balls were ripped up. These features can persist for many years, and can result in much of the forest floor being covered by a succession of pits and mounds, softened by re-growth of the herbaceous plant layer.

Research Natural Area (RNA): RNA's are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. Lands selected for this designation are high quality or unique representatives of different natural communities; management is aimed at maintaining natural biological and physical processes.

Riparian: The zone of land and vegetation adjacent to streams, lakes, and wetlands; close enough to the waters edge to affect, and be affected by, the aquatic community.

Road Decommissioning: Activities that result in the stabilization and restoration of unneeded road corridors to a more natural state.

Scarification: The process of removing the forest floor or mixing it with the mineral soil, to prepare a site for seeding or planting of tree seedlings.

Selection Harvest Cut – A system which removes trees individually in a scattered pattern from a large area each year. (1) Individual tree selection cutting involves the removal of selected trees of all size classes on an individual basis. Regeneration is established under the partial shade of the overstory canopy after each cut. (20 Group selection cutting involves the removal of selected trees of all size classes and groups of a fraction of an acre of 2 to 3 acres in size. Regeneration occurs in the groups under conditions similar to those found in small clearcuts.

Sensitivity Level: As used in Visual Quality Management: a particular degree or measure of viewer interest in scenic qualities of the landscape. 1-most sensitive, 2-sensitive, and 3-less sensitive.

Sensitive Species: Those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by a significant current or predicted downward trend in population numbers or density, or significant current or predicted downward trend in habitat capability that would reduce a species distribution. Some Forests, including the Chequamegon-Nicolet, have also maintained Forest sensitive species lists, as a means of focusing management attention on species of concern that do not yet warrant listing as Regional Forester sensitive species.

Shelterwood Cutting- A cutting method used in even-aged management. It is the removal of a stand of trees through a series of cuttings designed to establish a new crop with seed or by under planting seedlings.

Sinuosity: Describes the relative shape or pattern of a stream channel on the landscape; measured as the ratio of stream length:valley length.

Snag: A standing dead tree, or portion of tree; often contains structural features such as loose bark, broken branches or top, and cavities.

Softwater: This is a descriptive term for surface waters that refers to the chemical makeup of the water. Softwater streams and lakes have a relatively low level of dissolved minerals, particularly calcium, which gives them a low buffering capacity (making them more susceptible to acid precipitation). They are generally more acidic and less productive than hardwater streams and lakes.

Species Viability: The occurrence or maintenance of self-sustaining and interacting populations that are well distributed through a species range.

Succession: A series of dynamic changes by which organisms succeed one another through plant community stages, leading to a potential natural community or climax. Stages are transitory in nature, and describe a plant community from its earliest growth condition (early successional) to a condition of full maturity (late successional). Early successional communities are generally composed of pioneer species that are favored by open, disturbed conditions, such as aspen, paper birch, balsam fir, and many shrub and forb species.

Thinning – Under commercial thinning, only selected trees in each stand would be marked for harvest. This treatment is applied to areas with high tree densities where decreases are needed for stand structure, tree growth or species composition objectives. In general, trees that have poor form and poor quallity and those that are competing with the highest quality or crop trees are harvested first. This allows more growing space, moisture and nutrient availabilty for the remaining trees and results in an increase in growth and quality development. These objectives would be met by removing different species, sizes or amounts of trees while maintaining the primary characteristics of the tree community.

Uneven-aged Management – The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular size to retain within each area thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single–tree selection and group selection.

Vertical Stratification: The diversity in an area that results from the complexity of the above ground structure of the vegetation; more layers or tiers of vegetation generally result in a higher degree of diversity or stratification.

Visual Quality Objective (VQO): A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristics of an area. The five levels are Preservation, Retention, Partial Retention, Modification, and Maximum Modification.

6.8 Appendix H- Management Indicator Species Data

Monitoring requirements for Management Indicator Species (MIS) for the Chequamegon land base of the Chequamegon-Nicolet National Forest (CNF) are addressed on pages IV-87 and 88, V-13 and 14, and Appendix B of the Land and Resource Management Plan, Chequamegon National Forest (USDA Forest Service, 1986); pages III-25-28 of the Final Environmental Impact Statement (FEIS - 1986); and pages D-16 to D-19, FEIS Appendices. Additional background information is contained in a report entitled "Process Used in Selecting Management Indicator Species", available as part of the Planning Record in the Park Falls Supervisor's Office.

The End of Decade Monitoring Report for the Chequamegon-Nicolet National Forest (1998) provides an update to wildlife populations for the period from 1986 to 1996. This report includes a summary of monitoring methods and trend data for selected key MIS for alternative comparison and monitoring identified in the Chequamegon's FEIS.

Site-specific surveys are recommended for certain MIS if suitable habitat exists within the project area. For other species, randomized plot or transect surveys are utilized for assessing area populations. Complete project area site-specific surveys are not necessary to assess populations of these species.

Habitat by Vegetation Type

Forest Type	**Chequamegon Forest Acres**	Great Divide **District Acres**	**Project Area Acres**
Aspen	204,054	79,093	8,304
Balsam Fir	15,916	11,955	707
Jack Pine	24,244	1,197	169
Hemlock	4,047	803	30
Northern Hardwood	215,268	112,873	9,555
Oak	31,592	2,808	17
Paper Birch	22,851	6,216	221
Red Pine	61,867	16,738	1,046
White Pine	11,151	3,673	49
White Spruce	14,199	7,542	627
Upland Opening	18,529	4,384	231
Lowland Conifer	93,748	65,272	7,205
Lowland Hardwood	30,819	14,974	1,810
Lowland Opening	100,269	39,808	2,268
Total Acres	**848,554**	**367,336**	**32,239**

Management Indicator Species

Common Loon

Preferred habitat: Open water lakes larger than 20 acres with clear or light brown water.

Unit of measure: Population trends.

Frequency of measure: A portion of district lakes are surveyed each year, by FS personnel and volunteers. Randomized lake surveys coordinated by Wisconsin Project Loon Watch are conducted every 5 years. Additional site-specific surveys are recommended for this species if suitable habitat is present in the project area.

Management objective: Provide habitat that will support approximately 82 breeding pairs Forest-wide. Monitor selected lakes in cooperation with Project Loon Watch. Selected lakes are surveyed by volunteer "loon rangers" and/or by district personnel that report activity on specific lakes. Lakes are surveyed mostly in July following nesting activity. Data is collected on the number of adults and young and maintained at the respective district offices as well as the Sigurd Olson Environmental Institute at Northland College in Ashland, WI.

Habitat needed to meet management objective: Approximately 6,786 acres.

Current habitat availability: 14,460 acres; 828 within project area.

Population trend data: Although no precise continent wide estimate of populations is available, approximately 500,000 to 600,000 adults occur in the U.S. and Canada (Southeast Pine Environmental Analysis, Appendix G; Lakewood/Laona Ranger District, Chequamegon-Nicolet National Forest). The estimated number of adults in the lower U.S. number close to 18,000 with about 34,000 found in Alaska. Wisconsin loon numbers appeared to increase in the 1970's and early 1980's and leveled off in the late 1980's and 1990's (Daulton et al. 1997). Forest populations have followed these statewide trends and appear to be relatively stable. Loons use nearly all of the lakes larger than 20 acres on the Great Divide district to some extent. Loons have been observed with young at least once on 37 district lakes; regular nesting probably occurs on at least 14 of those. Adult loons have been observed on an additional 9 district lakes. District populations appear to be relatively stable. The following data was gathered through district surveys and volunteer surveys, and was compiled by Project Loon Watch (Sigurd Olson Environmental Institute, Northland College, Ashland, WI). It should be noted that much of the yearly variation in numbers is related to survey effort (number of lakes surveyed).

Year	**# Lakes surveyed**	**Adult Residents**	**Territorial Pairs**	**Young Hatched**	**Young Fledged**
1986	8	10	5	2	2
1987	5	8	4	2	2
1988	5	3	1	2	2
1989	14	20	9	4	1
1990	10	17	6	5	5
1991	10	20	5	3	1
1992	10	16	7	6	4
1993	7	16	5	5	2
1994	5	14	6	3	3
1995	5	6	4	3	2
1996	8	21	8	5	4
1997	5	17	5	2	2

1998	3	8	4	0	0
1999	3	5	2	1	1
2000	No data	ND	ND	ND	ND
2001	9	5	2	2	2

Randomized 5-year Lake Survey			
Year	**Number of District Lakes Surveyed**	Adult Loons	Loon Chicks
1985	8	4	0
1990	9	4	0
1995	7	9	3
2000	5	8	1

The University of Minnesota, Duluth, Natural Resources Research Institute (NRRI) Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 23 individuals from 10 forest stands (total of 41 stands surveyed on district). These were likely recorded either as "flyovers" or heard from nearby lakes. In addition, population estimates for the Chequamegon land base, the Great Divide District, and the project area are displayed in Table 1. They were calculated using the Nicolet National Forest Bird Information Retrieval and Display (NNFBIRD) population modeling software program (Dobiesz 1998).

Ring-necked Duck

Preferred habitat: Sedge meadow, sphagnum bog, deep marsh, open water.

Unit of measure: Amount of habitat available and population trends.

Frequency of measure: 10 years.

Management objective: Provide habitat that will support 350 breeding pairs. Monitor in cooperation with Wisconsin Department of Natural Resources (WDNR). Amount of available habitat is tracked through CNF Combined Data System (CDS).

Habitat needed to meet management objective: 2,015 acres sedge meadow, 465 acres sphagnum bog, 310 acres deep marsh, and 310 acres open water.

Current habitat availability: 5,900 acres sedge meadow, 10,580 acres sphagnum bog, 5,900 acres deep marsh, and 25,000 acres open water Forest-wide; project area has 188 acres sedge meadow, 137 acres sphagnum bog, 3 acres deep marsh, and 828 acres open water.

Population trend data: The U.S. Fish and Wildlife Service (FWS) does not estimate regional figures for ring-necked ducks. WDNR waterfowl surveys include the ring-necked duck with "other" ducks and does not estimate a state population. In northern Wisconsin the ring-necked duck is considered common but occurs in low densities. The population is felt to be stable to slightly increasing (Delta-Drummond Environmental Analysis, Appendix F; Washburn Ranger District, Chequamegon-Nicolet National Forest). The Forest Service has not conducted surveys specifically for ring-necked ducks on the Forest. Population estimates for the Chequamegon land base, Great Divide District, and project area, calculated using the NNFBIRD population modeling software program (Dobiesz 1998) are shown in Table 1.

Common Yellowthroat

Preferred habitat: Shrub swamp.

Unit of measure: **Amount of habitat available; ten-minute point count taken across all cover types.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 18,390 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 23,300 acres of shrub swamp.

Current habitat availability: 44,688 acres of shrub swamp Forest-wide; 1,676 acres in project area.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide district identified 138 individuals from 21 forest stands (total of 41 stands surveyed on district). NRRI population trend estimates for the CNF

indicated a significant decline between 1991 and 2000; a significant decline was also noted for the northern hardwood/ spruce region, according to U.S. Geological Survey's Breeding Bird Survey (BBS) records (Lind et al., 2001). An analysis of BBS routes nationwide indicated a significant decline of this species in eastern and central North America from 1978-1988, and a significant increase in western states from 1966-1988 (Natureserve, 2000). Another analysis of the BBS data showed a nationwide decline of about 2% over the previous 10 years (Niemi et al., 1992). Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Pileated Woodpecker

Preferred habitat: Swamp conifer and northern hardwoods.

Unit of measure: **Amount of habitat available and population trends.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 1,290 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 56,115 acres swamp conifer over 70 years old with not less than 11,350 acres over 100 years old; 168,400 acres northern hardwood over 70 years old with not less than 11,350 acres over 110 years old.

Current habitat availability: Forest-wide: 76,976 acres swamp conifer over 70 years old, with 29,430 acres over 100 years old. 158,380 acres northern hardwood over 70 years old, with 3273 acres over 110 years old, and 10,250 typed with no age (mature uneven age condition). Project area: 5015 acres swamp conifer over 70 years old, with 2217 acres over 100 years old; 5304 acres northern hardwood over 70 years old, with 130 acres over 110 years old.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 11 individuals from 10 forest stands (total of 41 stands surveyed on district). According to BBS data, there has been a significant increase of 33% in North America between 1966 and 1993 (NatureServe, 2000). Historic literature indicates the population can fluctuate widely over the years, but most authors report noticeable increases from the 1960's into the 1990's. Robbins (1991) reports an increasing number in Wisconsin Christmas Bird Counts since 1973. Rolley (2000) reported a highly significant increase in pileated woodpeckers in Wisconsin between 1983 and 1996. Trends for the Nicolet National Forest since 1986 vary year by year but appear to be relatively stable. Population estimates for the CNF, Great Divide District, and project area calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Pine Warbler

Preferred habitat: Red and white pine and white spruce over 130 years of age.

Unit of measure: **Amount of habitat available; ten-minute point count taken across all cover types.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 1,878 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 5,634 acres of red and white pine and white spruce over 130 years old.

Current habitat availability: 370 acres of red and white pine and white spruce over 130 years old Forest-wide; 0 acres within project area.

Note: Habitat availability according to Forest Plan guidelines would suggest a substantial shortage of age and type required to support management objectives. More recent observations from both Chequamegon and Nicolet bird surveys however have indicated territories of this species in much younger conifer stands, including plantation red pine stands originating from the late 1920's and early 1930's.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 11 individuals from 9 forest stands (total of 41 stands surveyed on district). BBS data indicates a significant increase range

wide of 65% from 1966 to 1993 and 30% from 1984 to 1993 (NatureServe, 2000). In Wisconsin, pine warblers are considered a fairly common resident in the north, reaching their greatest population concentration in the northwest part of the state (Robbins, 1991). Rolley (2000) reported a highly significant increase in Wisconsin between 1983 and 1996. Trends for pine warblers on the Nicolet since 1986 vary by year but appear to be stable if not slightly increasing. NRRI population trend estimates for the region and Chequamegon indicated no significant change between first and last years of survey, but mixed significant changes exist between years (Lind et al., 2000). Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Blackburnian Warbler

Preferred habitat: White spruce over 90 years old and balsam fir over 60 years old (blackburnian warblers also utilize lowland conifer habitat, hemlock stands, and hemlock inclusions within upland hardwoods).

Unit of measure: **Amount of habitat available; ten-minute point count taken across all cover types.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 2,185 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 8,740 acres of white spruce (over 90 years old) and balsam fir (over 60 years old).

Current habitat availability: 10,423 acres of white spruce and balsam fir meeting the age guidelines Forest-wide; project area has 480 acres meeting this criteria. In addition, there are 272 acres of hemlock and mixed hardwood/ hemlock over 70 years of age in the project area.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 164 individuals from 32 forest stands (total of 41 stands surveyed on district). BBS data indicates a minor (.11) population increase in the Midwest between 1966 and 1991, and an annual increase of 7.68 between 1982 and 1991 (Thompson et al.). The number recorded on BBS routes in Minnesota remained essentially the same in the previous 25 years (Neimi et al., 1992). In Wisconsin, blackburnian warblers are considered a fairly common summer resident in the north but a casual summer resident in the south (Robbins 1991). Rolley (2000) reported a stable population in Wisconsin between 1983 and 1996. NRRI population trend estimates for the Chequamegon indicated a significant increase between first and last years of survey (Lind et al., 2000). Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Brown Creeper

Preferred habitat: Deciduous/conifer mix.

Unit of measure: **Amount of habitat available; ten-minute point count taken across all cover types.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 1,080 individuals on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 5,400 acres of mixed deciduous/conifer forest older than 60 years.

Current habitat availability: Forest-wide: 10,346 acres of balsam fir/aspen, 3,685 acres of aspen/white spruce/balsam fir, 516 acres of red pine/oak, and 14,037 acres of hardwood/hemlock, all 60 years and older. Project area: 388 acres of balsam fir/aspen, 1,043 acres of aspen/white spruce/balsam fir, and 328 acres of hardwood/hemlock, all 60 years and older.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 118 individuals from 34 forest stands (total of 41 stands surveyed on district). NatureServe (2000) reports trends are difficult to assess range wide because the species shows up relatively infrequently and is easily missed during surveys due to its size, coloration, and discreet song. BBS data for the period 1966 to 1993 shows the population as basically stable in North America, with a 2% decline per year in Wisconsin. Data from Rolley (2000) however reports the species as increasing slightly in Wisconsin. NRRI population data for the region and the Forest indicated no significant changes

between any years (Lind et al., 2000). Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Olive-sided Flycatcher

Preferred habitat: Swamp conifer.

Unit of measure: **Amount of habitat available; ten-minute point count taken across all cover types.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 14,575 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 72,875 acres of swamp conifer.

Current habitat availability: Forest-wide: 38,272 acres of lowland black spruce, 12,987 acres of northern white cedar, 9,980 acres of tamarack, and 32,357 acres of mixed swamp conifer. Project area: 1,469 acres of lowland black spruce, 923 acres of northern white cedar, 773 acres of tamarack, and 4,028 acres of mixed swamp conifer.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 13 individuals from 9 forest stands (total of 41 stands surveyed on district). BBS data indicates a significant decline for this species in much of its range, including the lake states, with an overall population decline of 49% between 1966 and 1993 (NatureServe, 2000). BBS data for the eastern United States shows a significant decline of 2.6% per year (Neimi et al., 1992). Data from Rolley (2000) indicates a stable population in Wisconsin, however the reported data for that species is very low. The relative abundance of this species is too low to assess trends locally. Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Barred Owl

Preferred habitat: Mature mixed northern hardwoods.

Unit of measure: **Amount of habitat available and population trends.**

Frequency of measure: Yearly counts using standardized point counts, conducted since 1992 by NRRI.

Management objective: Provide habitat that will support 298 breeding pairs on the Chequamegon. Amount of habitat is tracked through CDS. Population trends are tracked through yearly Chequamegon Breeding Bird Survey.

Habitat needed to meet management objective: 168,370 acres of northern hardwood types over 70 years old.

Current habitat availability: 158,380 acres of northern hardwood type, and 21,890 acres of red oak type, over 70 years old, Forest-wide. Project area has 5,304 acres of northern hardwood type over 70 years old.

Population trend data: NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 6 individuals from 3 forest stands (total of 41 stands surveyed on district). BBS data indicates a significant population decline in eastern North America between 1978 and 1988, and a significant increase in the west between 1966 and 1988, with the range expanding into the Pacific Northwest states (NatureServe, 2000). Trends are difficult to assess locally because of relatively low population numbers. Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Thirteen-lined Ground Squirrel

Preferred habitat: Upland openings.

Unit of measure: **Amount of habitat available.**

Frequency of measure: Surveys are not currently being conducted for this species on the Forest. This species is primarily managed by providing suitable habitat. Habitat data is available in CDS as necessary.

Management objective: Provide habitat that will support 62,200 animals. Amount of habitat is tracked through CDS.

Habitat needed to meet management objective: 28,835 acres of permanent upland openings.

Current habitat availability: 18,529 acres Forest-wide; 231 acres in project area.

Population trend data: National figures are not available for the thirteen-lined squirrel. The state of Wisconsin does not collect population data on this species. The Forest Service has not conducted surveys for this species. Generally, the population of thirteen-lined squirrels likely fluctuates with vegetation and climate conditions, such that in years of mild weather, populations increase, while declines are expected following severe winters. This species is considered common in Wisconsin with a population estimated at approximately 10 million animals (Jackson, 1961). Its range has expanded northward but is less plentiful in the forested portions of the state, including the Chequamegon.

Bald Eagle

Preferred habitat: Supracanopy red and white pine within ½ mile of fish producing waters.

Unit of measure: **Number of breeding pairs.**

Frequency of measure: The Wisconsin DNR annually surveys all known and historic eagle territories in the state, including those on the Forest. Two flights are conducted, an early spring survey to determine the number of active territories, and a summer survey to assess nest productivity and count young. New or suspected territories are checked during these flights as well. Survey results are maintained at both Forest and DNR offices. Additional site-specific surveys are recommended for this species if suitable habitat is present within a project area.

Management objective: The Chequamegon was assigned a goal of 30 breeding pairs in accordance with the National Recovery Plan.

Current number of breeding pairs: There were 34 active pairs on the Forest in 2000; young were successfully raised in 25 of those territories. There were 20 active pairs on the Great Divide district in 2000, however none were in the project area.

Habitat needed to meet management objective: There was not a precise figure of habitat needed for the management objective determined at the time of the Forest Plan preparation. It is generally felt that eagles require relatively undisturbed areas containing supracanopy nest trees, within several miles of large lake or river systems. When the Forest Plan was signed in 1986 there were 21 active eagle pairs on the Chequamegon, as well as a number of areas that were considered potential habitat. Fulfilling the recovery goal of 30 active pairs on the Forest would have required the use of a number of these potential habitat areas.

Current habitat availability: The fact that the recovery goal has been met on the Forest every year since 1997 would suggest that adequate habitat is available. The recent success of many nests in areas heavily used for recreation would also suggest that eagles are becoming more adapted to development and recreational use. There are approximately 75,000 acres identified on the Great Divide district as suitable eagle habitat. Much of that is currently occupied, although there are some areas that are unoccupied, or occupied unsuccessfully from year to year. This would suggest that there is still some additional habitat available on the district.

Population trend data: Bald eagle populations have been increasing locally, regionally, and nationally. Nationally bald eagle territories have increased from 1,480 in 1982 to 5,748 in 1998. In the lower 48 states the breeding population has doubled every 6-7 years since the late 1970's (USFWS, Fed. Register 12 July 1994, p. 3585). Population trends on the Forest have followed the national trends as the number of occupied territories has more than doubled between 1975 and 2000. In addition, the number of young on the Forest has increased steadily to a total of 37 in 2000. In 2000, the 25 successful nests produced 37 young, for a ratio of 1.5 young per successful nest and a ratio of 1.1 young per occupied nest. These data compare favorably with the overall regional trend and exceed the Northern States Bald Eagle Recovery Plan goal of an average annual productivity rate of at least 1.0 young per occupied nest. Similar trends have been observed on the Great Divide district with the number of both occupied territories and young produced increasing from 7 in 1978 to 20 in 2000. The following table lists population data statewide, on the Chequamegon, and on the Great Divide district from 1973 to 2000 (district data was not available from 1973 to 1977):

Year	Wisconsin Breeding Pairs	Forest: Occupied Territories	Forest: Successful Territories	District: Occupied Territories	District: Successful Territories	District: Young Produced
1973	108	11	6			
1974	107	10	4			
1975	111	12	6			
1976	149	13	10			

1977	151	15	11			
1978	140	13	7	7	5	7
1979	151	16	13	6	5	8
1980	175	17	11	8	6	12
1981	188	19	13	11	7	10
1982	207	17	9	11	6	11
1983	198	15	8	8	4	5
1984	239	16	14	9	7	12
1985	214	17	11	8	5	6
1986	244	21	13	8	5	8
1987	295	22	15	11	8	12
1988	326	16	14	8	8	12
1989	336	21	12	10	6	9
1990	358	23	16	12	8	13
1991	414	26	19	13	10	14
1992	424	24	18	13	8	13
1993	464	26	17	12	7	8
1994	533	26	17	14	9	15
1995	583	26	25	16	15	20
1996	626	27	23	17	15	20
1997	645	30	24	13	12	19
1998	689	33	24	18	12	21
1999	751	33	21	17	10	18
2000	770	34	25	20	14	20
2001	No data	32	17	18	11	13

Grey Wolf

Preferred habitat: Remote habitat for denning and rendezvous sites; ungulate prey base.

Unit of measure: **Number of packs and individuals.**

Frequency of measure: Annually.

Management objective: The Forest was assigned two packs of wolves or about 20 animals, in accordance with the National Recovery Plan. Tracking surveys are conducted throughout the winter months when conditions are suitable, i.e. 1" or so of fresh snow. Existing and potential habitat is surveyed by a combination of trained volunteers, district staff, and DNR personnel. Additionally, wolf howling surveys are conducted, utilizing a standardized format, where pack activity is suspected. Also, in known pack territories, the DNR attempts to maintain at least one radio collared individual per pack. Once radio collared, these individuals provide data on pack territory, as well as size of pack from follow-up howling surveys.

Habitat needed to meet management objective: The 1986 Plan standards restrict the miles of road open to public vehicle use on approximately 300 square miles of suitable wolf habitat.

Current habitat availability: According to current knowledge of wolf habitat needs, the vast majority of the Chequamegon, and virtually all of Great Divide district, is considered probable wolf range (DNR, Wisconsin Wildlife Surveys report, August 2000, p. 135). According to a GIS analysis by Mladenoff, et al. (1995), most of the district could be considered "primary wolf habitat" (those areas with a 50% or greater chance of supporting a wolf pack), however some larger portions of the Forest were excluded, such as the majority of Washburn Ranger District. All of the project area can be considered suitable wolf habitat, and most of it, outside of the Clam Lake/Day Lake area, is occupied by active packs.

Current number of packs: As of spring 2001, 18 different packs, composed of 72 animals, had at least a portion of their territory on Chequamegon Forest land. There were 10 packs, composed of 41 animals, on or partially on the Great Divide district (Wydeven et al., 2001).

Population trend data: The gray wolf first returned to Wisconsin around 1975, and was listed that year as state endangered. Populations expanded across the state to the east and south, and now their range includes much of northern Wisconsin as well as some central counties. Since 1985, the population has grown statewide at approximately 20% per year, and continues to grow at a high rate. The lack of expansion in 2001 is probably due to the outbreak of sacroptic mange. This growth has been mirrored in northern Michigan and Minnesota, and in many western states where the wolf has become established. The wolf was downlisted in Wisconsin in 1999 to state threatened, and efforts may begin in the near future to delist it to a non-game species. The U.S. Fish and Wildlife Service started the federal reclassification process for Michigan and Wisconsin in July 2000. The following tables display wolf population data for the state and for the Chequamegon Forest, as of spring 2001:

Wisconsin

Year	No. of packs	No. of wolves
1980	5	25
1981	5	21
1982	4	27
1983	5	19
1984	4	17
1985	4	15
1986	5	16
1987	5	18
1988	6	28
1989	7	31
1990	11	34
1991	12	40
1992	13	45
1993	12	40
1994	14	57
1995	18	83
1996	28	99
1997	35	148
1998	47	178
1999	54	197
2000	66	260
2001	66	251-253

Chequamegon National Forest

District	Pack	No. of wolves
Washburn	Flag River	5
	Rainbow Lake	2
	Bearsdale	5
Great Divide	Ghost Lake	4
	Hungry Run	2
	Hellhole Creek	6
	Brush Creek	7
	Augustine Lake	5
	Torch River	5
	Shanagolden	3
	Black Lake	4
	Brunet River	2
	Log Creek	3
Medford/Park Falls	Kidrick Swamp	5
	Wilson Flowage	3
	Bootjack Lake	2
	Wintergreen Lake	3
	Hoffman Lake	5

Brook Trout

Preferred habitat: Cold water lakes and streams.

Unit of measure: **Amount of habitat available.**

Frequency of measure: Every five years.

Management objective: Cooperate with WDNR in identification of lake and stream habitat improvement work. The WDNR classifies trout streams into three categories: Class I – populations are completely self-sustaining, no stocking is needed; Class II – there is some natural reproduction but supplemental stocking is required to maintain populations; Class III – trout populations can be maintained only through artificial stocking. At the beginning of the Plan period, the Chequamegon had approximately 222.5 miles of classified trout streams including 59.8 miles of Class I, 107.9 miles of Class II, and 54.8 miles of Class III. Periodic surveys are done, primarily by the WDNR, to monitor populations and evaluate habitat conditions.

Habitat needed to meet management objective: Population goals and habitat needs for brook trout were not established as part of the Planning process.

Current habitat availability: Approximately the same as listed above under Management Objective. The project area contains approximately 9.8 miles of Class II trout water.

Population trend data: The quality of habitat has been improving as a result of several management activities. Current Forest Plan direction calls for no aspen regeneration within 300 feet of all Class I and selected Class II trout streams to discourage beaver activity. Since 1994 the Forest has had an active beaver management program that targets the higher quality streams for reduction of beaver numbers and removal of dams, to maintain free-flowing conditions. There

have been a number of projects completed, aimed at improving instream habitat, restoring riparian areas, and reducing sedimentation and erosion into streams.

Muskellunge

Preferred habitat: Warm water lakes and larger rivers.

Unit of measure: **Amount of habitat available.**

Frequency of measure: Every five years.

Management objective: Cooperate with WDNR in identification of lake habitat improvement projects. Maintain suitable habitat on approximately 31,873 acres of lakes containing muskellunge. Periodic surveys are done, primarily by the WDNR, to monitor populations and evaluate habitat conditions.

Habitat needed to meet management objective: Population goals and habitat needs for muskellunge were not established as part of the planning process.

Current habitat availability: Figures are not available for acres of habitat Forest-wide. Within the project area, musky are considered "common" in Day, East Twin, and Spillerberg Lakes.

Population trend data: Overall musky populations have remained stable on the Forest over the last decade. This can be attributed to a variety of management activities. The musky is the "state fish" of Wisconsin, therefore the WDNR expends considerable efforts on research and stocking of the species. The Forest adopted Wisconsin Forestry Best Management Practices (BMP's) in 1995 to help protect and restore riparian areas. There has been considerable education among anglers regarding catch and release of this species, therefore few musky are harvested as compared to other game fish. The WDNR Northern Initiative has identified shoreline development as a key issue and has been working with private landowners in the north to educate them on the effects of development on the lacustrine ecosystem. The Forest has an active fish survey and monitoring program, as well as a habitat improvement program; as a result the Forest has focused its fish management activities on trying to restore fish communities in lakes to what historically may have been there or to fit with the habitat/water quality (productivity) of the lake. In the previous decade 9314 acres of lake improvement was accomplished, together with 750 lake structures.

White-tailed deer

Preferred habitat: Forest edges, areas interspersed with fields and openings, conifer swamps (seasonally).

Unit of measure: Deer population figures are based on the Department of Natural Resources SEX-AGE-KILL (SAK) formula. Population figures shown in the table below are estimated over-winter numbers (post-hunting season), and are given for the management units that include portions of the Great Divide district (the units also include areas outside the Forest). The Winter Severity Index (WSI), also shown, is used to determine weather effects on deer in relation to deep snow and cold temperatures. The WSI is calculated by adding the number of days with 18" or more of snow with the days when the minimum temperature is O degrees F or lower between December 1 and April 30. Generally, a WSI <50 is considered mild, 50-80 is moderate, and >80 is considered severe.

Frequency of measure: Annual. The WDNR coordinates population assessments utilizing harvest records, summer deer observations, and WSI. Numbers of deer are tracked statewide as well as by individual Deer Management Units, each with a designated over-winter population goal. The WDNR manages the population by utilizing a variety of deer hunter harvest methods.

Management objective: Provide habitat that will support about 32,000 animals on the Chequamegon. WDNR population goals have been established for all of the Deer Management Units and range from 10 to 20 deer per square mile of deer range (over-winter numbers). Amount of habitat is tracked through CDS. Population trends are tracked through yearly WDNR population estimates.

Habitat needed to meet management objective: 268,400 acres aspen, 13,460 acres upland openings, 67,080 acres swamp conifer, and 67,080 acres oak.

Current habitat availability: Forest-wide: 204,054 acres aspen, 18,529 acres upland openings, 93,748 acres swamp conifer, and 31,592 acres oak. Project area: 8,304 acres aspen, 231 acres upland openings, 7,193 acres swamp conifer, and 17 acres oak. Note: Total forested acres (29,724) could also be considered as project area habitat available.

Population trend data: Since habitat is not a limiting factor for deer populations in Wisconsin, population trends are primarily dependent on weather and hunter harvest. Deer numbers in the Northern Forest area increased substantially during the 1980's. This was reduced somewhat in the early 90's due to aggressive hunting harvests. Populations recovered but were reduced again following the consecutive severe winters of 1995-96 and 1996-97. Currently all areas of Wisconsin have deer numbers above goal; the 1999 posthunt population was more than 20% above goal in 98 management units; the 2000 posthunt population was more than 20% above goal in 91 deer management units. The statewide 2000 posthunt population was the second highest on record (Dhuey, 2000, 2001).

Estimated annual deer populations for Deer Management Units that include Great Divide Ranger District (units also include land outside of the Forest); the WSI is the mean calculated for the Northern Forest area (note: project area is within Unit 6)

Unit	**Deer Range (sq.mi.)**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
06	404	6868	6060	6464	9696	12928	8888	5656	8484	9696	9500
13	717	17925	10038	11472	16491	24378	15774	11472	15774	19359	21900
14	333	6993	4662	4995	6660	9657	7326	5661	6327	9657	9900
28	615	9225	8610	9225	13530	19065	14145	7995	11070	13530	14400
WSI		50	43	48	32	126	116	16	44	37	83

Ruffed Grouse

Preferred habitat: Mixed forest types and age classes, particularly aspen in the Great Lakes Region.

Unit of measure: **Population trends.**

Frequency of measure: Annual standardized spring drumming route transects conducted by Forest Service and Wisconsin DNR personnel.

Management objective: Provide habitat that will support approximately 67,178 birds on the Chequamegon. Most districts have one or more grouse transects that are surveyed each spring. Survey routes consist of 10 survey sites spread along a road at one mile intervals; grouse drumming is counted at each site for four minutes. The same routes and sites are surveyed each year. In addition, population trends are tracked through yearly NRRI Breeding Bird surveys. Amount of habitat is tracked through CNF Combined Data System (CDS).

Habitat needed to meet management objective: 36,280 acres aspen 0-20 years old; 145,130 acres aspen 21-40 years old; 108,850 acres aspen over 40 years old; 65,380 acres jack pine and balsam fir; 7185 acres upland openings.

Current habitat availability: Forest-wide: 66,600 acres of aspen 0-20 years old; 53,010 acres aspen 21-40 years old; 84,351 acres aspen over 40 years old; 40,160 acres jack pine and balsam fir; 18,529 acres upland openings. Project area: 2,818 acres of aspen 1-20 years old; 1,269 acres of aspen 21-40 years old; 4,217 acres of aspen over 40 years old; 876 acres jack pine and balsam fir; 231 acres upland openings.

Population trend data: Statewide drumming counts for 2000 were down 14% over 1999 levels, however data for northern Wisconsin showed little change. Statewide populations decreased 23% between 2000 and 2001, based on roadside drumming counts (Dhuey, 2001). Yearly changes are to be expected as ruffed grouse typically follow cyclic population changes, however these results demonstrate that state birds are on the declining end of the cycle. Two drumming routes have been surveyed in recent years on the Great Divide district, one run by district personnel and one run by a DNR biologist. The following table displays the drums per stop statewide, for the northern region, and for the two routes on the district (route 2-2 is located within the project area). NRRI Breeding Bird Survey data for 1992-1999 on the Great Divide District identified 97 individuals from 29 forest stands (total of 41 stands surveyed on district). Population estimates for the CNF, Great Divide District, and project area, calculated using NNFBIRD population modeling software program (Dobiesz, 1998) are displayed in Table 1.

Year	Wisconsin	Northern WI	District - Route # **2-2**	District – Route # **58-2**
1994	0.58	0.67	0.40	0.50
1995	0.84	0.98	3.20	1.60
1996	0.86	1.10	1.50	1.60
1997	0.91	1.46	4.50	1.90

1998	1.24	2.12	3.80	4.30
1999	1.37	2.00	1.70	3.00
2000	1.20	1.93	2.60	3.80
2001	0.94	1.55	1.80	2.90

Spring Peeper

Preferred habitat: Wetlands within most forest types.

Unit of measure: **Population trends.**

Frequency of measure: Annually.

Management objective: Monitor as a bioindicator of environmental stress.

Habitat needed to meet management objective: NA

Current habitat availability: Approximately 95,435 acres of suitable wetland types Forest-wide.

Population trend data: Population has been relatively stable statewide. The WDNR has coordinated a state volunteer frog and toad survey since 1984 and has verified spring peepers in 55 of the states 72 counties. State and regional trends (mean annual % change in population estimates) are –0.2 and –1.4 respectively (Mossman et al., 1998). A survey has been conducted on the Great Divide district since 1992; the following table displays the number of sites out of a total of 10 that spring peepers were recorded on each year. Each survey is conducted three times during the year; since the spring peeper is an early breeder it is seldom recorded on the last survey, which is generally run in early summer.

Year	Census #1	Census #2	Census #3
1992	8	4	1
1993	10	10	0
1994	8	8	0
1995	7	9	0
1996	4	6	0
1997	9	9	0
1998	9	7	0
1999	8	10	Not run
2000	9	1	2
2001	10	10	0

Sharp-tailed Grouse

The sharp-tailed grouse is not found on the Great Divide district due to lack of suitable habitat (large grasslands/barrens/ pine savannahs) and will not be covered in this document. It will not be analyzed in any Environmental Analysis on the Great Divide district for the same reason.

Literature Cited

Chequamegon National Forest Land and Resource Management Plan; Final Environmental Impact Statement. 1986. Park Falls, WI.

Chequamegon-Nicolet National Forest. 1998. End of Decade Monitoring Report 1986-1996. Chequamegon-Nicolet National Forest, Implementing the National Forest Plans.

Daulton, T., M.W. Meyer, and P.W. Rasmussen. 1997. The 1995 status of the Common Loon in Wisconsin. Passenger Pigeon 59(3): 195-205.

Dobiesz, Norine. 1998. Nicolet National Forest Bird Information Retrieval and Display program, V3.04. Corel Paradox Version 7.0. Paradox Runtime.

Dhuey, B. 2001. Wisconsin Wildlife Surveys, August 2001 report. WDNR, Bureau of Integrated Science Services, Ecological Inventory and Monitoring Section, Madison, WI.

Dhuey, B. 2000. Wisconsin Wildlife Surveys, April 2000 report. WDNR, Bureau of Integrated Science Services, Ecological Inventory and Monitoring Section, Madison, WI.

Jackson, H.H.T. 1961. Mammals of Wisconsin. University of Wisconsin Press. Madison, WI. 504pp.

Lind, J., N. Danz, M.T. Jones, J.M. Hanowski, and G.J. Niemi. 2000. 1999 Annual Report: Breeding bird monitoring in Great Lakes National Forests: 1991-1999. Natural Resources Research Institute Technical Report: NRRI/TR-2000/04. Duluth, MN.

Lind, J., N. Danz, M.T. Jones, J.M. Hanowski, and G.J. Niemi. 2001. 2000 Annual Update Report: Breeding bird monitoring in Great Lakes National Forests: 1991-2000. Natural Resources Research Institute Technical Report: NRRI/ TR-2001/04. Duluth, MN.

Mladenoff, D.J., T.A. Sickley, R.G. Haight, and A.P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the Northern Great Lakes Region. Conservation Biology 9:279-294.

Mossman, M.J., J.R. Sauer, G.A. Gough, L.M. Hartman, and R. Hay. 1998. The Wisconsin frog and toad survey home page (http://www.mbr-pwrc.usgs.gov/wifrog/frog.htm). Wisconsin Department of Natural Resources (Madison) and USGS Patuxent Wildlife Research Center, Laurel, MD.

NatureServe: An online encyclopedia of life. 2000. Version 1.0. Arlington, VA: Association for Biodiversity Information (http://natureserve.org). Accessed: November 24, 2000.

Niemi, G.J., and J.M. Hanowski. 1992. Forest Wildlife, Forest Birds Section. Technical paper for Generic Environmental Impact Statement on timber harvesting and forest management in Minnesota. Prepared by Jaakko Poyry, consulting for Minn. Environmental Quality Board.

Robbins, S.D. 1991. Wisconsin Birdlife. The University of Wisconsin Press. Madison, WI. 702 pp.

Rolley, R. 2000. Wisconsin Checklist Project 1999. In Wisconsin Wildlife Surveys, August 2000 Volume 10, Issue 5, pp. 148-160.

Thompson, F.R., S.J. Lewis, J.Green, and D. Ewert. 1992. Status of neotropical migant landbirds in the Midwest: Identifying species of management concern. From proceedings: Status and management of neotropical migratory birds, Estes Park, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. GRT RM-229, pp. 145-158.

Wydeven, A.P., J.E. Wiedenhoeft, R.P. Thiel, R.N. Schultz, B. Kohn, and S.R. Boles. 2001. Progress report of wolf monitoring in Wisconsin for the period October 2000 – March 2001. WDNR, Park Falls, WI.

Table 1. Existing condition population estimates for bird MIS (excluding bald eagle) recommended (FEIS 1986) for alternative comparison and monitoring on the Chequamegon National Forest. Estimates calculated based on habitat availability, using NNFBIRD program (Dobiesz 1998). Numbers represent breeding pairs.

Species	Chequamegon Forest	Great Divide District	**Cayuga Project Area**
Common loon	144	53	6
Ring-necked duck	91	28	8
Common yellowthroat	11581	5124	509
Ruffed grouse	2671	1082	111
Pileated woodpecker	1854	777	68
Pine warbler	4564	1092	71
Blackburnian warbler	10435	5036	404
Brown creeper	8662	3882	353
Olive-sided flycatcher	2082	740	71
Barred owl	131	73	6

6.9 Appendix I- Aspen Conversion Table

Proposed aspen conversion: treatment by alternative – Cayuga Project Area

Comp.	Stand	Treatment	Reason	Forest Type (goal)	Alt. 2 acres	Alt. 3 acres	Alt. 4 acres
124	3	Underplant (Alt. 3- Shelterwood/ underplant	Visuals- Day Lake	White pine	10	18	10
124	22	Shelterwood/underplant	Visuals- Day Lake	White pine		2	
124	27	Shelterwood/underplant	Visuals- Day Lake/ Hwy M	White pine		13	
125	3	Shelterwood	Visuals- Hwy GG	Hardwood		4	
127	4	Shelterwood/underplant	Visuals- East Twin Lake	White pine	15	15	15

153	11	Shelterwood (Alt. 4- Improvement cut)	Restore transition area	Hardwood	12		12
157	2	Shelterwood (Alt. 4- Improvement cut)	Favor hardwood component	Hardwood	28		28
158	27	Shelterwood	Reduce fragmentation	Hardwood	15		
159	2	Underplant (Alt. 3- Shelterwood/ underplant	Visuals- Spillerberg Lake	White pine	14	14	
166	7	Shelterwood	RNA concerns	Hardwood	48		
166	13	Thinning	RNA concerns	White spruce		22	
170	65	Shelterwood	Visuals- Hwy GG	Hardwood	6	6	
171	19	Shelterwood/overstory removal	Visuals- Day Lake	White pine	14	14	14
176	33	Thinning	Visuals- Hwy GG	Hardwood	10	10	
176	34	Thinning	Visuals- Hwy GG	Hardwood	6	6	
176	36	Thinning	Visuals- Hwy GG	Hardwood	4	4	4
176	38	Thinning	Visuals- Hwy GG	Hardwood	14	14	14
176	39	Shelterwood	Visuals- Hwy GG	Hardwood	8		
177	3	Shelterwood (Alt. 3 & 4- Thinning)	Visuals- Hwy GG	Hardwood	27	27	27
177	9	Shelterwood (Alt. 3 & 4- Thinning)	Visuals- Hwy GG	Hardwood	30	30	30
177	11	Shelterwood	Visuals- Hwy GG	Hardwood	11		
177	16	Shelterwood (Alt. 3- Thinning; (Alt. 4- Improvement cut)	Visuals- Hwy GG	Hardwood	78	39	78
178	15	Shelterwood/underplant	Restore transition area	White pine	26		26
178	25	Thinning	Release spruce component	White spruce	15	15	15
179	9	Improvement cut	Reduce fragmentation	Hardwood			69
180	5	Thinning	Trout stream corridor	White spruce	22		22
180	10	Improvement cut	Favor hardwood component	Hardwood			37
180	19	Thinning	RNA concerns	Hardwood		35	
180	27	Thinning	Release spruce component	White spruce	15	29	
188	1	Thinning (Alt. 4- Improvement cut)	Visuals- Hwy GG	White spruce	13	13	13
188	41	Thinning	Trout stream corridor	White spruce	13	13	
198	4	Shelterwood (Alt. 3- Thinning)	Visuals- Hwy GG	White spruce	12	12	
198	17	Improvement cut	Restore transition area	Hardwood			20
198	24	Shelterwood (Alt. 3- Thinning)	Visuals- Hwy GG	White spruce	8	8	
199	21	Shelterwood (Alt. 4- Improvement cut)	Visuals- Hwy GG	White spruce	40		40
199	30	Shelterwood	Favor hardwood component	Hardwood	24		24
199	37	Thinning	Visuals- Hwy GG	Hardwood	30	30	30
203	6	Thinning	Reduce fragmentation	White spruce	4		
203	10	Thinning	Reduce fragmentation	Hardwood	15		
203	11	Thinning	Reduce fragmentation	White spruce	3		
204	11	Thinning (Alt. 4- Improvement cut)	Reduce fragmentation	Hardwood	12		12
204	14	Thinning	Reduce fragmentation	Hardwood	44	44	

SUMMARY – acres by treatment, by alternative

Reason for Conversion of Aspen	Alt. 2	Alt. 3	Alt. 4
Visuals- Hwy GG	297	203	236
Visuals- Lakeshores	53	76	39
RNA Concerns	48	57	0
Reduce fragmentation	93	44	81
Release spruce component	30	44	15
Favor hardwood component	52	0	89
Trout stream corridor	35	13	22
Restore transition area	38	0	58

6.10 Appendix J- Stand Treatment Tables

Alternative 2-Stand Treatment Table

Stand ID (Cpt-Std)	*Forest Type (Current)*	*Std Ac*	*Origin*	*ELTP*	*Hab Type*	*Activity*	*Treat-ment acres*	*Forest Type (Goal)*	*Mitigation Measures*
124-3	Aspen-fir	18	1923	LS4B//3	ATM	Underplant white pine near lake	10	White pine	W10, W11, W12, W13, W19
124-15	Paper birch	3	1934	SL/MCS4B//3	ATM	Underplant white pine	3	White pine	T2, T3, T4, W10, W11, W12, W13, W19
124-19	Red pine	88	1941	SL/MCS3A//3	ATM	Thin	88	~	T2, T3, T4V1, V2, V3
124-20	Red pine	23	1941	SL/MCS3A//3	ATM	Thin	23	~	T2, T3, T4, W10, W11, W12, W13, W19
124-21	Jack & red pine	25	1936	SL/MCS3A//3	ATM	Thin, remove jack pine component	25	Red pine	T2, T3, T4, V1, V2, V3
124-22	Aspen-fir	25	1926	LS4B//3	ATM	Clearcut, leave buffer near lake	15	~	R6
124-24	White spruce	5	1925	LS4B//3	ATM	Thin	5	~	W10, W11, W12, W13, W19
124-38	Jack pine	26	1939	LS4B/3	ATM	Underplant white pine	26	W. pine-oak	T2, T3, T4, W10, W11, W12, W13, W19
125-30	Aspen	9	1929	SL/MCS4B//3	ATM	Clearcut	9	~	R6
126-10	Red pine	14	1937	SL/LS4C//3	ATM	Thin	14	~	S1, S2
126-22	Red pine	16	1938	SL/MCS4B//3	ATM	Thin	16	~	
127-4	Aspen	15	1950	SL/MCS4B//3	ATM	Shelterwood, underplant white pine, mech site prep	15	White pine	R6
127-11	Aspen-fir	19	1935	SL/MCS4B//3	ATM	Clearcut, leave buffer near lake	15	~	R6
127-17	Aspen	88	1930	SL/MCS4B//3 LS/MCS3A//3	ATM/ TMC	Clearcut northern part	40	~	E11, R6, V4
153-3	Aspen	8	1961	LS/MCS3A//3 M1A	ATM/ TMC	Clearcut	8	~	S7, S8, S9, S10, W14, W15, W16, W17, W18
153-5	Aspen-fir	26	1935	M1A LS3A//3	ATM	Clearcut	26	~	S7, S8, S9, S10, W10, W11, W12, W13, W19
153-11	Aspen	12	1957	SL/LS4B//4V M1A	ATD	Shelterwood	12	N. hardwood	S7, S8, S9, S10, W14, W15, W16, W17, W18
156-6	Aspen	13	1937	LS4B//3 SL/Strs3A//3	ATM	Clearcut	13	~	
156-11	White spruce	14	1961	SL/LS3B/3	0	Thin	14	~	
156-32	White spruce	4	1961	LS4B//3	ATM	Thin	4	~	
157-2	Aspen	28	1964	SL/LS4B//4C	AViO	Shelterwood	28	N. hardwood	

157-3	N. hardwood	31	1935	SL/LS4B//4C LS4B//3	AViO/ ATD	Selection	31	~	T8
157-4	N. hardwood	23	1937	SL/LS4B//4C	AViO/ ATD	Selection	23	~	T8
157-7	Aspen-spruce	61	1938	LS4B//3 Pn1A	ATM	Clearcut, leave buffer near creek	40	~	F1, T8, W14, W15, W16, W17, W18
157-8	Aspen-spruce	38	1937	LS4B//3	ATM	Clearcut, leave buffer near creek	20	~	F1, T8
157-12	N. hardwood	17	1950	LS/S+G4A//3	ATM/ PMV	Thin	17	~	
157-18	N. hardwood	78	1931	SL/LS4B//4V	ATD	Thin	78	~	
157-19	Sugar maple	13	1923	SL/LS4B//4V	ATD	Thin	13	~	
157-20	N. hardwood	42	1947	SL/LS3-1B//3	ATM/ ATD	Thin	42	~	S11, W14, W15, W16, W17, W18
157-21	Aspen	30	1956	SL/LS3-1B//3 SL/LS4C//4V	ATM/ TMC/ ATD	Clearcut	30	~	S1, S2, S11, W6, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
158-1	Aspen	62	1950	LS4B//3	ATM	Clearcut, leave buffer near creek	55	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
158-8	Aspen	27	1954	SL/LS4B//4V LS4B//3	ATD/ ATM	Clearcut, leave buffer near creek	20	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
158-9	Sugar maple	23	1939	SL/LS4B//4V	ATD	Selection	23	~	F1, T1, T5, T8, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
158-15	N. hardwood	158	1930	SL/LS4B//4V SL/LS4C//4V	ATD	Selection	158	~	S1, S2
158-17	N. hardwood	41	1951	SL/LS4B//4V	ATD	Selection	41	~	
158-18	N. hardwood	91	1931	LS4B//3 Pa1A SL/LS3A//4V	ATD	Thin	91	~	
158-19	N. hardwood	23	1945	SL/LS4B//4V	ATD	Selection	23	~	
158-20	N. hardwood	16	1952	SL/LS4B//4V	ATD	Selection	16	~	
158-24	N. hardwood	65	1928	SL/LS4B//4V M1A	ATD	Thin, leave buffer along wetland	55	~	S7, S8, S9, S10
158-26	N. hardwood	23	1941	SL/LS4B//4V Pa1A	ATD	Thin, leave buffer along wetland	18	~	
158-27	Aspen-spruce	15	1961	LS4B//3	ATM	Shelterwood	15	N. hardwood	
158-28	N. hardwood	67	1929	SL/LS4B//4V	ATD	Selection	67	~	

158-30	N. hardwood	65	1940	SL/LS4B//4V LS4B//3	ATD	Selection	65	~	
158-33	N. hardwood	55	1920	SL/LS4B//4V	ATD	Selection	55	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
159-2	Aspen	14	1940	PN1A	0	Underplant white pine	14	White pine	W10, W11, W12, W13, W19
159-5	Sugar maple	85	1935	SL/LS4B//4V	ATD	Thin	85	~	
161-12	White spruce	4	1960	SL2A	TMC	Thin	4	~	S3, S4, S5, S6
161-14	Aspen-spruce	52	1957	SL2A LS4B//3 Pa1A	TMC/ ATM	Clearcut	52	~	F1, S3, S4, S5, S6, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
161-15	N. hardwood	98	1921	LS4B//3	ATM	Thin	98	~	F1, T1, T5, T8, W10, W11, W12, W13, W19
161-16	N. hardwood	28	1937	LS4B//3	ATM	Thin	28	~	
161-18	N. hardwood	51	1935	SL/LS4B//3	ATM	Thin	51	~	T1, T5, T8
161-19	Aspen-spruce	70	1945	SL/Strs3A//3	ATM	Clearcut west part	40	~	T1, T5, T8, W10, W11, W12, W13, W19
161-21	Aspen	12	1944	LS4B//3	ATM	Clearcut	12	~	
161-25	N. hardwood	14	1944	LS4B//3	ATM	Thin	14	~	
161-28	N. hardwood	32	1948	LS4B//3	ATM	Thin	32	~	
161-29	N. hardwood	7	1938	LS4B//3	ATM	Thin	7	~	
161-37	Aspen	10	1954	LS4B//3	ATM	Clearcut	10	~	
162-12	Sugar maple	47	1927	LS/4B//3	ATM	Thin	47	~	T1, T5, T8
162-20	N. hardwood	46	1927	SL/LS4B//3	ATM/ ATD	Thin, leave uncut part in center	30	~	T8
166-7	Aspen	48	1952	SL/S+G4B//3	ATD/ ATM	Shelterwood	48	N. hardwood	
166-12	Paper birch	28	1921	SL/MCS4B//3	ATM	Shelterwood, underplant white pine, mech site prep	28	White pine	
166-15	N. hardwood	20	1939	SL/LS3-1A//3 SL/MCS4B//3	ATM/ ATD	Thin	20	~	S11
166-28	Sugar maple	66	1932	SL/LS4B//4C	AViO/ ATD	Selection	66	~	T1, T5, T8
166-32	Sugar maple	26	1951	SL/LS4B//3	ATM	Thin	26	~	T1, T5, T8
166-34	Aspen	12	1949	SL/S+G4B//3 Pn1A	ATD/ ATM	Clearcut	12	~	
167-17	Sugar maple	5	1929	SL/LS4B//4C	AViO/ ATD	Selection	5	~	

168-1	Red pine	5	1934	SL/MCS3A//3	ATM	Thin	5	~	V1 V2, V3
168-18	N. hardwood	11	1942	SL/MCS4B//3	ATM	Thin	11	~	
168-28	Aspen-spruce	16	1935	SL/S+G4B//3	ATD/ ATM	Clearcut	16	~	T1, T5, T8
168-32	Aspen	32	1960	SL/LS4B//4V	ATD	Clearcut	32	~	R6, W10, W11, W12, W13, W19
169-13	Red pine	4	1969	SL/MCS4B//3	ATM	Thin	4	~	
169-25	Aspen-fir	8	1950	LS/MCS2A//3 SL/MCS4B//3	ATM/ TMC	Clearcut	8	~	S3, S4, S5, S6
169-26	Red pine	21	1950	SL/MCS4B//3 SL/Strs3A//3	ATM/ PMV	Thin	21	~	
169-44	Aspen-fir	8	1944	SL/MCS4B//3	ATM	Clearcut	8	~	T1, T5, T8
169-52	N. hardwood	8	1944	SL/LS4B//4V	ATD	Thin	8	~	
170-9	N. hardwood	41	1940	SL/LS4B//3 SL/MCS4B//3	ATM/ ATD	Thin	41	~	
170-16	Paper birch	39	1910	SL/MCS4B//3	ATM	Overstory removal	39	White pine	
170-17	Paper birch	25	1899	LS/MCS2A//3	TMC	Shelterwood, underplant hemlock, mech site prep	25	Hemlock	
170-31	Red pine	30	1934	LS/S+G4B//3 LS/S+G4A//3	PMV	Thin	30	~	W10, W11, W12, W13, W19
170-41	Aspen-fir	11	1929	SL/S+G4B//3	ATD/ ATM	Clearcut	11	~	T1, T5, T8
170-42	Sugar maple	11	1930	SL/S+G4A//3	ATD/ ATM	Thin	11	~	V1 V2, V3
170-53	N. hardwood	7	1918	SL/MCS4B//3	ATM	Thin	7	~	R6
170-54	Red pine	7	1932	SL/MCS4B//3	ATM	Thin	7	~	V1 V2, V3
170-65	Aspen	6	1935	SL/MCS4B//3	ATM	Shelterwood	6	N. hardwood	V1 V2, V3
171-6	Sugar maple	67	1929	SL/LS4B//4V	ATD	Thin	67	~	R6
171-19a	Aspen	14	1958	LS4B//3	ATM	Shelterwood, lakeside part	7	White pine	R6, W10, W11, W12, W13, W19
171-19b	Aspen	14	1958	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
171-24	Red pine	9	1966	SiL/SL3A//3	ATM	Thin	9	~	S12, S13, S14
171-29a	Paper birch	14	1943	LS4B//3	ATM	Shelterwood, lakeside part	7	White pine	R6, W10, W11, W12, W13, W19
171-29b	Paper birch	14	1943	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
176-33	Aspen	10	1935	SiL/SL2A//3	ATM	Thin	10	N. hardwood	S15, S16, S17, V1 , V2, V3
176-34	Aspen	6	1935	SiL/SL2A//3 SL/LS4B//4V	ATM/ ATD	Thin	6	N. hardwood	S15, S16, S17, V1 V2, V3

176-36	Aspen	4	1935	SL/LS4B//4V	ATD	Thin	4	N. hardwood	V1 V2, V3
176-38	Aspen	14	1935	SL/LS4B//4V	ATD	Thin	14	N. hardwood	V1 V2, V3
176-39	Aspen	8	1935	SiL/SL2A//3	ATM	Shelterwood	8	N. hardwood	S15, S16, S17
177-3	Aspen	27	1933	SL/LS3A//3	ATM	Shelterwood	27	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W19
177-4	Sugar maple	143	1900	SL/LS4B//4V	ATD	Selection	143	~	
177-6	N. hardwood	99	1924	SL/LS4B//4V	ATD	Selection	99	~	W14, W15, W16, W17, W18
177-9	Aspen	30	1948	SL/LS4B//4V	ATD	Shelterwood	30	N. hardwood	V1 V2, V3
177-10	N. hardwood	69	1926	SL/LS4B//4V	ATD	Selection	69	~	W14, W15, W16, W17, W18
177-11	Aspen	11	1946	SiL/SL2A//3	ATM	Shelterwood	11	N. hardwood	S15, S16, S17, W14, W15, W16, W17, W18
177-16	Aspen-spruce	78	1935	SL/LS4B//4V	ATD	Shelterwood	78	N. hardwood	V1 V2, V3
178-6	Red pine	2	1970	LS4B//3	ATM	Thin	2	~	
178-15	Aspen-spruce	26	1935	SL/Strs4B//3	PMV	Shelterwood, underplant white pine, mech site prep	26	White pine	
178-20	Sugar maple	90	1930	SL/LS4C//4V	ATD	Selection	90	~	E7, S1, S2, W6, W14, W15, W16, W17, W18
178-21	Red pine	28	1957	LFS/FS4B//3	PMV/ AVVib	Thin	28	~	E7, W14, W15, W16, W17, W18
178-23	Red pine	32	1957	LFS/FS4B//3	PMV/ AVVib	Thin	32	~	E7
178-25	Aspen-spruce	15	1950	LS/S+G3A//3	ATM	Thin	15	White spruce	E7, E8
179-8	Red pine	16	1958	SL/MCS4B//3	ATM	Thin	16	~	
179-9	Aspen	69	1940	SL/LS4B//4V	ATD	Clearcut northern part	40	~	
179-17	Aspen-spruce	32	1935	SiL/SL2A//3	ATM	Clearcut	32	~	E13, S15, S16, S17
179-18	N. hardwood	28	1914	SL/LS4B//3	ATM	Thin	28	~	
179-24	Aspen-spruce	51	1950	SL/LS4B//3	ATM	Clearcut	51	~	
179-29	N. hardwood	32	1925	SL/Strs3A//3	PMV	Shelterwood	32	~	
180-4	Sugar maple	47	1939	SL/LS4B//4C	AViO/ ATD	Selection	47	~	
180-5	Aspen	22	1951	SL/Strs3A//3 SL2A	PMV/ TMC	Thin	22	White spruce	F1, S3, S4, S5, S6, W14, W15, W16, W17, W18
180-6	N. hardwood	47	1928	SL/LS4B//4C	AViO/ ATD	Selection	47	~	W14, W15, W16, W17, W18
180-7	N. hardwood	28	1931	SL/LS4B//4C	AViO/ ATD	Selection	28	~	W14, W15, W16, W17, W18
180-8	Aspen	29	1932	LS4B//3	ATM	Clearcut	29	~	

180-10	Aspen	37	1932	LSMCS2A//3	ATM/ TMC	Clearcut	37	~	S3, S4, S5, S6, W14, W15, W16, W17, W18
180-14	Sugar maple	46	1932	SL/LS4B//4C	AViO/ ATD	Selection	46	~	
180-27	Aspen-spruce	29	1948	LS4B//3	ATM	Thin, leave buffer near RNA	15	White spruce	W14, W15, W16, W17, W18
180-28	Sugar maple	18	1940	LS4B//3	ATM	Thin	18	~	W5, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
180-30	White spruce	20	1941	LS/S+G4B//3 SL/Strs3A//3	PMV	Thin	20	~	F1, W5, W10, W11, W12, W13, W19
180-32	Aspen	22	1941	LS4B//3	ATM	Clearcut	22	~	
188-1	Aspen-spruce	13	1940	LS4B/3	ATM	Thin	13	White spruce	V1 V2, V3
188-6	N. hardwood	42	1928	SL/LS4B//3	ATM	Thin	42	~	F1
188-11	N. hardwood	56	1925	SL/LS4B//4V	ATD	Shelterwood	56	~	F1, W5, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
188-12	Sugar maple	152	1925	SL/LS4B//4V	ATD	Thin	152	~	V1 V2, V3
188-18	N. hardwood	22	1930	SL/Strs3A//3 SL2A	PMV/ TMC	Thin	22	~	E12, S3, S4, S5, S6, W14, W15, W16, W17, W18
188-41	Aspen-spruce	13	1930	SL/MCS4B//3 LS4B//3	ATM	Thin	13	White spruce	F1, V1, V2, V3 W5, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19, W43
188-45	Sugar maple	19	1920	SL/LS4B//4B	TMC	Thin	19	~	
198-4	Aspen-spruce	12	1945	SL/Strs4B//3	PMV	Shelterwood	12	White spruce	V1 V2, V3
198-17	Aspen-spruce	20	1932	SL/LS4B//4V	ATM	Clearcut	20	~	W14, W15, W16, W17, W18
198-24	Aspen-spruce	8	1926	SL/Strs4B//3	PMV	Shelterwood	8	White spruce	W14, W15, W16, W17, W18
199-21	Aspen-spruce	59	1945	LS4B//3	ATM	Shelterwood	40	White spruce	V1, V2, V3, W10, W11, W12, W13, W19
199-22	N. hardwood	18	1926	LS4B//3	ATM	Thin	6	~	V1, V2, V3, W14, W15, W16, W17, W18
199-24	Red pine	12	1963	LS4B//3	ATM	Thin	12	~	W14, W15, W16, W17, W18
199-25	N. hardwood	27	1932	SL/LS4C//4V LS4B//3	ATD/ ATM	Thin	27	~	S1, S2, W6, W14, W15, W16, W17, W18
199-30	Aspen	24	1941	SL/LS3A//3	ATM	Shelterwood	24	N. hardwood	W14, W15, W16, W17, W18
199-32	N. hardwood	15	1940	SiL/SL2A//3 SL/LS3A//3	ATM	Thin	15	~	W14, W15, W16, W17, W18
199-35	N. hardwood	136	1915	SL/LS4B//4V	ATD	Selection	60	~	T7, V1, V2, V3, W14, W15, W16, W17, W18
199-37	Aspen-spruce	61	1946	SL/STRS4B//3	ATM	Thin	30	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
199-39	N. hardwood	42	1951	LS4B//3	ATM	Thin	42	~	W14, W15, W16, W17, W18

199-43	N. hardwood	28	1932	SL/LS4B//4V SL/LS3A//3	ATD/ ATM	Thin	28	~	W14, W15, W16, W17, W18
200-1	N. hardwood	83	1917	SL/LS4B//4V	ATD	Selection	83	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-2	N. hardwood	140	1916	SL/LS4B//4V	ATD	Selection	140	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-8	Sugar maple	12	1927	SL/LS4B//3	ATM	Thin	12	~	
200-11	Sugar maple	35	1918	SL/LS4B//4V	ATD	Selection	35	~	E11, T7
202-1	N. hardwood	78	1906	SiL/SL2A//3 SL/LS4B//4V	ATM/ ATD	Selection	78	~	E12, S15, S16, S17, T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
202-8	Sugar maple	73	1913	SL/LS4B//4V	ATD	Selection	73	~	T7, W10, W11, W12, W13, W19
202-9	N. hardwood	19	1930	SL/LS4B//4V	ATD	Selection	19	~	T7
202-14	N. hardwood	16	1916	SL/LS4B//4V	ATD	Selection	16	~	T7, W14, W15, W16, W17, W18
202-15	N. hardwood	9	1929	SL/LS4B//4V	ATD	Selection	9	~	T7, W14, W15, W16, W17, W18
202-16	Sugar maple	10	1930	SL/LS4B//4V	ATD	Selection	10	~	T7, W14, W15, W16, W17, W18
203-1	N. hardwood	27	1917	SL/LS4B//4V	ATD	Selection	27	~	E3, T7, W14, W15, W16, W17, W18
203-4	N. hardwood	22	1910	SL/LS4B//4V	ATD	Selection	22	~	T7, W10, W11, W12, W13, W19
203-5	N. hardwood	75	1913	SL/LS4B//4V	ATD	Selection	75	~	E3, E4, E5, E6, T7
203-6	Aspen-spruce	4	1931	SL/LS4B//4V	ATD	Thin	4	White spruce	
203-8	N. hardwood	15	1919	SL/LS4B//4V	ATD	Selection	15	~	T7
203-10	Aspen	15	1927	SL/LS4B//4V	ATD	Thin	15	N. hardwood	
203-11	Aspen-spruce	3	1928	SL/LS4B//4V	ATD	Thin	3	White spruce	
203-14	N. hardwood	60	1929	SL/LS4B//4V	ATD	Selection	60	~	T7, W10, W11, W12, W13, W19
203-15	N. hardwood	54	1939	SL/LS4B//4V	ATD	Selection	54	~	T7
203-16	N. hardwood	27	1908	SL/LS4B//4V	ATD	Selection	27	~	E1, E4, E5, T7

203-19	N. hardwood	26	1911	SL/LS4B//4V	ATD	Selection	26	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
203-21	N. hardwood	6	1946	SL/LS4B//4V	ATD	Selection	6	~	T7
203-24	Red pine	4	1930	SL/LS4B//4V	ATD	Thin	4	~	
203-25	Red maple	30	1928	SL/LS4B//4V SiL/SL2A//3	ATD/ ATM	Thin	30	~	S15, S16, S17
203-28	N. hardwood	27	1930	SL/LS4B//4V	ATD	Selection	27	~	T7
203-30	Sugar maple	10	1927	SL/LS4B//4V	ATD	Selection	10	~	T7
203-31	Sugar maple	55	1921	SL/LS4B//4V	ATD	Selection	55	~	T7, W10, W11, W12, W13, W19
204-2	Sugar maple	38	1920	SL/LS4B//4V	ATD	Selection	38	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
204-7	N. hardwood	10	1941	SL/LS4B//4V	ATD	Selection	10	~	T7
204-11	Aspen	12	1935	SL/LS4B//4V	ATD	Thin	12	N. hardwood	
204-12	N. hardwood	13	1930	SL/LS4B//4V	ATD	Selection	13	~	T7, W10, W11, W12, W13, W19
204-14	Aspen	44	1935	SL/LS4B//4V	ATD	Thin	44	N. hardwood	W14, W15, W16, W17, W18
204-19	N. hardwood	10	1930	SL/LS4B//4V	ATD	Selection	10	~	T7
204-25	Aspen-spruce	14	1938	LS4B//3	ATM	Clearcut	14	~	

1/ Mitigation measures that apply to all stands include: R1, R3, R5, P1,W1, W2, W3, W4, W8, W9

2/ Mitigation measures that apply to all stands requiring temporary roads: E9, W7

3/ Mitigation measures that apply to all final regeneration harvest areas: R2

4/ Mitigation measures that apply to all stands where treatments will have soil disturbance: N1, N2, N3, N4, N6

5/ Mitigation measures that apply to all stands with non-native invasive species: N5

6/ Mitigation measures that apply to all final regeneration harvest areas >10 acres in size: R4 **7**/ Mitigation measures that apply to the use of unclassified Rd # W218202 in Comp. 203: E3

Alternative 3- Stand Treatment Table

Stand ID (Cpt-Std)	*Forest Type (Current)*	*Std ac*	*Origin*	*ELTP*	*Forest Habitat Type*	*Activity*	*Treat-ment acres*	*Forest Type (Goal)*	*Mitigation Measures*
124-3	Aspen-fir	18	1923	LS4B//3	ATM	Shelterwood, underplant white pine, mech site prep	18	White pine	R6, W10, W11, W12, W13, W19
124-15	Paper birch	3	1934	SL/MCS4B//3	ATM	Underplant white pine	3	White pine	T2, T3, T4, W10, W11, W12, W13, W19
124-19	Red pine	88	1941	SL/MCS3A//3	ATM	Thin	88	~	T2, T3, T4V1, V2, V3
124-20	Red pine	23	1941	SL/MCS3A//3	ATM	Thin	23	~	T2, T3, T4, V1, V2, V3, W10, W11, W12, W13, W19
124-21	Jack & red pine	25	1936	SL/MCS3A//3	ATM	Thin, remove jack pine component	25	Red pine	T2, T3, T4
124-22a	Aspen-fir	25	1926	LS4B//3	ATM	Clearcut, leave buffer near lake	13	~	R6
124-22c	Aspen-fir	25	1926	LS4B//3	ATM	Shelterwood, underplant white pine along Hwy M, mech site prep	2	White pine	R6
124-24	White spruce	5	1925	LS4B//3	ATM	Thin	5	~	W10, W11, W12, W13, W19
124-27a	Aspen	22	1959	LS4B/3	0	Clearcut, leave buffer near lake	7	~	R6
124-27b	Aspen	22	1959	LS4B/3	0	Shelterwood, underplant white pine along Hwy M, mech site prep	13	White pine	R6
124-38	Jack pine	26	1939	LS4B/3	ATM	Underplant white pine	26	W. pine-oak	T2, T3, T4, W10, W11, W12, W13, W19
124-53	Jack pine	14	1939	LS4B/3	0	Clearcut, plant red pine	14	Red pine	E10, R6, T2, T3, T4
124-57	Jack pine	12	1937	LS4B/3	0	Clearcut, plant red pine	12	Red pine	E10, R6, T2, T3, T4
125-3a	Aspen	8	1929	SL/MCS4B//3	ATM	Clearcut	4	~	R6
125-3b	Aspen	8	1929	SL/MCS4B//3	ATM	Shelterwood near Hwy GG	4	N. hardwood	R6
125-30	Aspen	9	1929	SL/MCS4B//3	ATM	Clearcut	9	~	R6
126-7	Aspen	6	1955	LFS/FS4B/3	0	Clearcut	6	~	
126-10	Red pine	14	1937	SL/LS4C//3	ATM	Thin	14	~	S1, S2
126-22	Red pine	16	1938	SL/MCS4B//3	ATM	Thin	16	~	
127-4	Aspen	15	1950	SL/MCS4B//3	ATM	Shelterwood, underplant white pine, mech site prep	15	White pine	R6
127-11	Aspen-fir	19	1935	SL/MCS4B//3	ATM	Clearcut, leave buffer near lake	15	~	R6
127-17	Aspen	88	1930	SL/MCS4B//3 LS/MCS3A//3	ATM/ TMC	Clearcut north and south ends	60	~	E11, R6, V4

127-23	Paper birch	20	1940	SL/MCS4B//3 LS/MCS2A//3	ATM/ TMC	Shelterwood, scarify for birch, mech site prep	20	~	S3, S4, S5, S6
127-24	Paper birch	22	1940	SL/MCS4B//3 LS/MCS2A//3	ATM/ TMC	Shelterwood, scarify for birch, mech site prep	22	~	S3, S4, S5, S6
127-28	Paper birch	12	1940	SL/MCS4B//3 LS/MCS2A//3	ATM/ TMC	Shelterwood, scarify for birch, mech site prep	12	~	S3, S4, S5, S6
153-2	Aspen-fir	7	1928	SL2A	TMC	Clearcut	7	~	S3, S4, S5, S6
153-3	Aspen	8	1961	LS/MCS3A//3 M1A	ATM/ TMC	Clearcut	8	~	S7, S8, S9, S10, W14, W15, W16, W17, W18
153-5	Aspen-fir	26	1935	M1A LS3A//3	ATM	Clearcut, leave buffer near creek	23	~	S7, S8, S9, S10
153-11	Aspen	12	1957	SL/LS4B//4V M1A	ATD	Clearcut, leave buffer near FR 181	10	~	S7, S8, S9, S10, W14, W15, W16, W17, W18
156-6	Aspen	13	1937	LS4B//3 SL/Strs3A//3	ATM	Clearcut	13	~	
156-11	White spruce	14	1961	SL/LS3B/3	0	Thin	14	~	
156-32	White spruce	4	1961	LS4B//3	ATM	Thin	4	~	
157-2	Aspen	28	1964	SL/LS4B//4C	AViO	Clearcut	28	~	
157-3	N. hardwood	31	1935	SL/LS4B//4C LS4B//3	AViO/ ATD	Selection	31	~	T8
157-4	N. hardwood	23	1937	SL/LS4B//4C	AViO/ ATD	Selection	23	~	T8
157-7	Aspen-spruce	61	1938	LS4B//3 Pn1A	ATM	Clearcut north and south ends	50	~	F1, T8, W14, W15, W16, W17, W18
157-8	Aspen-spruce	38	1937	LS4B//3	ATM	Clearcut, leave buffer near creek	30	~	F1
157-12	N. hardwood	17	1950	LS/S+G4A//3	ATM/ PMV	Thin	17	~	
157-18	N. hardwood	78	1931	SL/LS4B//4V	ATD	Thin	78	~	
157-19	Sugar maple	13	1923	SL/LS4B//4V	ATD	Thin	13	~	
157-20	N. hardwood	42	1947	SL/LS3-1B//3	ATM/ ATD	Thin	42	~	S11, W14, W15, W16, W17, W18
157-21	Aspen	30	1956	SL/LS3-1B//3 SL/LS4C//4V	ATM/ TMC/ ATD	Clearcut	30	~	S1, S2, S11, W6, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
158-1	Aspen	62	1950	LS4B//3	ATM	Clearcut east and west parts	40	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
158-8	Aspen	27	1954	SL/LS4B//4V LS4B//3	ATD/ ATM	Clearcut, leave buffer near creek	20	~	F1, T1, T5, T8, W14, W15, W16, W17, W18

158-9	Sugar maple	23	1939	SL/LS4B//4V	ATD	Selection	23	~	F1, T1, T5, T8, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
158-15	N. hardwood	158	1930	SL/LS4B//4V SL/LS4C//4V	ATD	Selection	158	~	S1, S2
158-17	N. hardwood	41	1951	SL/LS4B//4V	ATD	Selection	41	~	
158-18	N. hardwood	91	1931	LS4B//3 Pa1A SL/LS3A//4V	ATD	Thin	91	~	
158-19	N. hardwood	23	1945	SL/LS4B//4V	ATD	Selection	23	~	
158-20	N. hardwood	16	1952	SL/LS4B//4V	ATD	Selection	16	~	
158-22	Aspen	31	1946	LS4B//3 M1A	ATM	Clearcut	31	~	S7, S8, S9, S10
158-24	N. hardwood	65	1928	SL/LS4B//4V M1A	ATD	Thin, leave buffer along wetland	55	~	S7, S8, S9, S10
158-26	N. hardwood	23	1941	SL/LS4B//4V Pa1A	ATD	Thin, leave buffer along wetland	18	~	
158-27	Aspen-spruce	15	1961	LS4B//3	ATM	Clearcut	15	~	
158-28	N. hardwood	67	1929	SL/LS4B//4V	ATD	Selection	67	~	
158-30	N. hardwood	65	1940	SL/LS4B//4V LS4B//3	ATD	Selection	65	~	
158-33	N. hardwood	55	1920	SL/LS4B//4V	ATD	Selection	55	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
159-2	Aspen	14	1940	PN1A	0	Shelterwood, underplant white pine, mech site prep	14	White pine	W10, W11, W12, W13, W19
159-5	Sugar maple	85	1935	SL/LS4B//4V	ATD	Thin	85	~	
159-9	Sugar maple	35	1935	LS4C//3	ATM	Thin part within project area	12	~	S1, S2
161-2	Aspen-fir	29	1942	LS4B//3 SL/Strs3A//3	ATM/ PMV	Clearcut	29	~	W10, W11, W12, W13, W19
161-5	Aspen-fir	12	1946	SL/Strs3A//3	PMV	Clearcut	12	~	
161-6	Sugar maple	14	1945	LS4B//3	ATM	Selection	14	~	
161-7	Aspen-spruce	32	1944	SL2A LS4B//3	TMC	Clearcut	32	~	S3, S4, S5, S6, W10, W11, W12, W13, W19
161-12	White spruce	4	1960	SL2A	TMC	Thin	4	~	S3, S4, S5, S6
161-14	Aspen-spruce	52	1957	SL2A LS4B//3 Pa1A	TMC/ ATM	Clearcut, leave buffer along creek	40	~	F1, S3, S4, S5, S6, W14, W15, W16, W17, W18
161-15	N. hardwood	98	1921	LS4B//3	ATM	Thin	98	~	F1,T1, T5, T8, W10, W11, W12, W13, W19

161-16	N. hardwood	28	1937	LS4B//3	ATM	Thin	28	~	T8
161-18	N. hardwood	51	1935	SL/LS4B//3	ATM	Thin	51	~	T1, T5, T8
161-19	Aspen-spruce	70	1945	SL/Strs3A//3	ATM	Clearcut part west of FR 183, and part adj to 161-2. Leave center.	40	~	W10, W11, W12, W13, W19
161-21	Aspen	12	1944	LS4B//3	ATM	Clearcut	12	~	
161-25	N. hardwood	14	1944	LS4B//3	ATM	Thin	14	~	
161-28	N. hardwood	32	1948	LS4B//3	ATM	Thin	32	~	
161-29	N. hardwood	7	1938	LS4B//3	ATM	Thin	7	~	
161-30	N. hardwood	31	1941	LS4B//3 M1A	ATM	Selection	31	~	T1, T5, T8, S7, S8, S9, S10
161-33	N. hardwood	14	1931	SL2A	TMC	Selection	14	~	S3, S4, S5, S6
161-36	Aspen	7	1951	LS4B//3	ATM	Clearcut	7	~	
161-37	Aspen	10	1954	LS4B//3	ATM	Clearcut	10	~	
162-4	Aspen-fir	52	1945	SL/LS3-1A//3	ATM/ TMC	Clearcut east part	35	~	
162-12	Sugar maple	47	1927	LS/4B//3	ATM	Thin	47	~	T1, T5, T8
162-20	N. hardwood	46	1927	SL/LS4B//3	ATM/ ATD	Thin, leave buffers near wetlands	30	~	T8
166-7	Aspen	48	1952	SL/S+G4B//3	ATD/ ATM	Clearcut east and west parts	32	~	
166-10	Aspen	20	1945	SL/S+G4B//3 SL/LS4B//4C	AViO	Clearcut, leave buffer near RNA	15	~	
166-12	Paper birch	28	1921	SL/MCS4B//3	ATM	Thin	28	N. hardwood	
166-13	Aspen-spruce	22	1954	SL/MCS4B//3	ATM	Thin	22	White spruce	
166-15	N. hardwood	20	1939	SL/LS3-1A//3 SL/MCS4B//3	ATM/ ATD	Thin	20	~	S11
166-26	N. hardwood	19	1909	SL/LS4B//4C SL/MCS4B//3	AViO/ ATD	Selection	19	~	
166-28	Sugar maple	66	1932	SL/LS4B//4C	AViO/ ATD	Selection	66	~	T1, T5, T8
166-32	Sugar maple	26	1951	SL/LS4B//3	ATM	Thin	26	~	T1, T5, T8
166-34	Aspen	12	1949	SL/S+G4B//3 Pn1A	ATD/ ATM	Clearcut	12	~	
167-5a	Aspen	46	1963	SL/S+G4B//3	ATM	Clearcut north part	10	~	
167-17	Sugar maple	5	1929	SL/LS4B//4C	AViO/ ATD	Selection	5	~	
168-1	Red pine	5	1934	SL/MCS3A//3	ATM	Thin	5	~	V1, V2, V3
168-18	N. hardwood	11	1942	SL/MCS4B//3	ATM	Thin	11	~	
168-28	Aspen-spruce	16	1935	SL/S+G4B//3	ATD/ ATM	Clearcut	16	~	T1, T5, T8

168-32	Aspen	32	1960	SL/LS4B//4V	ATD	Clearcut	32	~	R6, W10, W11, W12, W13, W19
169-13	Red pine	4	1969	SL/MCS4B//3	ATM	Thin	4	~	
169-25	Aspen-fir	8	1950	LS/MCS2A//3 SL/MCS4B//3	ATM/ TMC	Clearcut	8	~	S3, S4, S5, S6
169-26	Red pine	21	1950	SL/MCS4B//3 SL/Strs3A//3	ATM/ PMV	Thin	21	~	
169-40	Aspen	16	1928	SL/LS4B//3	ATM/ PMV	Clearcut	16	~	
169-44	Aspen-fir	8	1944	SL/MCS4B//3	ATM	Clearcut	8	~	T1, T5, T8
169-51	Aspen-fir	9	1934	SL/LS4B//3	ATM	Clearcut	9	~	
169-52	N. hardwood	8	1944	SL/LS4B//4V	ATD	Selection	8	~	
170-9	N. hardwood	41	1940	SL/LS4B//3 SL/MCS4B//3	ATM/ ATD	Selection	41	~	
170-16	Paper birch	39	1910	SL/MCS4B//3	ATM	Overstory removal	39	White pine	
170-17	Paper birch	25	1899	LS/MCS2A//3	TMC	Shelterwood, underplant hemlock, mech site prep	25	Hemlock	
170-31	Red pine	30	1934	LS/S+G4B//3 LS/S+G4A//3	PMV	Thin	30	~	W10, W11, W12, W13, W19
170-41	Aspen-fir	11	1929	SL/S+G4B//3	ATD/ ATM	Clearcut	11	~	T1, T5, T8
170-42	Sugar maple	11	1930	SL/S+G4A//3	ATD/ ATM	Selection	11	~	V1, V2, V3
170-53	N. hardwood	7	1918	SL/MCS4B//3	ATM	Selection	7	~	R6
170-54	Red pine	7	1932	SL/MCS4B//3	ATM	Thin	7	~	
170-65	Aspen	6	1935	SL/MCS4B//3	ATM	Shelterwood	6	N. hardwood	V1, V2, V3
171-6	Sugar maple	67	1929	SL/LS4B//4V	ATD	Selection	67	~	R6
171-19a	Aspen	14	1958	LS4B//3	ATM	Shelterwood, lakeside part, mech site prep	7	White pine	R6, W10, W11, W12, W13, W19
171-19b	Aspen	14	1958	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
171-24	Red pine	9	1966	SiL/SL3A//3	ATM	Thin	9	~	S12, S13, S14
171-29a	Paper birch	14	1943	LS4B//3	ATM	Shelterwood, lakeside part, mech site prep	7	White pine	R6, W10, W11, W12, W13, W19
171-29b	Paper birch	14	1943	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
176-30	Aspen-fir	21	1934	SL/S+G3A//3	ATD/ ATM	Clearcut	21	~	
176-31	Aspen-fir	13	1934	SL/MCS4A//3	ATM/ TMC	Clearcut	13	~	
176-33	Aspen	10	1935	SiL/SL2A//3	ATM	Thin	10	N. hardwood	S15, S16, S17, V1, V2, V3
176-34	Aspen	6	1935	SiL/SL2A//3 SL/LS4B//4V	ATM/ ATD	Thin	6	N. hardwood	S15, S16, S17, V1, V2, V3
176-36	Aspen	4	1935	SL/LS4B//4V	ATD	Thin	4	N. hardwood	V1, V2, V3

176-38	Aspen	14	1935	SL/LS4B//4V	ATD	Thin	14	N. hardwood	V1, V2, V3
176-39	Aspen	8	1935	SiL/SL2A//3	ATM	Clearcut	8	~	S15, S16, S17
177-3	Aspen	27	1933	SL/LS3A//3	ATM	Thin	27	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W19
177-4	Sugar maple	143	1900	SL/LS4B//4V	ATD	Selection	143	~	
177-6	N. hardwood	99	1924	SL/LS4B//4V	ATD	Selection	99	~	W14, W15, W16, W17, W18
177-9	Aspen	30	1948	SL/LS4B//4V	ATD	Thin	30	N. hardwood	V1, V2, V3
177-10	N. hardwood	69	1926	SL/LS4B//4V	ATD	Selection	69	~	W14, W15, W16, W17, W18
177-11	Aspen	11	1946	SiL/SL2A//3	ATM	Clearcut	11	~	S15, S16, S17, W14, W15, W16, W17, W18
177-16a	Aspen-spruce	78	1935	SL/LS4B//4V	ATD	Thin along hwy GG	39	N. hardwood	V1, V2, V3
177-16b	Aspen-spruce	78	1935	SL/LS4B//4V	ATD	Clearcut east part	39	~	
178-6	Red pine	2	1970	LS4B//3	ATM	Thin	2	~	
178-15	Aspen-spruce	26	1935	SL/Strs4B//3	PMV	Clearcut	26	~	
178-20	Sugar maple	90	1930	SL/LS4C//4V	ATD	Selection	90	~	E7, S1, S2, W6, W14, W15, W16, W17, W18
178-21	Red pine	28	1957	LFS/FS4B//3	PMV/ AVVib	Thin	28	~	E7, W14, W15, W16, W17, W18
178-23	Red pine	32	1957	LFS/FS4B//3	PMV/ AVVib	Thin	32	~	E7
178-25	Aspen-spruce	15	1950	LS/S+G3A//3	ATM	Thin	15	White spruce	E7, E8
179-2	N. hardwood	25	1912	SL/Strs3A//3	PMV	Selection	25	~	
179-8	Red pine	16	1958	SL/MCS4B//3	ATM	Thin	16	~	
179-9	Aspen	69	1940	SL/LS4B//4V	ATD	Clearcut northern part	40	~	
179-17	Aspen-spruce	32	1935	SiL/SL2A//3	ATM	Clearcut	32	~	E13, S15, S16, S17
179-18	N. hardwood	28	1914	SL/LS4B//3	ATM	Selection	28	~	
179-24	Aspen-spruce	51	1950	SL/LS4B//3	ATM	Clearcut south part	30	~	
179-29	N. hardwood	32	1925	SL/Strs3A//3	PMV	Shelterwood, underplant white pine, mech site prep	32	White pine	
180-4	Sugar maple	47	1939	SL/LS4B//4C	AViO/ ATD	Selection	47	~	
180-5	Aspen	22	1951	SL/Strs3A//3 SL2A	PMV/ TMC	Clearcut	22	~	F1, S3, S4, S5, S6, W14, W15, W16, W17, W18
180-6	N. hardwood	47	1928	SL/LS4B//4C	AViO/ ATD	Selection	47	~	W14, W15, W16, W17, W18

180-7	N. hardwood	28	1931	SL/LS4B//4C	AViO/ ATD	Selection	28	~	W14, W15, W16, W17, W18
180-8	Aspen	29	1932	LS4B//3	ATM	Clearcut	29	~	
180-10	Aspen	37	1932	LSMCS2A//3	ATM/ TMC	Clearcut	37	~	S3, S4, S5, S6, W14, W15, W16, W17, W18
180-14	Sugar maple	46	1932	SL/LS4B//4C	AViO/ ATD	Selection	46	~	
180-19	Aspen	65	1945	SL/MCS4B//3	ATM	Thin east part	35	N. hardwood	
180-27	Aspen-spruce	29	1948	LS4B//3	ATM	Thin	29	White spruce	W14, W15, W16, W17, W18
180-28	Sugar maple	18	1940	LS4B//3	ATM	Thin	18	~	W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
180-30	White spruce	20	1941	LS/S+G4B//3 SL/Strs3A//3	PMV	Thin	20	~	F1, W10, W11, W12, W13, W19
180-32	Aspen	22	1941	LS4B//3	ATM	Clearcut	22	~	
188-1	Aspen-spruce	13	1940	LS4B/3	ATM	Thin	13	White spruce	V1, V2, V3
188-6	N. hardwood	42	1928	SL/LS4B//3	ATM	Thin	42	~	F1
188-11	N. hardwood	56	1925	SL/LS4B//4V	ATD	Improvement cut	56	~	F1
188-12	Sugar maple	152	1925	SL/LS4B//4V	ATD	Selection	152	~	V1, V2, V3
188-18	N. hardwood	22	1930	SL/Strs3A//3 SL2A	PMV/ TMC	Selection	22	~	E12, S3, S4, S5, S6, W14, W15, W16, W17, W18
188-20	Aspen-fir	25	1933	SL/Strs3A//3	PMV	Clearcut	25	~	
188-41	Aspen-spruce	13	1930	SL/MCS4B//3 LS4B//3	ATM	Thin	13	White spruce	F1, V1, V2, V3, W5, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19, W43
188-45	Sugar maple	19	1920	SL/LS4B//4B	TMC	Selection	19	~	
198-4	Aspen-spruce	12	1945	SL/Strs4B//3	PMV	Thin	12	White spruce	V1, V2, V3
198-17	Aspen-spruce	20	1932	SL/LS4B//4V	ATM	Clearcut	20	~	W14, W15, W16, W17, W18
198-24	Aspen-spruce	8	1926	SL/Strs4B//3	PMV	Thin	8	White spruce	W14, W15, W16, W17, W18
199-21	Aspen-spruce	59	1945	LS4B//3	ATM	Clearcut part within project area	30	~	
199-22a	N. hardwood	18	1926	LS4B//3	ATM	Selection	6	~	V1, V2, V3, W14, W15, W16, W17, W18
199-24	Red pine	12	1963	LS4B//3	ATM	Thin	12	~	W14, W15, W16, W17, W18

199-25	N. hardwood	27	1932	SL/LS4C//4V LS4B//3	ATD/ ATM	Selection	27	~	S1, S2, W14, W15, W16, W17, W18
199-30	Aspen	24	1941	SL/LS3A//3	ATM	Clearcut	24	~	W14, W15, W16, W17, W18
199-32	N. hardwood	15	1940	SiL/SL2A//3 SL/LS3A//3	ATM	Selection	15	~	W14, W15, W16, W17, W18
199-35a	N. hardwood	136	1915	SL/LS4B//4V	ATD	Selection	60	~	V1, V2, V3, W14, W15, W16, W17, W18
199-37a	Aspen-spruce	61	1946	SL/STRS4B//3	ATM	Thin	30	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
199-39	N. hardwood	42	1951	LS4B//3	ATM	Selection	42	~	W14, W15, W16, W17, W18
199-41	Aspen-spruce	37	1944	SiL/SL2A//3	ATM	Clearcut	37	~	S15, S16, S17
199-43	N. hardwood	28	1932	SL/LS4B//4V SL/LS3A//3	ATD/ ATM	Selection	28	~	W14, W15, W16, W17, W18
199-46	N. hardwood	85	1930	SL/LS4B/4V	ATD	Selection	85	~	W10, W11, W12, W13, W19
200-1	N. hardwood	82.9	1917	SL/LS4B//4V	ATD	Selection	83	~	W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-2	N. hardwood	140	1916	SL/LS4B//4V	ATD	Selection	140	~	W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-8	Sugar maple	11.9	1927	SL/LS4B//3	ATM	Selection	12	~	
200-11	Sugar maple	35.3	1918	SL/LS4B//4V	ATD	Selection	35	~	E11
202-1	N. hardwood	78	1906	SiL/SL2A//3 SL/LS4B//4V	ATM/ ATD	Selection	78	~	E12, S15, S16, S17, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
202-8	Sugar maple	73	1913	SL/LS4B//4V	ATD	Selection	73	~	W10, W11, W12, W13, W19
202-9	N. hardwood	19	1930	SL/LS4B//4V	ATD	Selection	19	~	
202-14	N. hardwood	16	1916	SL/LS4B//4V	ATD	Selection	16	~	W14, W15, W16, W17, W18
202-15	N. hardwood	9	1929	SL/LS4B//4V	ATD	Selection	9	~	W14, W15, W16, W17, W18
202-16	Sugar maple	10	1930	SL/LS4B//4V	ATD	Selection	10	~	W14, W15, W16, W17, W18
203-1	N. hardwood	27	1917	SL/LS4B//4V	ATD	Selection	27	~	E3, W14, W15, W16, W17, W18

203-4	N. hardwood	22	1910	SL/LS4B//4V	ATD	Selection	22	~	W10, W11, W12, W13, W19
203-5	N. hardwood	75	1913	SL/LS4B//4V	ATD	Selection	75	~	E3, E4, E5, E6
203-6	Aspen-spruce	4	1931	SL/LS4B//4V	ATD	Clearcut	4	~	
203-8	N. hardwood	15	1919	SL/LS4B//4V	ATD	Selection	15	~	
203-10	Aspen	15	1927	SL/LS4B//4V	ATD	Clearcut	15	~	
203-11	Aspen-spruce	3	1928	SL/LS4B//4V	ATD	Clearcut	3	~	
203-14	N. hardwood	60	1929	SL/LS4B//4V	ATD	Selection	60	~	W10, W11, W12, W13, W19
203-15	N. hardwood	54	1939	SL/LS4B//4V	ATD	Selection	54	~	
203-16	N. hardwood	27	1908	SL/LS4B//4V	ATD	Selection	27	~	E1, E4, E5
203-17	N. hardwood	23	1919	SL/LS4B//4V	ATD	Selection	23	~	E2, W10, W11, W12, W13, W19
203-19	N. hardwood	26	1911	SL/LS4B//4V	ATD	Selection	26	~	W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
203-21	N. hardwood	6	1946	SL/LS4B//4V	ATD	Selection	6	~	
203-24	Red pine	4	1930	SL/LS4B//4V	ATD	Thin	4	~	
203-25	Red maple	30	1928	SL/LS4B//4V SiL/SL2A//3	ATD/ ATM	Thin	30	~	S15, S16, S17
203-28	N. hardwood	27	1930	SL/LS4B//4V	ATD	Selection	27	~	
203-30	Sugar maple	10	1927	SL/LS4B//4V	ATD	Selection	10	~	
203-31	Sugar maple	55	1921	SL/LS4B//4V	ATD	Selection	55	~	W10, W11, W12, W13, W19
204-2	Sugar maple	38	1920	SL/LS4B//4V	ATD	Selection	38	~	W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
204-7	N. hardwood	10	1941	SL/LS4B//4V	ATD	Selection	10	~	
204-11	Aspen	12	1935	SL/LS4B//4V	ATD	Clearcut	12	~	
204-12	N. hardwood	13	1930	SL/LS4B//4V	ATD	Selection	13	~	W10, W11, W12, W13, W19
204-14	Aspen	44	1935	SL/LS4B//4V	ATD	Thin	44	N. hardwood	W14, W15, W16, W17, W18
204-19	N. hardwood	10	1930	SL/LS4B//4V	ATD	Selection	10	~	

204-25	Aspen-spruce	14	1938	LS4B//3	ATM	Clearcut	14	~	
204-26	Aspen-spruce	20	1937	LS4C//3	ATD	Clearcut	20	~	
204-29	Aspen-spruce	29	1937	LS4B//3	ATM	Clearcut	29	~	
204-30	Aspen-spruce	13	1937	LS4B//3	ATM	Clearcut	13	~	
	1/ Mitigation measures that apply to all stands include: R1, R3, R5, P1,W1, W2, W3, W4, W8, W9 **2**/ Mitigation measures that apply to all stands requiring temporary roads: E9, W7 **3**/ Mitigation measures that apply to all final regeneration harvest areas: R2 **4**/ Mitigation measures that apply to all stands where treatments will have soil disturbance: N1, N2, N3, N4, N6 **5**/ Mitigation measures that apply to all stands with non-native invasive species: N5 **6**/ Mitigation measures that apply to all final harvest areas > 10 acres in size: R4 **7**/ Mitigation measures that apply to the use of unclassified Rd # 218202 in Comp. 203: E3								

Alternative 4 Stand Treatment Table

Stand ID (Cpt-Std)	*Forest Type (Current)*	*Std Ac*	*Origin*	*ELTP*	*Hab type*	*Activity*	*Treat-ment acres*	*Forest Type (Goal)*	*Mitigation Measures*
124-3	Aspen-fir	18	1923	LS4B//3	ATM	Underplant white pine near lake	10	White pine	W10, W11, W12, W13, W19
124-15	Paper birch	3	1934	SL/MCS4B//3	ATM	Underplant white pine	3	White pine	T2, T3, T4, W10, W11, W12, W13, W19
124-20	Red pine	23	1941	SL/MCS3A//3	ATM	Thin	23	~	T2, T3, T4, V1, V2, V3, W10, W11, W12, W13, W19
124-21	Jack pine	25	1936	SL/MCS3A//3	ATM	Thin, remove jack pine component	25	Red pine	T2, T3, T4
124-24	White spruce	5	1925	LS4B//3	ATM	Thin	5	~	W10, W11, W12, W13, W19
124-38	Jack pine	27	1939	LS4B/3	ATM	Underplant white pine	26	W. pine-oak	T2, T3, T4, W10, W11, W12, W13, W19

124-53	Jack pine	14	1939	LS4B/3	ATM	Clearcut, plant red pine	14	Red pine	E10, R6, T2, T3, T4
124-57	Jack pine	12	1937	LS4B/3	ATM	Clearcut, plant red pine	12	Red pine	R6, T2, T3, T4
125-30	Aspen	9	1929	SL/MCS4B//3	ATM	Clearcut	9	~	R6
126-10	Red pine	14	1937	SL/LS4C//3	ATM	Thin	14	~	S1, S2
126-22	Red pine	16	1938	SL/MCS4B//3	ATM	Thin	16	~	
127-4	Aspen	15	1950	SL/MCS4B//3	ATM	Shelterwood, underplant white pine, mech site prep	15	White pine	R6
127-17	Aspen	88	1930	SL/MCS4B//3 LS/MCS3A//3	ATM/ TMC	Clearcut 60 ac in one block	60	~	E11, R6
153-11	Aspen	12	1957	SL/LS4B//4V M1A	ATD	Improvement cut	12	N. hardwood	S7, S8, S9, S10, W14, W15, W16, W17, W18
156-6	Aspen	13	1937	LS4B//3 SL/Strs3A//3	ATM	Clearcut	13	~	
156-11	White spruce	14	1961	SL/LS3B/3	ATM	Thin	14	~	
156-32	White spruce	4	1961	LS4B//3	ATM	Thin	4	~	
157-2	Aspen	28	1964	SL/LS4B//4C	AViO	Improvement cut	28	N. hardwood	
157-3	N. hardwood	31	1935	SL/LS4B//4C LS4B//3	AViO/ ATD	Selection	31	~	T8
157-4	N. hardwood	23	1937	SL/LS4B//4C	AViO/ ATD	Selection	23	~	T8
157-7	Aspen-spruce	61	1938	LS4B//3 Pn1A	ATM	Clearcut, leave buffer near creek	40	~	F1, T8, W14, W15, W16, W17, W18
157-8	Aspen-spruce	38	1937	LS4B//3	ATM	Clearcut, leave buffer near creek	20	~	F1
157-12	N. hardwood	17	1950	LS/S+G4A//3	ATM/ PMV	Improvement cut	17	~	
157-18	N.	78	1931	SL/LS4B//4V	ATD	Improvement cut	78	~	
157-19	Sugar	13	1923	SL/LS4B//4V	ATD	Improvement cut	13	~	
157-20	N. hardwood	42	1947	SL/LS3-1B//3	ATM/ ATD	Improvement cut	42	~	S11, W14, W15, W16, W17, W18
158-1	Aspen	62	1950	LS4B//3	ATM	Clearcut, leave buffer near creek	55	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
158-9	Sugar maple	23	1939	SL/LS4B//4V	ATD	Selection	23	~	F1, T1, T5, T8, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
158-15	N. hardwood	158	1930	SL/LS4B//4V SL/LS4C//4V	ATD	Selection	158	~	S1, S2
158-17	N. hardwood	41	1951	SL/LS4B//4V	ATD	Selection	41	~	

158-18	N. hardwood	91	1931	LS4B//3 Pa1A SL/LS3A//4V	ATD	Improvement cut	91	~	
158-19	N. hardwood	23	1945	SL/LS4B//4V	ATD	Selection	23	~	
158-20	N. hardwood	16	1952	SL/LS4B//4V	ATD	Selection	16	~	
158-28	N. hardwood	67	1929	SL/LS4B//4V	ATD	Selection	67	~	
158-30	N. hardwood	65	1940	SL/LS4B//4V LS4B//3	ATD	Selection	65	~	
158-33	N. hardwood	55	1920	SL/LS4B//4V	ATD	Selection	55	~	F1, T1, T5, T8, W14, W15, W16, W17, W18
159-5	Sugar maple	85	1935	SL/LS4B//4V	ATD	Thin	85	~	
161-12	White spruce	4	1960	SL2A	TMC	Thin	4	~	S3, S4, S5, S6
161-14	Aspen-spruce	52	1957	SL2A LS4B//3 Pa1A	TMC/ ATM	Clearcut, leave buffer near creek	40	~	F1, S3, S4, S5, S6, W14, W15, W16, W17, W18
161-15	N. hardwood	98	1921	LS4B//3	ATM	Improvement cut	98	~	F1, T1, T5, T8, W10, W11, W12, W13, W19
161-16	N. hardwood	28	1937	LS4B//3	ATM	Improvement cut	28	~	
161-18	N. hardwood	51	1935	SL/LS4B//3	ATM	Improvement cut	51	~	T1, T5, T8
161-19	Aspen-spruce	70	1945	SL/Strs3A//3	ATM	Clearcut west part as block with 161-21, leave buffer near creek	35	~	T1, T5, T8, W10, W11, W12, W13, W19
161-21	Aspen	12	1944	LS4B//3	ATM	Clearcut	12	~	
161-25	N. hardwood	14	1944	LS4B//3	ATM	Thin	14	~	
161-28	N. hardwood	32	1948	LS4B//3	ATM	Thin	32	~	
161-29	N. hardwood	7	1938	LS4B//3	ATM	Thin	7	~	
162-12	Sugar maple	47	1927	LS/4B//3	ATM	Improvement cut	47	~	T1, T5, T8
162-20	N. hardwood	46	1927	SL/LS4B//3	ATM/ ATD	Improvement cut, leave uncut part in center	30	~	T8
166-15	N. hardwood	20	1939	SL/LS3-1A//3 SL/MCS4B//3	ATM/ ATD	Improvement cut	20	~	S11
166-28	Sugar maple	66	1932	SL/LS4B//4C	AViO/ ATD	Selection	66	~	T1, T5
166-32	Sugar maple	26	1951	SL/LS4B//3	ATM	Improvement cut	26	~	T1, T5, T8
166-34	Aspen	12	1949	SL/S+G4B//3 Pn1A	ATD/ ATM	Clearcut	12	~	

167-17	Sugar maple	5	1929	SL/LS4B//4C	AViO/ ATD	Selection	5	~	
168-1	Red pine	5	1934	SL/MCS3A//3	ATM	Thin	5	~	V1, V2, V3
168-18	N. hardwood	11	1942	SL/MCS4B//3	ATM	Thin	11	~	
168-32	Aspen	32	1960	SL/LS4B//4V	ATD	Clearcut	32	~	R6, W10, W11, W12, W13, W19
169-13	Red pine	4	1969	SL/MCS4B//3	ATM	Thin	4	~	
169-26	Red pine	21	1950	SL/MCS4B//3 SL/Strs3A//3	ATM/ PMV	Thin	21	~	
169-44	Aspen-fir	8	1944	SL/MCS4B//3	ATM	Clearcut	8	~	T1, T5, T8
169-52	N. hardwood	9	1944	SL/LS4B//4V	ATD	Selection	8	~	
170-9	N. hardwood	41	1940	SL/LS4B//3 SL/MCS4B//3	ATM/ ATD	Selection	41	~	
170-16	Paper birch	39	1910	SL/MCS4B//3	ATM	Overstory removal, mech site prep	39	White pine	
170-31	Red pine	30	1934	LS/S+G4B//3 LS/S+G4A//3	PMV	Thin	30	~	W10, W11, W12, W13, W19
170-41	Aspen-fir	11	1929	SL/S+G4B//3	ATD/ ATM	Clearcut	11	~	T1, T5, T8
170-42	Sugar maple	11	1930	SL/S+G4A//3	ATD/ ATM	Selection	11	~	V1, V2, V3
170-53	N. hardwood	7	1918	SL/MCS4B//3	ATM	Selection	7	~	R6
170-54	Red pine	7	1932	SL/MCS4B//3	ATM	Thin, underplant red oak	7	~	V1, V2, V3
171-6	Sugar maple	67	1929	SL/LS4B//4V	ATD	Selection	67	~	R6
171-19a	Aspen	14	1958	LS4B//3	ATM	Shelterwood, lakeside part, mech site prep	7	White pine	R6, W10, W11, W12, W13, W19
171-19b	Aspen	14	1958	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
171-24	Red pine	9	1966	SiL/SL3A//3	ATM	Thin	9	~	S12, S13, S14
171-29a	Paper birch	14	1943	LS4B//3	ATM	Shelterwood, lakeside part, mech site prep	7	White pine	R6, W10, W11, W12, W13, W19
171-29b	Paper birch	14	1943	LS4B//3	ATM	Overstory removal	7	White pine	R6, W10, W11, W12, W13, W19
176-36	Aspen	4	1935	SL/LS4B//4V	ATD	Thin	4	N. hardwood	V1, V2, V3
176-38	Aspen	14	1935	SL/LS4B//4V	ATD	Thin	14	N. hardwood	V1, V2, V3
177-3	Aspen	27	1933	SL/LS3A//3	ATM	Thin	27	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W19
177-4	Sugar maple	143	1900	SL/LS4B//4V	ATD	Selection	143	~	

177-6	N. hardwood	99	1924	SL/LS4B//4V	ATD	Selection	99	~	W14, W15, W16, W17, W18
177-9	Aspen	30	1948	SL/LS4B//4V	ATD	Thin	30	N. hardwood	V1, V2, V3
177-10	N. hardwood	69	1926	SL/LS4B//4V	ATD	Selection	69	~	W14, W15, W16, W17, W18
177-16	Aspen-spruce	78	1935	SL/LS4B//4V	ATD	Improvement cut	78	N. hardwood	V1, V2, V3
178-6	Red pine	2	1970	LS4B//3	ATM	Thin	2	~	
178-15	Aspen-spruce	26	1935	SL/Strs4B//3	PMV	Shelterwood, underplant white pine	26	White pine	
178-20	Sugar maple	90	1930	SL/LS4C//4V	ATD	Selection	90	~	E7, S1, S2, W6, W14, W15, W16, W17, W18
178-21	Red pine	28	1957	LFS/FS4B//3	PMV/ AVVib	Thin	28	~	E7, W14, W15, W16, W17, W18
178-23	Red pine	32	1957	LFS/FS4B//3	PMV/ AVVib	Thin	32	~	E7
178-25	Aspen-spruce	15	1950	LS/S+G3A//3	ATM	Thin	15	White spruce	E7, E8
179-8	Red pine	16	1958	SL/MCS4B//3	ATM	Thin	16	~	
179-9	Aspen	69	1940	SL/LS4B//4V	ATD	Improvement cut	69	N. hardwood	
179-18	N. hardwood	28	1914	SL/LS4B//3	ATM	Selection	28	~	
179-29	N. hardwood	32	1925	SL/Strs3A//3	PMV	Shelterwood	32	~	
180-4	Sugar maple	47	1939	SL/LS4B//4C	AViO/ ATD	Selection	47	~	
180-5	Aspen	22	1951	SL/Strs3A//3 SL2A	PMV/ TMC	Thin	22	White spruce	F1, S3, S4, S5, S6, W14, W15, W16, W17, W18
180-6	N. hardwood	47	1928	SL/LS4B//4C	AViO/ ATD	Selection	47	~	W14, W15, W16, W17, W18
180-7	N. hardwood	28	1931	SL/LS4B//4C	AViO/ ATD	Selection	28	~	W14, W15, W16, W17, W18
180-8	Aspen	29	1932	LS4B//3	ATM	Clearcut	29	~	
180-10	Aspen	37	1932	LSMCS2A//3	ATM/ TMC	Improvement cut	37	N. hardwood	S3, S4, S5, S6, W14, W15, W16, W17, W18
180-14	Sugar maple	46	1932	SL/LS4B//4C	AViO/ ATD	Selection	46	~	
180-28	Sugar maple	18	1940	LS4B//3	ATM	Improvement cut	18	~	W14, W15, W16, W17, W18
180-30	White spruce	20	1941	LS/S+G4B//3 SL/Strs3A//3	PMV	Thin	20	~	F1, W10, W11, W12, W13, W19
180-32	Aspen	22	1941	LS4B//3	ATM	Clearcut	22	~	
188-1	Aspen-spruce	13	1940	LS4B/3	ATM	Improvement cut	13	White spruce	V1, V2, V3

188-6	N. hardwood	42	1928	SL/LS4B//3	ATM	Improvement cut	42	~	F1
188-11	N. hardwood	56	1925	SL/LS4B//4V	ATD	Improvement cut	56	~	F1, W5, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
188-12	Sugar maple	152	1925	SL/LS4B//4V	ATD	Selection	152	~	V1, V2, V3
188-18	N. hardwood	22	1930	SL/Strs3A//3 SL2A	PMV/ TMC	Selection	22	~	E12, S3, S4, S5, S6, W14, W15, W16, W17, W18
188-45	Sugar maple	19	1920	SL/LS4B//4B	TMC	Selection	19	~	
198-17	Aspen-spruce	20	1932	SL/LS4B//4V	ATM	Improvement cut	20	N. hardwood	W14, W15, W16, W17, W18
199-21	Aspen-spruce	59	1945	LS4B//3	ATM	Improvement cut within project bdy	40	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W19
199-22	N. hardwood	18	1926	LS4B//3	ATM	Selection, part within project area	6	~	T7, V1, V2, V3, W14, W15, W16, W17, W18
199-24	Red pine	12	1963	LS4B//3	ATM	Thin	12	~	W14, W15, W16, W17, W18
199-25	N. hardwood	27	1932	SL/LS4C//4V LS4B//3	ATD/ ATM	Selection	27	~	S1, S2, T7, W14, W15, W16, W17, W18
199-30	Aspen	24	1941	SL/LS3A//3	ATM	Shelterwood	24	N. hardwood	W14, W15, W16, W17, W18
199-32	N. hardwood	15	1940	SiL/SL2A//3 SL/LS3A//3	ATM	Selection	15	~	T7, W14, W15, W16, W17, W18
199-35	N. hardwood	136	1915	SL/LS4B//4V	ATD	Selection, part within project area	60	~	T7, V1, V2, V3, W14, W15, W16, W17, W18
199-37	Aspen-spruce	61	1946	SL/STRS4B//3	ATM	Thin, part within project area	30	N. hardwood	V1, V2, V3, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
199-39	N. hardwood	42	1951	LS4B//3	ATM	Selection	42	~	T7, W14, W15, W16, W17, W18
199-43	N. hardwood	28	1932	SL/LS4B//4V SL/LS3A//3	ATD/ ATM	Selection	28	~	T7, W14, W15, W16, W17, W18
199-46	N. hardwood	85	1930	0	0	Selection	85	~	T7, W10, W11, W12, W13, W19
200-1	N. hardwood	83	1917	SL/LS4B//4V	ATD	Selection	83	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-2	N. hardwood	140	1916	SL/LS4B//4V	ATD	Selection	140	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
200-8	Sugar maple	12	1927	SL/LS4B//3	ATM	Selection	12	~	T7

200-11	Sugar maple	35	1918	SL/LS4B//4V	ATD	Selection	35	~	E11, T7
202-1	N. hardwood	78	1906	SiL/SL2A//3 SL/LS4B//4V	ATM/ ATD	Selection	78	~	E12, S15, S16, S17, T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
202-8	Sugar maple	73	1913	SL/LS4B//4V	ATD	Selection	73	~	T7, W10, W11, W12, W13, W19
202-9	N. hardwood	19	1930	SL/LS4B//4V	ATD	Selection	19	~	T7
202-14	N. hardwood	16	1916	SL/LS4B//4V	ATD	Selection	16	~	T7, W14, W15, W16, W17, W18
202-15	N. hardwood	9	1929	SL/LS4B//4V	ATD	Selection	9	~	T7, W14, W15, W16, W17, W18
202-16	Sugar maple	10	1930	SL/LS4B//4V	ATD	Selection	10	~	T7, W14, W15, W16, W17, W18
203-1	N. hardwood	27	1917	SL/LS4B//4V	ATD	Selection	27	~	E3, T7, W14, W15, W16, W17, W18
203-4	N. hardwood	22	1910	SL/LS4B//4V	ATD	Selection	22	~	T7, W10, W11, W12, W13, W19
203-5	N. hardwood	75	1913	SL/LS4B//4V	ATD	Selection	75	~	E3, E4, E5, E6, T7
203-8	N. hardwood	15	1919	SL/LS4B//4V	ATD	Selection	15	~	T7
203-14	N. hardwood	60	1929	SL/LS4B//4V	ATD	Selection	60	~	T7, W10, W11, W12, W13, W19
203-15	N. hardwood	54	1939	SL/LS4B//4V	ATD	Selection	54	~	T7
203-16	N. hardwood	27	1908	SL/LS4B//4V	ATD	Selection	27	~	E1, E4, E5, T7
203-19	N. hardwood	26	1911	SL/LS4B//4V	ATD	Selection	26	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
203-21	N. hardwood	6	1946	SL/LS4B//4V	ATD	Selection	6	~	T7
203-24	Red pine	4	1930	SL/LS4B//4V	ATD	Thin	4	~	
203-25	Red maple	30	1928	SL/LS4B//4V SiL/SL2A//3	ATD/ ATM	Thin	30	~	S15, S16, S17
203-28	N. hardwood	27	1930	SL/LS4B//4V	ATD	Selection	27	~	T7
203-30	Sugar maple	10	1927	SL/LS4B//4V	ATD	Selection	10	~	T7
203-31	Sugar maple	55	1921	SL/LS4B//4V	ATD	Selection	55	~	T7, W10, W11, W12, W13, W19

204-2	Sugar maple	38	1920	SL/LS4B//4V	ATD	Selection	38	~	T7, W10, W11, W12, W13, W14, W15, W16, W17, W18, W19
204-7	N. hardwood	10	1941	SL/LS4B//4V	ATD	Selection	10	~	T7
204-11	Aspen	12	1935	SL/LS4B//4V	ATD	Improvement cut	12	N. hardwood	
204-12	N. hardwood	13	1930	SL/LS4B//4V	ATD	Selection	13	~	T7, W10, W11, W12, W13, W19
204-19	N. hardwood	10	1930	SL/LS4B//4V	ATD	Selection	10	~	T7

1/ Mitigation measures that apply to all stands include: R1, R3, R5, P1,W1, W2, W3, W4, W8, W9

2/ Mitigation measures that apply to all stands requiring temporary roads: E9, W7

3/ Mitigation measures that apply to all final regeneration harvest areas: R2

4/ Mitigation measures that apply to all stands where treatments will have soil disturbance: N1, N2, N3, N4, N6

5/ Mitigation measures that apply to all stands with non-native invasive species: N5

6/ Mitigation measures that apply to all final regeneration harvest areas > 10 acres in size: R4

7/ Mitigation measures that apply to the use of unclassified Rd # 218202 in Comp. 203: E3

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